THE HASHIMITE KINGDOM OF JORDAN
NATIONAL ELECTRIC POWER CO.

P.O. BOX 2310

AMMAN 11181

المملكة الأردنية الهاشمية
شركــة الكهربــاء الوطنيــة م.ع
ص.ب 2310
عمان 11181

TENDER NO. 48 /2025

SUPPLY OF 132KV CONTROL AND PROTECTION PANELS

AT IRBID S/S

1. Invitation To Tender.
2. Instructions To Tenderers.
3. Forms of Tender.
4. General Conditions Of Contract.
5. Technical specification .
6. Technical Schedules.
7. Price Schedules.

TENDERER

……

……

……

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS AT IRBID S/S

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SECTION 1

- INVITATION TO TENDER

- TENDER ACKNOWLEDGEMENT

NATIONAL ELECTRIC POWER COMPANY
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SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

INVITATION TO TENDER

The National Electric Power Company (NEPCO) intends to have a loan and / or from NEPCO's own sources towards the cost of supply of 132 KV CONTROL AND PROTECTION PANELS (Qty: 5), 132 KV CONTROL DESK (Qty: 1) AND 132 KV SYNCHRONIZING TROLLY (Qty:1).

The National Electric Power Company hereby invites sealed Tenders from eligible Tenderers for design, manufacture, inspection, testing, packing for export, supply CFR Aqaba, setting to Works and warranty for a period of (12) months from the date of receipt of last consignment at site or NEPCO warehouses.

Interested Eligible Tenderers may obtain further information at the office of:

National Electric Power Company
PO Box 2310
11181 Amman
Jordan

Telephone: +(962) 6-5858615
Telefax: +(962) 6-5818336

A complete set of Tender Documents may be purchased by any interested eligible Tenderer on application to the above and upon payment of a non-refundable fee of JD 125 (One Hundred Twenty-Five Jordanian Dinars).

The enclosed Tender Acknowledgement should be returned to the National Electric Power Company.

Tenders must be delivered to The Tenders Committee (in the form of two envelopes, one envelope for Technical and Financial offer and one envelope for Bid Bond), National Electric Power Company at the above address not later than 14.00 noon Amman time on **MONDAY 03/11/2025**

All Tenders must be accompanied by a Tender Guarantee in the amount of JD 3300 (Three thousand and three hundred Jordanian Dinars) in the form of a Bank Guarantee issued directly by an approved Bank located in Jordan and in the form provided in the Tender Documents.

NATIONAL ELECTRIC POWER COMPANY
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AT IRBID S/S

TENDER ACKNOWLEDGEMENT

National Electric Power Co
P.O. Box 2310
11181 Amman
Jordan

Telefax: 00 +(962) 6-5818336

Attention: The Managing Director,

Dear Sirs

We the undersigned _____

Acknowledge receipt of the Tender Documents for Tender Number (48/2025) comprising one copy of each of the following:

- Invitation for Tenders, Instructions to Tenderers, Conditions of Contract and Tender Forms.
- Technical Specification and Drawings.
- Technical Schedules.
- Price Schedules.

We wish to receive any further information concerning this Tender at the following address:

Name:
_____
_____

Address:
_____
_____

_____

_____

_____

_____

Our local agent in Jordan is:

Name:

_____

_____

Address:

_____

_____

_____

_____

_____

_____

In case of not submitting this form to NEPCO before closing date, it is the Tenderer responsibility of not receiving correspondence, amendments to the tender, addendums… etc.

Section 2

INSTRUCTIONS TO PERSONS TENDERING

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

INSTRUCTION TO PERSON TENDERING

1. The Tender shall be made in one copy on the accompanying form of tender with all blanks therein and in all the Schedules duly filled up in ink and signed, The Tender price shall include all incidental and contingent expenses. In particular, the Form of Tender must be completed and signed without alteration.

Tenderers are particularly directed that the amount entered on the Form of Tender shall be a fixed price for performing the Contract strictly in accordance with the bond document and shall be the sum total of all the amounts printed into and entered by the Tenderer upon the Schedule of Prices.

Should the Tenderer consider that he can offer any advantages to the purchaser by a modification to the Specification he may draw attention to such by an attached document stating the change in the amount of his Tender if such modification is accepted by the Purchaser, but the total entered on the Form of Tender shall be such as represents complete compliance with the bound document.

2. No alteration shall be made in the Form of Tender or in the Schedules there to except in filling up the blanks as directed, If any such alteration to be made or if these Instructions will not be fully complied with the Tender may be rejected. The Tenderer, however, is at liberty to add any further details that he may deem desirable and, in the event of his so doing, shall print or type such details and annex the added matter to the Tender submitted by him. Such additional details shall not be binding upon the Purchaser unless they shall be subsequently incorporated in the Contract.

3. The Tenderer shall submit with his Tender in order of the relevant clauses, a statement of any departures from the Specifications. Notwithstanding any description, drawings or literature which may be submitted, all details other than those in the Statement of Departures shall be assumed to be in accordance with the Specifications.

4. Although IEC Recommendations and British Standards for workmanship, equipment and materials, have been selected in

this Specification as a basis of reference, standards and specifications of other countries and recommendations of other international standard organizations will be acceptable provided they are substantially equivalent to the designated Standards and provided furthermore that the Tenderer submits for approval Specifications which he proposes to use.

5. References to brand names or catalogue numbers, if any, in this Specification have been made only for that equipment for which it has been determined that a degree of standardization is necessary to maintain certain essential features, In certain instances such references have also been made for purpose of convenience to specify the requirements. In either case, offers of alternative goods which have similar characteristics and provide performance and quality at least equal to those specified are acceptable.

6. Pre-Tender Meeting and Site Visit:

6.1 The Bidder is advised to attend the pre-bid meeting and site visit at Irbid S/S. A pre-bid meeting and site visit shall be held as mentioned in the invitation letter in NEPCO offices.

6.2 The Bidder is advised to visit and examine the site (Irbid S/S) and surroundings where the Facilities are to be installed and obtain for itself on its own responsibility all information that may be necessary for preparing the tender and entering into a contract. The costs of visiting the site shall be at the Bidder's own expense. Modification work at the associated substation shall be compatible with the existing system, site visit is a must during bidding stage, the bidders are responsible to arrange for such site visit and such site visit will also be approved by NEPCO

6.3 Where the Bidders and any of its personnel or agents have been granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, the Bidders, its personnel, and agents will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal injury (whether fatal or otherwise) , loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the visit.

6.4 Failure to investigate the Site shall not relieve the Bidders from responsibility for estimating properly the difficulty or cost of successfully performing the Works.

6.5 If the site visit cancels a report of the site visit carried out by NEPCO will be provided.

7. In the event that the intending signatory does not manufacture one or more of the main sections of equipment and materials, then the Tender submitted should give evidence to show that all the obligations imposed by the documents on the intending signatory have been fully understood and accepted, where applicable, by the manufacturer (s) to whom it would be intended to subcontract one or more of the main sections of the equipment and materials.

8. If the Tenderer has any doubt as to the meaning of any portion of the General Conditions or the Specifications or Drawings, he shall when be submitting his Tender, set out in his covering letter the interpretation on which he relies.

9. The purchaser does not bind himself to accept the lowest or any tender, nor to assign any reason for the rejection of any tender, nor to purchase the whole of the equipment and materials specified.

10. The purchaser will not be responsible for, nor pay for, any expense or loss, which may be incurred by a Tenderer in the preparation of his Tender.

11. One copy of the Tender, and its accompanying documents, filled up as directed, together with the drawings called for must be enclosed in a secure envelope endorsed (Tender for Contract No. 48/2025, should be submitted to the Managing Director, National Electric Power Company, P.O. Box 2310, Amman 11181 The HASHEMITE KINGDOM OF JORDAN, by the time stated in the covering letter.

12. No tender received after that time will be considered.

13. All correspondence in connection with this Tender and Contract and all matter accompanying the Tender which is relevant to its examination shall be in the English language and expressed in metric units.

14. The Tender is to be held open for acceptance or rejection for a validity period of (90) days from the time fixed for opening the Tenders.

15. A non-refundable fee of JD (125 Jordanian Dinar) will be charged for each set comprising one copy of the Tender Documents.

16. The Tender shall be accompanied by a Tender Bond in the form of a Bank Guarantee valid for at least 90 days from the time fixed to Tender closing date, or a certified cheque in favour of and payable to the Purchaser for a sum of JD 3300 (Three thousand and three hundred Jordanian Dinars) as guarantee of good faith.

17. This Bond is to be issued by any approved Bank in Jordan. The Bond will be returned to the unsuccessful Tenderer according to Regulation No. (8) For the year 2022 Government Procurements Regulation. In the case of the successful Tenderer the Bond will, subject to the Conditions of Contract, be returned as soon as a formal Contract Agreement and a performance Bond have been entered into.

18. Tenders received prior to the time fixed for opening will be securely kept, unopened. Tenders received after that time will be rejected. The Purchaser bears no responsibility for premature opening of Tenders not properly addressed or identified.

19. Tenders may be withdrawn by formal request received in writing from the Tenderer prior to the time fixed for opening. If for any reason the Tender should be withdrawn after the time fixed for opening and before expiry of the said validity period, the Purchaser has the right to retain the full value of the Tender Bond.

20. A) Any arithmetical error shall be corrected by a decision of the procurement committee and the bidder must be notified accordingly, provided that the arithmetical corrections are as follows:

1. In the event of a discrepancy between the unit price and the total amount, the unit price shall be adopted and the total price shall be corrected accordingly unless there is clear evidence that the decimal point is misplaced.
2. If there is an error in the total amounts in the Bill of Quantities as a result of the addition and subtraction processes of the sub-totals, the subtotals shall be adopted and the total price shall be corrected accordingly.
3. In the event of a discrepancy between the unit price, in figures and in writing, the unit price that mentioned in writing shall be adopted unless the procurement committee finds a basis for the adoption of the price mentioned in figures.
4. If any bidder does not accept the correction of the errors after the analysis and evaluation, its submission shall be excluded

and the bid bond shall be forfeited by a decision of the procurement committee.

5. If the bidder has not priced one or more of the items in the works and technical services tendering, these unquoted items shall be considered to be loaded on the other items of the tender, and the bidder shall execute them free of charge, if the tender has been awarded to it, whether the bidder attaches or does not attach those items in the tender.

B) Subject to the provisions of paragraph (a) of this Article, the basis for the examination of submissions included in the unified works contract for the construction projects shall be adopted.

21. Where compliance with a specific Standard Specification is called for the Standard Specification used shall be that in force at the time of Tender.

22. The successful Tenderer shall abide by the commercial and professional regulations as required by the Ministry of Industry & Trade, Engineering Association, Jordan contractor's association and other relevant Institutions in Jordan. (If applicable).

23. The Tenderer may state the Tender Price in Jordanian Diners. If, however, a portion of the Tenderers expenditure under the Contract is expected to be made in countries other than Jordan he may state a corresponding foreign currency portion of the Tender Price in the currencies of those other countries.

24. Tender evaluation will be consistent with the terms and conditions set for in the Tender documents.

In addition to the Tender Price, adjusted to correct arithmetical errors, other relevant factors such as the time of completion of delivery or construction, operating costs where applicable or the efficiency and compatibility of the equipment, the availability of service and spare parts, and reliability of construction methods proposed will be taken into consideration to the extent and in the manner specified in the Tender documents, in determining the evaluated Tender most advantageous to the Purchaser.

25. For comparison of all Tenders, the currency or currencies of the Tender Price for each Tender will be valued in terms of Jordan Dinars. The rates of exchange to be used in such valuation will be the selling rates published by the Central Bank of Jordan, and applicable to similar transactions, on the day of Tenders closing date unless there should be a change in the value of the currencies before the award is made. In the later case, the exchange rates

prevailing at the time of the decision to notify the award to the successful Tenderer may be used.

26. Stamp duty and award fees are payable on Jordanian Contracts according to Jordanian laws, it is the Contractor's responsibility to purchase legal stamps to the requisite amount depending on the Contract Value, these fees should be paid within 10 days of the date of LOA and before signing the contract to the Ministry of Finance, otherwise penalties will be imposed according to laws and regulations.

If the final contract price is increased during or after completion of the works, contractor shall pay extra stamp duty and award fees proportional to the amount of increase.

27. Before signing the contract and within 28 days from date Letter of Award, the successful Tenderer shall furnish an irrevocable and **unconditional Performance Bond of (10%) of the total contract price** in the form given and in the same contract currency, and you are required to extend the validity of the Bid Bond until the Performance Bond has been established and accepted by NEPCO.

The Performance Bond shall be valid for a period expiring at least one month after receipt of the last CONSIGNMENT at site or NEPCO warehouse and shall still enforce until submission of the maintenance Guarantee for the Guarantee Period.

Failure of the successful Tenderer to comply with the requirements of above Sub-Clause shall constitute sufficient grounds for the annulment of the award and forfeiture of the tender security, in which event the Employer may make the award to the next lowest evaluated Tenderer or call for new tenders.

If any variation order has been issued to increase the contract price during the contract duration, the contractor must increase the performance bond to the value of (15%) of the increased amount.

The contractor shall seek for releasing Performance Bond upon fully finalized all contractual terms required and submit of maintenance Guarantee.

28. For overseas transport, the Contractor and his sub-contractors Suppliers and Manufacturers shall give priority to Jordan National Line Co., and to Arab shipping companies and their subsidiaries for, the shipping of goods, materials and Plant provided such companies ships call at the port of export. The

Contractor shall also give priority to the Royal Jordanian Airlines for airfreight shipment and transport of personnel. Shipment by sea freight must be on direct and regular (liner) vessel less than 15 years old at the time of shipment. The vessel should be classified and in accordance with (ISM) code and should be a member in the P&I club

29. Any further information may be obtained on application in writing to:-

Managing Director

National Electric Power Company,

P.O. Box 2310, Amman, 11181

The Hashemite Kingdom of Jordan.

30. The Contractor should print NEPCO Stock Code No. on the supplied Materials which can be obtained in due time.

31. The bid bond shall be submitted either by the supplier or by the vendor on behalf of supplier in condition that he is fully authorized by Power of attorney letter from the supplier.

32. Tenderer must submit country of origin and name of manufacturer for the offered goods.

33. Tenderer shall submit his offer based on single price, excluding all custom duties and sales tax.

34. Tenderer must fill the schedules of bill of quantities incorporated with breakdown prices of this tender.

35. Tenderer must complete the technical data sheets of this tender.

36. **Complete offer shall be complete order; partial offer will not be accepted.**

37. Insurance:

NEPCO undertakes to insure all the shipped materials and equipment's with local Jordanian companies against all risks from the time they leave the works until they are delivered at site or at NEPCO warehouse.

The contractor must provide full details of the material to be dispatched in good time for NEPCO to arrange for marine insurance before material is actually dispatched.

38. Payments:

Terms of payment for this contract will be strictly according to paragraph No.8 (Terms of Payment) of General Conditions of the Contract.

39. Contract Incoterms:

For execution of this contract, the chosen incoterms are as follows:

"CFR – Aqaba port - Jordan Incoterms 2020"

In case of locally manufactured materials and the awarding has been done into local Jordanian company the required delivery and prices will be assumed as (delivery to NEPCO Stores).

40. This document is subject to the provisions and instructions of the Government Procurement Regulation No. (8) Of 2022.

41. Tenderers Eligibility and Qualification:

In order to satisfy the requirements for eligible experience, the Tenderer shall provide documentary evidence to establish:

A. That, in the case of a Tenderer offering to supply materials and equipment under the contract which the Tenderer does not manufacture or otherwise produce, **the Tenderer has been duly authorised by the manufacturer or producer of the materials and equipment to supply them in the employer's country (authorised certificate shall be provided).**

B. Documentary evidence of the Tenderers qualification to perform the Contract and the Tenderer has the technical capacity and production capability necessary to perform the contract. In particular, it is required that:

- **The Tenderer shall provide documentation, certified by the owner (Two End user certificates),** to show that the 132kv Control and Protection Panels to be supplied, having the type and rating (same or above) and the same place of manufacture, is in successful commercial service for a minimum of two years in two different countries within the last 12 years (2013 - 2024).
- End user certificate should conform the following:
    - Certified (signed and stamped) by the owner of the material (end user) not from the contractor In English language, printed officially and stamped,
    - End-user certificate shall show clearly the following:

a. Name of customer/company and complete address where equipment is installed.

b. Date of issuance of certificate.

c. Date of put in operation.

d. Rating, capacity of related equipment

Original performance certificate maybe returned, if required by tenderer.

C. **The Tenderer shall provide documentation, certified by the owner (Type Test),** to show that the 132 kv Control and Protection Panels to be supplied, having similar type or above and the same place of manufacture, passed the type test successfully within last 12 years (2013 - 2024).

- Type test certificate should conform the following:

  - Certified (signed and stamped) by the manufacturer / or third party of the material (type test) not from the contractor In English language, printed officially and stamped,
  - Type test certificate shall show the following:

    a. Type of equipment.

    b. Date of issuance of certificate.

    c. All results of test in pass status.

Failure to supply the required qualification documentation (i.e., Type test certificates of equipment, End User Certification & Tenderers qualifications documentation) to the satisfaction of the employer result in rejection of the tender.

Section 3

FORMS

- Form of Tender
- Form of advance payment guarantee
- Form of tender Guarantee
- Form of Performance Guarantee
- Form of Maintenance Guarantee
- Form of Declaration for Prohibited Payments
- Form of Declaration for Other Payments
- Form of Request for Shipping Release
- Form of Inspection Certificate

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

FORM OF TENDER

Managing Director
National electric Power Company,
P.O. Box 2310,
Amman, 11181
The Hashemite Kingdom of Jordan.

Dear Sir,

1. Having examined the conditions of contract, Specifications and Schedules for the above Works, we, the undersigned, offer to manufacture, design, engineering, supply of works, and deliver the equipment described in the Specifications and Schedules and in accordance with the said Conditions of the Contract, for the sum of
   ……
   ……
   ……

   Or such other sum as may be ascertained in accordance with the said Conditions.

2. We agree that this Tender shall be held open for acceptance or rejection for the validity period of 90 days from the date fixed for opening Tenders and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

3. Unless and until a formal Agreement is prepared and executed this Tender, together with your written acceptance thereof, shall constitute a binding Contract between us.

4. If our Tender is accepted, we will deliver to National Electric Power Company a performance Bond, according to clause No.26 instruction to person tendering.

5. We undertake if our Tender is accepted and on receipt of your acceptance to commence and manufacture works, and complete for delivery to Aqaba port the whole of the Works offered within ( ) months. Calculated from the date of Letter of Award (i.e., commencement date), and to deliver on the dock at Aqaba Port, Jordan the whole of the works offered within a further ( ) months. (Anyhow all delivery dates will be in accordance with the required completion date of as specified for each substation).

6. We will provide details of the plant and materials to be shipped in good time for the National Electric Power Company to arrange for the Marine Insurance.

7. A Guarantee Period will apply to each section of the Works for (12) months from the date of receipt of last consignment at site or NEPCO warehouse.

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

Date this …… day of …… 20 ……

Signature …….in the capacity of ……..

Duly authorised to sign Tender for and on behalf of……..……..

…… ……..…...

Address
…… …...

Occupation…… ……

Telephone No:
Fax No. :

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
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AT IRBID S/S

FORM OF ADVANCE PAYMENT GUARANTEE

GUARANTEE NO.

M/S., National Electric Power Co. (NEPCO)
Amman – Jordan

NAME OF CONTRACT: TENDER NO. 48 / 2025 132 KV CONTROL AND PROTECTION PANELS AT IRBID S/S

At the request of bank… (The Foreign Bank) and on behalf of M/S……..…
(The contractor Name and Address), we the…. (The Local Bank) issue in your favour our irrevocable and unconditional Advance Payment Guarantee No…...in the amount of (----------) (In words).

In this connection we … (Local bank) hereby consider ourselves responsible for the unconditional payment to you or your authorized representatives of the above sum on your first Written demand in whole or in part not withstanding any objections on the part of the above-named contractor and without any need for notarial warning or judicial proceedings.

This guarantee remains valid from the date of issue till its expiry date on …/…/…… unless it's extended or renewed upon your request within the guarantee validity, and it will not be cancelled unless our bank received an official letter duly issued and signed by you attached with original guarantee and all related original amendments and or extensions.

Bank (Local Bank)

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

FORM OF TENDER GUARANTEE

To: M/S., NATIONAL ELECTRIC POWER COMPANY (NEPCO)

AMMAN – JORDAN.

NAME OF CONTRACT: TENDER NO. 48 / 2025 132 KV CONTROL AND PROTECTION PANELS AT IRBID S/S

WHEREAS (*Name of Tenderer*) (hereinafter called "the Tenderer") has submitted its Tender dated (*date of Tender*) for the performance of the above-named Contract (hereinafter called "the Tender").

At the request of _____ Bank (the *Foreign Bank*) and on behalf of M/S._____ *(the Contractor Name and Address*), we _____(*the Local Bank*) issue in your favour our irrevocable and unconditional Tender Guarantee No. _____ in the amount of, JD ---------- (---------- (i*n words)*).

This guarantee will remain in full force for a period of 90 days from the tender closing date, and any demand in respect thereof must reach the Bank not later than the above date.

Bank (Local Bank)

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

FORM OF PERFORMANCE GUARANTEE

GUARANTEE NO.

M/S., Beneficiary

Amman – Jordan

NAME OF CONTRACT: TENDER NO. 48 / 2025 132 KV CONTROL AND PROTECTION PANELS AT IRBID S/S

At the request of the Bank… (The Foreign Bank) and on behalf of M/S. (The contractor Name and Address), we ...(The Local Bank) issue in your favour our irrevocable and unconditional performance guarantees No…xxx... In the amount of (XXX) (in words).

In this connection we…. (local bank) hereby consider ourselves responsible for the unconditional payment to you or your authorized representatives of the above sum on your first written demand in whole or in part not withstanding any objections on the part of the above named contractor and without any need for notarial warning or judicial proceedings.

This guarantee remains valid from the date of issuance until its expiry date on (…….) and it shall be automatically renewed for consecutive periods; each period for three months, and it will not be cancelled unless our bank received an official letter duly issued and signed by you attached with original guarantee and all related original amendments and or extensions.

Bank (Local Bank)

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS AT IRBID S/S

FORM OF MAINTENANCE GUARANTEE

GUARANTEE *NO.*

M/S., Beneficiary
Amman – Jordan

NAME OF CONTRACT: TENDER NO. 48 / 2025 132 KV CONTROL AND PROTECTION PANELS AT IRBID S/S

At the request of bank (The Foreign Bank) and on behalf of M/S…
(The contractor Name and Address), we the.… (The Local Bank) issue in your favour our irrevocable and unconditional maintenance *guarantee* No…...in the amount of (XXXX) (In words).

In this connection we … (Local bank) hereby consider ourselves responsible for the unconditional payment to you or your authorized representatives of the above sum on your first Written demand in whole or in part not withstanding any objections on the part of the above-named contractor and without any need for notarial warning or judicial proceedings.

This guarantee remains valid from the date of issue till its expiry date on …/…/…….. unless it's extended or renewed upon your request within the guarantee validity, and it will not be cancelled unless our bank received an official letter duly issued and signed by you attached with original guarantee and all related original amendments and or extensions.

BANK (LOCAL BANK)

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48/2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

FORM OF DECLARATION FOR PROHIBITED PAYMENTS *

(i) We, the undersigned, ----------

---
declare that we have read and comprehended the provisions under Item 14 of General Condition of the Contract related to this Contract and in compliance with this clause; we enclose a declaration properly signed and sealed representing and warranting to The Employer that no direct or indirect commissions, consulting fees, agent fees, Tender fees or other payments, and no inducements or the giving of anything of value (collectively referred to as "Prohibited Payments"), have been made or promised to be made, directly or indirectly, by or on behalf of the Contractor, its sub-Contractor and its or their Employees, agents or representatives, to The Employer, including without limitation any official, employee, agent or representative (whether or not acting in an official capacity) of The Employer, in connection with the solicitation, bidding, negotiation, award or performance of this Contract; and (ii) hereby covenants and agrees that no Prohibited Payments shall be made or promised to be made, directly or indirectly, by or on behalf, of Contractor, its sub-Contracts and its or their employees, agents or representatives, to any official, employee, agent or representative (whether or not acting in an official capacity) of The Employer in connection with the amendment, modification, renewal, extension or performance of this Contract.

Tenderers Name----------

Name of authorized signatory----------
----------Signature----------Seal --------
----------* The Tenderer is required to submit a declaration for other payments in a separate envelope whether such payments have been paid or not and the offers of all Contractors that do not include such a declaration will be rejected.

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

FORM OF DECLARATION FOR OTHER PAYMENTS *

(i) We, the undersigned, ----------

---
declare that we have read and comprehended the provisions under Item 15 of General Condition of the Contract related to this contract and in compliance with this sub-clause; we enclose a declaration properly signed and sealed disclosing any and all direct or indirect commissions, consulting fees, agent fees, tender fees or other payments, or inducements or the giving of anything of value (collectively referred to as "Other Payments") to third parties other than any official, employee, agent or representative (whether or not acting in an official capacity) of The Employer, including without limitation a detailed description of the basis therefore, made or to be made, directly or indirectly, by or on behalf of Contractor, its subcontractors, and its or their employees, agents or representatives, in connection with the solicitation, bidding, negotiation, award or performance of this Contract; and (ii) hereby covenants and agrees promptly to disclose to The Employer in writing the existence of any Third Party Payments including without limitation, a detailed description of the basis therefore, upon the earliest to occur of Contractor making or being obligated to make, any such Third Party Payments.

Contractor's Name

Name of authorized signatory

Signature

Seal ----------

* The Tenderer is required to submit a declaration for other payments in a separate envelope whether such payments have been paid or not and

the offers of all Contractors that do not include such a declaration will be rejected.

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELSAT IRBID S/S
FORM OF REQUEST FOR SHIPPING RELEASE

REQUEST FOR SHIPPING RELEASE TENDER NO. 48 / 2025 SUPPLY OF 132 Kv CONTROL AND PROTECTION PANELS REHAB AND IRBID EAST S/S Request No: Date:			
To: National Electric Power company Your contract reference: Our contract reference:			
We would be pleased to receive your shipping release.			
Manufacturer	Equipment	Qty.	Total No. Of Packages
CONTRACTOR SIGNATURE	RECORD PURPOSE ONLY Local Release No: Date:		

Yours faithfully,

* Note : The request must be sent to NEPCO along with the FAT documents.

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

FORM OF INSPECTION CERTIFICATE

INSPECTION CERTIFICATE NO.				
CLIENT	NATIONAL ELECTRIC POWER COMPANY(NEPCO)			
PROJECT	132 Kv CONTROL AND PROTECTION PANELS AT IRBID S/S.			
CONTRACT NO.	48/2025		ORDER COMPLETE	(YES/NO)
MAIN CONTRCTOR			L/C NO.:	
EMPLOYER	NEPCO			
TENDERER				
INSPECTED AT			DATE OF INSPECTION	
Routine test by manufacturer not witnessed by NEPCO				
EQUIPMENT/ MATERIAL INSPECTED:				
NUMBER INSPECTED: -				
	According to Annex		Quantity	
RESULT OF INSPECTION:				
ATTACHMENTS:				
This is to certify that the Equipment/Material covered by this report has been examined				
in accordance with the relevant specification (s) as well as the drawings and diagrams,				
as appropriately tested and described and found to be in condition stated.				
Approved for Dispatch		Approved for further Work		NOT APPROVED
Waived Inspection Engineer:		For and on behalf of		

SECTION 4

GENERAL CONDITIONS OF CONTRACT

GENERAL CONDITIONS OF CONTRACT
FOR THE SUPPLY AND DELIVERY OF MATERIALS BASED ON
UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE
PUBLICATION REF.: ME/ 188
GENEVA. MARCH, 1953

1. PREAMBLE:

1.1 These General Conditions shall apply, save as varied by express agreement accepted in writing by both parties.

1.2 Definition Of Terms

The "Purchaser" shall mean the “National Electric Power Company" hereinafter called “NEPCO", and shall include NEPCO legal personal representatives and duly appointed Engineers.

The "Engineer" shall mean the “National Electric Power Company" or persons for the time being or from time to time duly appointed in writing by the purchaser to act as Engineer for the purpose of the Contract.

The words “approved" and” approval" where used in these Conditions or in the specification shall mean "approved by" and “approval of" the purchaser respectively.

The "Vendor" shall mean the "Contractor" whose Tender has been accepted by the Purchaser and shall include the Vendor's (Contractor's") legal personal representatives, successors and permitted assigns.

“F.O.B Price" shall mean the cost of the equipment delivered free on board of the ship or truck or aircraft, all port charges and handling charges (also heavy lift if applicable) included. The Contractor must insure the material against all risks from the time it leaves the works until it is placed F.O.B.

"C&F or CFR Price" shall mean F.O.B. Price plus freight. Including unloading at the port of destination. All Marine Insurance will be effected by the Purchaser. The Contractor must provide full details of the material to be dispatched in good time for NEPCO to arrange for Marine Insurance before the material is actually dispatched.

2. FORMATION OF CONTRACT:

2.1 The Contract shall be deemed to have been entered into when the Purchaser has sent an acceptance in writing before time set in the Tender for acceptance or any such later date extended by the Tenderer at the request of the Purchaser.

2.2 Notwithstanding that the Contract and correspondence in connection with the Contract shall be in the English language, the Contract shall be and be deemed to be Jordanian Contract and shall accordingly be governed by to the laws for the time being in force in the Hashemite Kingdom of Jordan.

2.3 Power To Vary The Work

No alterations, amendments, omissions, additions, suspensions, or variations of the work, (hereinafter referred to as "variations") under the Contract as shown by the Contract Drawings or the Specification shall be made by the Contractor except as directed in writing by the purchaser but the Purchaser shall have full Power, subject to the provision hereinafter contained, from time to time during the execution of the Contract by notice in writing to instruct the Contractor to make such variation without Prejudice to the Contract and the Contractor shall carry out such variations, and be bound by the same Conditions, as far as applicable, as though the said variations occurred in the Specification.

If any suggested variations would, in the opinion of the Contractor, if carried out, prevent him from fulfilling any of his obligations or guarantees under the Contract, he shall notify the Purchaser thereof in writing, and the Purchaser shall decide forthwith whether or not the same shall be carried out, and if the Purchaser confirms his instructions, the Contractor's obligations and guarantees shall be modified to such an extent as may be justified. The difference in cost, if any, occasioned by any such variations, shall be added to or deducted from the Contract Price as the case may require. The amount of such difference, if any, shall be ascertained and determined in accordance with the rates specified in the Schedule of Prices so far as the same may by applicable, and where the rates are not contained in the said Schedule, or are not applicable, they shall be settled by the Purchaser and the Contractor jointly. But the Purchaser shall not become liable for the payment of any charge in respect of any such variations, unless the instruction for the performance of the same shall have been given in writing by him.

In the event of the Purchaser requiring any variations, such reasonable and proper notice shall be given to the Contractor as will enable him to make his arrangements accordingly, and in cases where goods materials are already prepared, or any designs, drawings, or patterns made or work done that requires to be altered a reasonable sum in respect thereof shall be allowed by the Purchaser.

Provided that no such variation shall, except with the consent in writing of the Contractor, be such as will involve an increase or decrease of the total price payable under the Contract by more than 25 percent thereof.

The power given to the purchaser to make any alteration, amendment, omission, addition or variation to, from or in any part of the works shall include power to vary from time to time the date for the completion of the works or any part thereof.

2.4 Precedence:

In the event of any discrepancy or contradiction between the provisions of the Conditions of Contract and of the Specification, the Conditions of Contract shall take precedence.

2.5 Prices

2.5.1 The Tender calls for firm prices for the definite works.

2.5.2 Provisional items may or may not in whole or in part be purchased by the Purchaser under the Contract.

3. Drawings And Descriptive Documents

3.1 The weights, dimensions, capacities, prices, performance ratings and other data included in catalogues, prospectuses, circulars, advertisements, illustrated matter and price lists constitute an approximate guide.

These data shall not be binding save to the extent that they are by reference expressly included in the Contract.

3.2 Any drawings or technical documents intended for use in the construction of the plant or of part thereof and submitted to the Purchaser prior or subsequent to the formation of the Contract remain the exclusive property of the Vendor. They may not, without the Vendor's consent, be utilized by the Purchaser or copied, reproduced,

transmitted or communicated to a third party. Provided, however, that the said plans and documents shall be the property of the Purchaser:

a) If it is expressly so agreed, or.

b) If they are referable to a separate preliminary Development Contract on which no actual construction was to be performed and in which the property of the Vendor in the said plans and documents was not reserved.

3.3 Any drawings or technical documents intended for use in the construction of the plant or of part thereof and submitted to the Vendor by the Purchaser prior or subsequent to the formation of the Contract remain the exclusive property of the purchaser. They may not, without his consent be utilized by the Vendor or copied, reproduced, transmitted or communicated to third party.

3.4 Drawing Guidelines for Contract Drawings

All drawing shall confirm to the following:

1) All drawings are to be prepared on the international sizes as described in BSI BS EN ISO 5457. They are to be of "A" series.

DESIGNATION	SHEET SIZE
A 0	814 x 1189
A1	594x841
A2	420x594
A3	297x420
A4	210x297

2) The NEPCO title block must be added to all drawings produced for the Contract. The block may be reduced in size, depending on sheet size, The NEPCO drawing number must appear in bottom right hand corner of drawing, the drawings must also include the Contractor's / Consultant's title block adjacent to NEPCO title block.

3) Each drawing to have its own individual number. For schedules, a drawing number to be given and then sheet 1 of x sheets.

4) All descriptive information must be entered in NEPCO title block. All drawings must contain NEPCO drawing numbers as so described and issued by NEPCO.

5) The title block should contain the following:

1. Revision block as NEPCO requirement.

2. Name of subject i.e. power station, substation, equipment.

3. Nature of drawing i.e. site layout, general arrangement, single line diagram.

4. Any other information or notes.

5. Dimensions to be in MM or M.

6. Scale i.e. 1:50, 1:1000.

7. Contract No. i.e. 48/ 2025.

8. DRG. No. NEPCO drawing numbers that allocated by NEPCO.

9. Rev. to contain latest revision number.

10. Title block for Contractor/Consultant.

11. Graphical bar scales where required, not required for single line diagrams or reinforced concrete details.

6) Drawing sheet should be laid out according to NEPCO requirement.

7) Scales to be in multiples of 1:5, 1:10.

8) All information to be stenciled on drawings, block capital letters should be used throughout. No freehand printing on drawing except for "revision or hold" cloud.

9) 1. Revisions must be lettered and indicated block provided, all revisions to be checked and approved by Engineer.

2. Revisions must be interred and highlighted by pencilling cloud around the part revised on the reverse side of the tracing sheet as shown rev. b

3. Vague descriptions of revisions such as "general revisions" should be avoided. Revisions should be specific. No matter how small the revisions, it should be recorded.

10) Notes, reference drawing, and legends should be recorded on drawing, if key plan and north point is required, then apply NEPCO requirement.

11) Example of drawing title blocks and titles should be submitted to NEPCO for approval before commencement of drawings.

12) On completion of contract, the final drawings submitted to NEPCO are to be marked "as built" dated and signed, The drawings must be

accompanied by a complete drawing schedule, listing all the drawings in the order of the NEPCO Numbers. The drawings schedule should be in the region of A3 or A4 size.

4. Packing Of Materials And Shipping Marks:

4.1 All materials, equipment and goods shall be very well packed, in seaworthy containers and/or wooden cases, etc. These should protect the material during shipping, handling, unloading, and for a reasonable period of storage at Aqaba and later storage at NEPCO central stores.

Packing for indoor materials should be done in such a manner as to adequately ensure no ingress of moisture during the shipping and storage periods.

Packing of fragile equipment (e.g. including instruments and porcelain) should be done in a way which ensures a reasonable resistance to impact breakage during transport.

Packing shall in general be adequate and in compliance with the best international practice.

A descriptive and fully itemized list shall be prepared for the contents of each packing case. A copy of this list shall be placed in a waterproof envelope under a metal or other suitable plate securely fastened to the outside of one end of the case, and its position adequately indicated by stenciling on the case. Where appropriate, drawings showing the erection markings of the item concerned shall be placed inside the case.

NEPCO will supply the successful Tenderer with a drawing of its shipping Mark for utilization.

All packing cases, crates, barrels and drums shall remain the property of the purchaser.

5. Inspection And Tests:

5.1 The contractor is required to provide all facilities to enable the employer's representatives **(Two Persons for 5 days excluding traveling days)** to carry out the necessary inspection and testing. The costs of all tests during manufacture and preparation of test records including airfares, hotel accommodations, transport, and all meals are to be borne by the contractor. In case of failure of test all costs of repeated trips of the employer’s representatives will be borne by the contractor. The performance of any such inspections and tests in the presence of the purchaser and /or an independent testing authority does not relieve the contractor from his contractual obligations.

5.2 If as a result of such inspection and checking the purchaser shall be of the opinion that any materials or parts are defective or not in accordance with the contract, he shall state in writing his objections and the reasons therefore.

5.3 Testing instruments shall be approved and shall, if required by the employer's representative, be calibrated by the national physical laboratory or such other body as may be approved, at the expense of the contractor.

5.4 Acceptance tests will be carried out and, unless otherwise agreed, will be made at the vendor's works instruments, if the tests are not specified in the contract, the tests will be carried out in accordance with the general practice obtaining in the appropriate branch of the industry in the country where the plant is manufactured.

5.5 The vendor shall give to the purchaser sufficient notice of the tests to permit the purchaser's representative to attend. If the purchaser is not represented at the tests, the test report shall be communicated by the vendor to the purchaser and shall be accepted as accurate by the purchaser. After completion of the FAT the vendor is required to send complete test report with request for shipping release.

The purchaser will check test report/test results and if accepted a shipping release certificate will be issued within 10 days from the receipt of the report/ shipping release request.

5.6 If on any test (other than a test on site, where tests on site are provided for in the contract) the plant shall be found to be defective or not in accordance with the contract, the vendor shall be with all speed make good the defect or ensure that the plant complies with the contract thereafter, if the purchaser so requires, the test shall be repeated.

5.7 Unless otherwise agreed, the vendor shall bear all the expenses of tests carried out in his works.

5.8 If the contract provides for tests on site, the terms and conditions governing such tests shall be such as may be specially agreed between the parties.

5.9 In case of third party testing the contractor will conduct all required tests by the employer through the appointed third-party testing company of the list attached hereto all costs for a/m tests will be incurred by the contractor.

6. Passing Of Risk:

6.1 Save as provided in paragraph 7.6, the time at which the risk shall pass shall be fixed in accordance with the International Rules for the Interpretation of Trade Terms (INCOTERM) of the International Chamber of Commerce in force at the date of the formation of the Contract.

7. Delivery:

7.1 Unless otherwise agreed the delivery period (CFR Aqaba Docks) should be within (8) months from the commencement date (i.e., Letter of Award).

7.2 Should delay in delivery be caused by any of the circumstances mentioned in Clause 10 or by an act or omission of the Purchaser and whether such cause occur before or after the time or extended time for delivery, there shall be granted subject to the provisions of paragraph 7.5 hereof such extension of the delivery period as is reasonable having regard to all the circumstances of the case.

7.3 If a fixed time for delivery is provided for in the Contract and the Vendor fails to deliver within such time or any extension thereof granted under paragraph 2 hereof, the purchaser shall be entitled, on giving to the Vendor within a reasonable time notice in writing, to claim a reduction of the price payable under the Contract. Such reduction shall be calculated at the rate of one half of one percent of that part of the price payable under the Contract which is properly attributable to such portion of the Plant as cannot in consequence of the said failure be put to the use intended for each complete week of delay commencing on the due date of delivery, but shall not exceed a maximum percentage reduction of (15) percent. Such reduction shall be allowed when a payment becomes due on or after delivery. Save as provided in paragraph 7.5 hereof, such reduction of price shall be to the exclusion of any other remedy of the purchaser in respect of the Vendor's failure to deliver as aforesaid.

7.4 If the time for delivery mentioned in the Contract is an estimate only, either party may after the expiration of two thirds of such estimated time require the other party in writing to agree on a fixed time.

Where no time for delivery is mentioned in the Contract, this course shall be open to either party after the expiration of seven months from the formation of the Contract.

If in either case the parties fail to agree, either party may have recourse to arbitration, in accordance with the provisions of Clause 13, to determine a reasonable time for delivery and the time so determined shall be deemed to be the fixed time for delivery provided for in the Contract and paragraph 3 hereof shall apply accordingly.

7.5 If any portion of the plant in respect of which the purchaser has become entitled to the maximum reduction provided for by paragraph 3 hereof, or in respect of which he would have been so entitled had he given the notice referred to therein, remains undelivered, the purchaser may by notice in writing to the vendor require time to deliver and by such last mentioned notice fix a final time for delivery which shall be reasonable taking into account such delay as has already occurred. If for any reason whatever the Vendor fails within such time to do everything that he must do to effect delivery, the purchaser shall be entitled by notice in writing to the Vendor, and without requiring the consent of any Court, to terminate the Contract in respect of such portion of the plant and thereupon to recover from the vendor any amount not exceeding that part of the price payable under the Contract which is properly attributable to such portion of the plant as could not in consequence of the Vendor's failure e put to the use intended.

7.6 If the purchaser fails to accept delivery on due date he shall nevertheless make any payment conditional in delivery as if the plant had been delivered. The Vendor shall arrange for the storage of the plant at the risk and cost of the purchaser, If required by the purchaser, the Vendor shall insure the plant at the cost of the purchaser, Provided that if the delay in accepting delivery is due to one of the circumstances mentioned in clause 10 and the Vendor is in a position to store it in his premises without prejudice to his business, the cost of storing the plant shall not be borne by the purchaser.

7.7 Unless the failure of the purchaser is due to any of the circumstances mentioned in Clause 9, the Vendor may require the purchaser by notice in writing to accept delivery within a reasonable time.

If the purchaser fails for any reason whatever to do so within such time, the Vendor shall be entitled by notice in writing to the purchaser, and without requiring the consent of any Court, to terminate the Contract in respect of such portion of the plant as is by reason of the failure of the purchaser aforesaid not delivered and thereupon to recover from the purchaser any loss, suffered by reason of such failure up to an amount

not exceeding the value of the plant, the delivery of which has not been accepted.

8. Terms of Payment:

8.1 Subject to any deductions which the purchaser may be authorized to make under the contract, or subject to any additions or deductions provided for under clause 2.3 above, the contractor shall be entitled strictly to payment as follows:-

i. **Ten (10) percent of contract value as advance payment** within sixty (60) days from the Contractor's correct application of payment (invoice) against submitting of the following:

- Receiving accepted Advance Payment Bank Guarantee in the form given for the same advance payment value and same contract currency.
- Receiving accepted Performance Guarantee as specified in Instructions to Tenderers.
- Commercial Invoice or payment request in two originals plus four copies.
- Interim payment certificate issued and signed by NEPCO in one original and four copies.

ii. **Seventy (70) percent of contract value as interim payment for shipment of material** within sixty (60) days from the Contractor's correct application of payment (invoice) supplemented with the following documents:

- Commercial Invoice in two originals plus four copies, showing commodity, description, quantity, unit price, total price and delivery base, reference to items as per schedule of prices.
- Interim payment certificate issued and signed by NEPCO in one original and four copies.
- Packing list in one original plus four copies.
- Bill of lading – three negotiables, four non-negotiable.
- Inspection certificate and / or waived inspection certificate issued and signed by NEPCO (one original) and /or test certificates, two copies and /or shipping release issued and signed by NEPCO – two copies.
- Certificate of origin in one original and four copies.
- Vessel certificate less than 15 years old (Certificate).

iii. **Fifteen (15) percent of contract value as interim payment for receipt at NEPCO's warehouses of material** within sixty (60) days from the Contractor's correct application for interim payment (invoice) supplemented with the following documents:

- Receipt of an invoice or payment request in one original and four copies for the correct amount.
- Receiving report issued and signed by NEPCO committee as evidence that the material has been received at NEPCO's warehouses in satisfactory condition.
- Interim payment certificate issued and signed by NEPCO.

iv. **The remaining Five (5) percent of contract value** will be paid against the interim certificate to the Contractor after 60 days from the date of expiring of the maintenance period or (depends on the employer approval) against the submitting of maintenance bond of (5%) of the Contract amount, for the purpose of replacement and\or adjustment of defective material.

Submission of shipping Documents & Invoices:

Shipping documents must be submitted early for clearance purposes.

Shipping documents shall be submitted to the bank if payment made by CAD or LC. If payment is through bank transfer the shipping documents shall be submitted directly to NEPCO as specified.

- Shipment:

Shipment by sea freight must be on direct and regular (liner) vessel less than 15 years old at the time of shipment. The vessel shall be classified and certified in accordance with the (ISM) code and shall be a member in the P&I club.

If the Contract has been terminated the claim for termination costs shall be accompanied by:

1) Written justification by Contractor supporting in detail the claimed charge.

2) Either written concurrence by the Employer to the Contractor's claim or a certified copy of an arbitration award.

If the Contractor claims payment for suspension of the works the claim for suspension costs shall be accompanied by:

1) Written justification by the Contractor supporting in detail the claimed charge.

2) Either written concurrence by the Employer to the Contractor's claim or a certified copy of an arbitration award.

8.2 All bank charges, commissions and expenses inside and outside Jordan are to be for the vender account.

8.3 If delivery has been made before payment of the whole sum payable under the contract, plant delivered shall, to the extent permitted by the law of the country where the plant is situated after delivery, remain the property of the vendor until such payment has been effected. If such law does not permit the vendor to retain the property in the plant, the vendor shall be entitled to the benefit of such other rights in respect thereof as such law permits him to retain. The purchaser shall give the vendor every assistance in taking any measures required to protect the vendor's right of property or such other rights as aforesaid.

8.4 A payment conditional on the fulfillment of an obligation by the vendor shall not be due until such obligation has been fulfilled, unless the failure of the vendor is due to an act or omission of the purchaser.

8.5 If the purchaser delays in making any payment, the vendor may postpone the fulfillment of his own obligations until such payment is made, unless the failure of the purchaser is due to an act or omission of the vendor.

8.6 If delay by the purchaser in making any payment is due to one of the circumstances mentioned in clause 10, the vendor shall not be entitled to any interest on the sum due.

8.7 Save as aforesaid, if the purchaser delays in making any payment, the vendor shall on giving to the purchaser within a reasonable time notice in writing be entitled, and without requiring the consent of any court, to terminate the contract and thereupon to recover from the purchaser the amount of his loss up to the value of the plant, the payment for which has been unreasonably delayed.

9. Guarantee:

9.1 Subject as hereinafter set out, the Vendor undertakes to remedy any defect resulting from faulty design, materials or workmanship.

9.2 This liability is limited to defects which appear during the period (hereinafter called the Guarantee period) **of (12) months after receipt of last consignment at site or NEPCO warehouses.**

9.3 In fixing this period due account has been taken of the time normally required for transport as contemplated in the Contract.

9.4 In respect of such parts (whether of the Vendor's own manufacture or not) of the plant as are expressly mentioned in the Contract. The Guarantee Period shall be such other period (if any) as specified in respect of each of such parts.

9.5 In order to be able to avail himself of his rights under this clause the purchaser shall notify the Vendor in writing without delay of any defects that have appeared and shall give him every opportunity of inspecting and remedying them.

9.6 On receipt of such notification the Vendor shall remedy the defect forthwith and at his own expense. Save where the nature of the defect is such that it is appropriate to effect repairs on site, the Purchaser shall return to the Vendor any part in which a defect covered by this Clause has appeared, for repair or replacement by the Vendor, and in such case the delivery to the purchaser of such properly repaired or a part in replacement thereof shall be deemed to be a fulfillment by the Vendor of his obligations under this paragraph in respect of such defective part.

9.7 The guarantee Period is based on the continuous use of the plant in service for 24 hours every day.

9.8 The Vendor shall bear all the costs and risks of the transport of defective parts or equipment's and their replacements.

9.9 Where, in pursuance of paragraph 7 hereof, repairs are required to be effected on site, the conditions covering the attendance of the Vendor's representatives on site shall be such as may be specially agreed between the parties.

9.10 Defective parts replaced in accordance with this Clause shall be placed at the disposal of the Vendor.

9.11 If the Vendor refuses to fulfil his obligations under this Clause or fails to proceed with due diligence after being required to do so, the purchaser may proceed to do the necessary work at the Vendor's risk and expense.

9.12 The Vendor's liability does not apply to defects arising out of materials provided, or out of a design stipulated, by the purchaser.

9.13 The Vendor's liability shall apply only to defects that appear under the conditions of operation provided for by the Contract and under proper use, it does not cover defects due to causes arising after the risk in the Plant has passed in accordance with Clause 6. In particular it does not cover defects arising from the purchaser's faulty maintenance or erection, or from alterations carried out without the Vendor's consent in writing, or from repairs carried out improperly by the purchaser, nor does it cover normal deterioration.

9.14 Save as in this Clause expressed, the Vendor shall be under no liability in respect of defects after the risk in the plant has passed in accordance with Clause 6, even if such defects are due to causes existing before the risk so passed, It is expressly agreed that the purchaser shall have no claim in respect of personal injury or of damage to property not the subject matter of the circumstances of the case that the Vendor has been guilty of gross misconduct.

9.15 "Gross misconduct" does not comprise any and every lack of proper care or skill, but means an act or omission on the part of the Vendor implying either a failure to pay due regard to serious consequences which a conscientious contractor would normally foresee as likely to ensure, or a deliberate disregard of any consequences of such act or omission.

9.16 A fresh guarantee period equal to that stated in paragraph 2 hereof shall apply, under the same terms and condition as those application to the original plant, to part supplied in replacement of defective part or to part renewed in pursuance of this clause this provision shall not apply to the remaining part of the plant, the guarantee period of which shall be extended only by a period equal to the period during which the plant is out of action as a result of defect covered by this clause.

10. Relief's:

10.1 The following shall be considered as cases of relief if they intervene after the formation of the Contract and impede its performance. Industrial disputes and any other circumstances (e.g., fire, mobilization, requisition, embargo, currency restrictions, insurrection, shortage of transport, general shortage of materials and restriction in the use of power) when such other circumstances are beyond the control of the parties.

10.2 The party wishing to claim relief by reason of any of the said circumstances shall notify the other party in writing without delay on the intervention and on the cessation thereof.

10.3 The effects of the said circumstances so far as they affect the timely performance of their obligations by the parties, are defined in Clauses 7 and 8. Save as provided in paragraphs 7.5, 7.7., and 8.7, if, by reason of any of the said circumstances, the performance of the Contract within a reasonable time becomes impossible, either party

shall be entitled to terminate the Contract by notice in writing to the other party without requiring the consent of any court.

10.4 If the Contract is terminated in accordance with paragraph 3 hereof, the division of the expenses incurred in respect of the Contract shall be determined by agreement between the parties.

10.5 In default of agreement, it shall be determined by the arbitrator which party has been prevented from performing his obligations and that party shall bear the whole of the said expenses. Where the purchaser is required to bear the whole of the expenses and has before termination of the Contract paid to the Vendor more than the amount of the Vendor's expenses, the purchaser shall be entitled to recover the excess.

If the arbitrator determines that both parties have been prevented from performing their obligations, he shall apportion the said expenses between the parties in such manner as to him seems fair and reasonable, having regard to all the circumstances of the case.

10.6 For the purposes of this Clause "expenses" means actual out-of- pocket expenses reasonably incurred, after both parties shall have mitigated their losses as far as possible. Provided that as respects plant delivered to the purchaser the Vendor's expenses shall be deemed to be that part of the price payable under the Contract which is properly attributable thereto.

11. Limitation Of Damages:

11.1 Where either party is liable in damages to the other, these shall not exceed the damage which the party in default could reasonably have foreseen at the time of the formation of the Contract.

11.2 The party who sets up a breach of the Contract shall be under a duty to take all necessary measures to mitigate the loss which has occurred provided that he can do so without unreasonable inconvenience or cost. Should he fails to do so, the party guilty of the breach may claim a reduction in the damages.

12. Rights At Termination:

12.1 Termination of the contract, from whatever cause arising, shall be without prejudice to the rights of the parties occurred under the Contract up to the time of termination.

13. Arbitration And Law Applicable:

13.1 If any dispute, question or controversy shall arise between the Purchaser and the Contractor concerning this Contract the matter in dispute shall be referred to an arbitration committee composed of three (3) arbitrators. One arbitrator shall be nominated by the Purchaser and one by the Contractor, and the third arbitrator shall be appointed by both parties.

If either party fails to appoint his arbitrator within one month of the appointment of the arbitrator by the other party, or if the two parties fail to agree on the third arbitrator within two months of the date of the request to refer the dispute to arbitration, such arbitrator shall be appointed by the president of the highest Court in Jordan at the request of either or both parties.

13.2 The decision of the arbitrators shall be final and binding on both the purchaser and the Contractor. Any such reference shall conform to the statutory enactment or regulation governing arbitration's as may be in force in Jordan at the time. The assessment of costs incidental to the reference and award respectively shall be at the discretion of the arbitration committee.

14. Declaration for Prohibited Payments

A - The tenderer shall represent and warrant to The Employer in the Declaration for Prohibited Payments attached to this Tender, that no direct or indirect commissions, consulting fees, Tender fees or other payments, and no inducements or the giving of anything of value, (collectively referred to as “Prohibited Payments”), have been made or promised to be made, directly or indirectly, by or on behalf of the Contractor, its sub-Contractors and its or their employees, agents or representatives, to The Employer including without limitation any official, employee, agent or representative (whether or not acting in an official capacity) of The Employer, in connection with the solicitation, bidding, negotiation, award or performance of this Contract; and hereby covenants and agrees that no Prohibited Payments shall be made or promised to be made, directly or indirectly, by or on behalf of the Contractor, its sub-Contractors and its or their employees, agents or representatives, to any official, employee, agent or representative (whether or not acting in an official capacity) of The Employer in connection with the amendment, modification, renewal, extension or performance of this Contract.

B - In the event of any violation or breach of the provisions of paragraph A of this clause, The Employer at its sole option and discretion shall take all or any of the following Actions: (i) terminate the Contract; and /or (ii) deduct from all or any payments due to the Contractor under this Contract an amount equal to two times the amount of any Prohibited Payment; and/or (iii) demand that the Contractor pay forthwith to the Employer, which demand the Contractor hereby irrevocably agrees to honour, an amount equal to two times the amount of any Prohibited Payment, it being the intention, subject to paragraph D below, that the aggregate of all amounts to which The Employer is entitled under paragraph B shall not exceed the amount which is two times the amount of all Prohibited Payments.

C - The Tenderer agrees that provisions substantially similar (but in no event less restrictive) to paragraphs A and B above shall be incorporated by the Contractor in all agreements with the Contractor's Sub-Contractors, suppliers or contractors arising out of or relating to this Contract, and which provisions shall also expressly provide that the same may, at The Employers sole discretion, be enforced directly by The Employer. The Tenderer further agrees promptly to supply to The Employer true and complete copies of such agreements, forthwith upon entering into by the Contractor of such agreements.

D - The rights and remedies of The Employer under this clause are in addition to and not in derogation of any other rights The Employer may have under applicable law or regulations.

E - This clause shall survive the termination of the Contract.

15. <u>Declaration for other Payments</u>

A- The Tenderer shall fully disclose in the Declaration for Other Payments attached to this Tender any and all direct or indirect commissions, consulting fees, agent fees, tenders fees or other payments, or inducements or the giving of anything of value (collectively referred to as "Other Payments") to third parties other than any official employee, worker, representative or agent of The Employer, including without limitation a detailed description of the basis therefore, made or to be made, directly or indirectly, by or on behalf of the Contractor, its sub-contractors and its or their employees, agents or representatives, in connection with the solicitation, bidding, negotiation, award or performance of this Contract, and hereby covenants and agrees promptly

to disclose to The Employer in writing the existence of any Third Party Payments including without limitation, a detailed description of the basis therefore, upon the earliest to occur of the Contractor making or being obligated to make, any such Third Party Payments.

B- In the event of any violation or breach of the provisions of paragraph A of this clause, The Employer at its sole option and discretion shall take all or any of the following Actions: (i) terminate the Contract; and /or (ii) deduct from all or any payments due to the Contractor under this Contract an amount equal to two times the amount of any Third Party Payments; and/or (iii) demand that the Contractor pay forthwith to the Employer, which demand the Contractor hereby irrevocably agrees to honour, an amount equal to two times the amount of any Third Party Payments, it being the intention, subject to paragraph D below, that the aggregate of all amounts to which The Employer is entitled under paragraph B shall not exceed the amount which is two times the amount of all Third Party Payments.

C- The Tenderer agrees that provisions substantially similar (but in no event less restrictive) to paragraphs A and B above shall be incorporated by the Contractor in all agreements with the Contractor's Sub-Contractors, suppliers or Contractor arising out of or relating to this Contract, and shall also expressly provide that the same may, at The Employers sole discretion, be enforced directly by The Employer. The Contractor further agrees promptly to supply to The Employer true and complete copies of such agreements, together with evidence of their inclusion in such agreements, forthwith upon entering into by the Contractor of such agreements.

D- Nothing in this Section shall expressly or impliedly make lawful or permissible any Third-Party Payments that are otherwise prohibited under applicable law or regulations. The rights and remedies of The Employer under this clause are in addition to and not in derogation of any other rights The Employer may have under applicable law or regulations.

This clause shall survive the termination of the Contract

16. Force Majeure:

16.1 A Party's failure or delay in performing any of its obligations under this Contract will not be deemed a breach of this Contract to the extent that such failure or delay is directly due to any Force Majeure Event.

16.2 For the purposes of this Clause, “Force Majeure Event” means an event or situation beyond the control of a Party that is not foreseeable, is unavoidable, and its origin is not due to negligence or lack of care on the part of a Party. Such events may include, but are not limited to, acts of a Party in its, wars or revolutions, fires, floods, epidemics, quarantine restrictions, and freight embargoes.

16.3 If a Force Majeure Event arises, the affected Party shall promptly notify the other Party in writing of such condition and the cause thereof. Unless otherwise directed by the other party in writing, the affected Party shall continue to perform its obligations under the Contract as far as is reasonably practicable, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure Event.

Section 5

Technical Specifications

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

GENERAL TECHNICAL SPECIFICATIONS

These General Technical Specifications, together with Particular Technical Specifications shall ensure that the delivered equipment is manufactured and assembled in complete and following all the details according to the designed purpose. Thus, it is understood that the Contractor, by accepting the Contract, agree to properly manufacture and properly inspect & test the complete equipment, regardless of the omissions in the text and/or drawings in the General and/or Particular Technical Specifications.

Wherever possible, these General Technical Specifications shall be applied in conjunction with the Particular Technical Specifications for specific equipment in case of discrepancies between the General and Particular Technical Specifications, the Particular Technical Specifications shall prevail.

Furthermore, in case of discrepancies between this Technical Specifications and the Conditions of Contract, the Conditions of Contract shall prevail.

All the equipment presented on drawings, which is not mentioned or described in General and Particular Technical Specifications, shall be considered included in the Contract, in the same way as if it were described in the General and Particular Technical Specifications.

The Contractor shall be responsible for any discrepancies, errors or omissions in the particulars and guarantees, whether or not such particulars and guarantees have been approved by the Client.

1.1 - Nature of work

This Specification provides for the design, manufacture, testing in factory, packing for export, supply CFR (C&F - cost and freight) Aqaba-Jordan, setting to work at site and warranty for a period of 12 calendar months from the date of receipt the last consignment of 132KV CONTROL AND PROTECTION PANELS at site or NEPCO warehouses.

1.2 - Extent of work

The Contract Works to be supplied shall include all work incidental there to whether specified in detail or not and in general is to be carried out by the Contractor in accordance with the Conditions of Contract and shall comprise the following: -

1.2.1 - Definite work. The design, manufacture, testing in factory, supply CFR Aqaba, setting to work in accordance with the Conditions of Contract and this Specification at the prices stated in the Schedules, on the following basis: -

Work at fixed schedule prices. The 132 Kv CONTROL AND Protection Panels and ancillary items of which the numbers, quantities and details are specified in the Schedules, the type(s), voltage and rating(s) as described and of which particulars of the detailed equipment are given, such equipment including all accessories, wiring

1.2.2 - Work at the option of the Employer. This shall include but not be limited to:

i. Spare apparatus and materials. The manufacture, testing, supply CFR Aqaba may require in accordance with the Conditions of Contract at the prices stated in the Schedules, of such quantities of the apparatus and materials enumerated and such repeats (if any) thereof as the Employer shall order from the Contractor at any time before the expiration of the Defects Notification Period of the Definite Work.

ii. Tools and appliances. The supply CFR Aqaba may require in accordance with the Conditions of Contract at the prices stated in the Schedules, of such quantities of the apparatus enumerated and such repeats (if any) thereof as the Employer shall order from the Contractor at any time before the expiration of the Defect Notification Period of the Definite Work.

Each separate order for Work at the Option of the Employer shall constitute a Section for the purpose of payment and taking over.

1.3 - Site Access

Aqaba, Jordan's only seaport can be reached by sea via the Red Sea and the Straits of Tiron. Amman can be reached by road from Aqaba or by air directly from Europe and other countries.

Access to all substation sites is available by existing roads. Rail access is not available at these sites.

1.4 - General particulars and guarantees

The Contract Works shall comply with the general particulars and guarantees specified in the Schedules.

All plants and apparatus supplied under this Contract shall be to approval.

The Contractor shall be responsible for any discrepancies, errors or omissions in the particulars and guarantees, whether or not such particulars and guarantees have been approved by the Engineer.

1.5 - Compliance with Specification

Notwithstanding any description, drawings or illustrations which may have been submitted with the tender, all details other than those shown in the Schedule of Departures from the Specification will be deemed to be in accordance with the Specification and the standard specifications and codes referred to therein.

No departures from the Specification, except those shown in the Schedule of Departures and approved by the Employer, shall be made without the written approval of the Engineer.

1.6 - Variance with Conditions of Contract

In the event of there being any inconsistency between the provisions of this Specification and the Conditions of Contract, the provisions of the Conditions of Contract shall prevail and shall be considered as incorporated in the Contract.

1.7 Compliance with Technical Specifications

All equipment and materials supplied under this Contract shall be approved by Client.

The Contractor shall be responsible for any discrepancies, errors or omissions in the particulars and guarantees, whether or not such particulars and guarantees have been approved by the Client.

No deviations from the Technical Specifications shall be permitted.

1.8 Compliance with Standards

THE EQUIPMENT COVERED BY THESE SPECIFICATIONS SHALL BE MANUFACTURED AND TESTED ON THE BASIS OF THE CURRENTLY APPROVED PUBLICATIONS OF THE CORRESPONDING TECHNICAL REGULATIONS, STANDARDS AND NORMS ACCEPTED AND RECOGNIZED IN THE WORLD.

The Contractor shall state, for the particular elements, as well as for the complete equipment, exactly the regulations, recommendations, standards etc., he applied or he will apply for dimensioning, selection of material, inspection and quality assurance, manufacture, installation and testing of equipment (in English language).

The latest publication of the following standards and codes, in particular, shall be used where applicable:

- IEC International Electro technical Commission,
- ISO International Standardization Organization,
- BSI British Standard Institution,
- ANSI American National Standard Institute,
- IEEE Institute of Electrical and Electronic Engineers,
- ASTM American Society for Testing Materials,
- NEMA National Electrical Manufacturer Association,
- DIN German Industrial Norms.

The Contractor can also use other internationally recognized standards or codes in the country where the equipment shall be manufactured provided that they are equal or higher quality than above mentioned but must have the approval of the Client obtained in writing. To obtain this approval the Contractor is obliged to submit in advance to the Client with copy of standards or codes he intends to use and to clearly explain the extent, reason and advantage for their application (in English language).

The Contractor shall provide one original copy of the latest standards (IEC, BS, ANSI, IEEE, DIN or other applicable standards) which are applicable to this Contract.

1.9- Compliance with Regulation

All supplied equipment and material, and all works carried out shall comply in all respects with such of the requirements of the Regulations and Acts in force in the Country of the Client as are applicable to the Contract Works and with any other applicable regulations.

1.10 Quality Assurance

The Contractor shall establish and maintain throughout the whole period of the Contract a project quality plan according to ISO 9001 which will ensure that a quality system of regular inspection, test and check procedures are carried out on every aspect of the work. Such work shall include but not be limited to materials, workmanship, design, preparation of drawings, factory acceptance tests (FAT), packing, shipping, storing, supervision of erection, site testing & commissioning.

Samples of all materials used shall be taken and tests performed to ensure compliance with the specifications. All test results shall be recorded, and test certificates supplied as required. Samples of materials and workmanship shall be provided to the Client from manufacturers as required.

All records shall be kept available for inspection by the Client.

1.11 Places of manufacture

The manufacturer and places of manufacture, testing and inspection of the various portions of the Contract Works shall be stated in the Schedules.

1.12 Sub-contracts

The Contractor shall supply three copies of all orders placed with sub-contractors. Information is to be given on each sub-order sufficient to identify the material or equipment to which the sub-order relates and to notify the sub-contractor that the conditions of the Specification apply.

1.13- Dates for completion

The dates of readiness for inspection and testing, access to site(s), delivery and completion of the various Sections of the Contract Works shall be as stated in the Schedules.

1.14 - Access to manufacturer's works

Access to the Contractor's and sub-contractor's works shall be granted to the representatives of the Engineer for the purpose of inspection, testing and ascertaining progress.

1.15 - Programme, progress reports and meetings

The Contractor shall submit for approval within 1 month of the starting date four copies of an outline production and delivery chart. Within a further period of one month the Contractor shall provide four copies of a detailed programme in a form to be specified by the Engineer showing plant manufacture and delivery; this programme shall also include details of drawing submission and circuit outage requirements.

The Contract Works of this Specification shall be incorporated in the supply systems with the minimum of interruption of supply and the Contractor shall arrange his Programme of Work, in conjunction with the Engineer, to obtain maximum availability of plant at all times.

If at any time during the execution of the Contract it is found necessary to modify the approved chart, the Contractor shall inform the Engineer and submit a modified chart for approval. Such approval shall not be deemed to be consent to any amendment of the completion date stated in the Schedules.

At monthly intervals after approval of the programme chart the Contractor shall submit to the Engineer three copies of written detailed progress reports in an approved form, indicating the stage reached in the design, ordering of material, manufacture and delivery of all components of plant.

The progress reports shall include good quality colour photographs of approximately half-plate size to show details of the required equipment. A minimum of ten photographs shall be incorporated.

If during execution of the Contract the Engineer considers the progress position of any section of the work to be unsatisfactory, he will be at liberty to call such meetings, either at the Amman Office or at Site, as deemed to be necessary. If required by the Engineer a responsible representative from the Contractor's works shall attend such meetings.

1.16 - Testing and inspection

The Contractor shall carry out the tests stated in accordance with the conditions of this Specification and, without extra charge, such additional tests as in the opinion of the Engineer are necessary to determine that the Contract Works comply with this Specification under either test (in manufacturer's works, on the Site or elsewhere) or ordinary working conditions.

Type tests may be omitted at the discretion of the Engineer if satisfactory evidence is given that tests already made.

All materials used shall be subjected to and shall withstand satisfactorily such routine tests as are customary in the manufacture of the types of plant included in the Contract Works.

All tests shall be carried out to the Satisfaction of the Engineer and in his presence, at such reasonable times as he may require, unless agreed otherwise.

Not less than 30 days' notice of all tests shall be given to the Engineer in order that he may be represented if he so desires. Failure of the Contractor to give such notice which results in a delay in the completion of the tests cannot be used by the Contractor as a reason for failure to meet the overall completion date and any extra costs incurred by the Contractor are not recoverable. As many tests as possible shall be arranged together. Three copies of the Contractor's record of tests shall be supplied to the Engineer.

Measuring apparatus shall be approved by the Engineer and if required shall be calibrated at the expense of the contractor at an approved laboratory.

The Contractor shall be responsible for the proper testing of the work completed or plant or materials supplied by a sub-contractor to the same extent as if the work, plant or materials were completed or supplied by the Contractor himself.

All apparatus, instruments and connections required for the above tests shall be provided by the Contractor but the Employer will permit the Contractor to use for the tests on site any instruments and apparatus which may be provided permanently on site subject to the operation of the system and the carrying out of other Contracts and conditional upon the Contractor accepting liability for any damage which may be sustained by the Employer's equipment during the test.

The Employer is responsible to provide on-site electrical energy for the purpose of approved preliminary tests and for the official tests.

Any costs incurred by the Employer or the Engineer in connection with inspection and re-testing as a result of a failure of the subject under test, shall be to the account of the Contractor.

No inspection or lack of inspection or passing by the Engineer of work, plant or materials, whether carried out or supplied by the Contractor or sub-contractor, shall relieve the Contractor from his liability to complete the Contract Works in accordance with the Contract or exonerate him from any of his guarantees.

1.17 Language and System of Units

The English language shall be used in all written communications between the Client and the Contractor with respect to the related services to be rendered and with respect to all documents and drawings procured or prepared by the Contractor pertaining to the work, unless otherwise agreed by the Client.

All equipment labels or plates and the Operating and Maintenance Manuals shall be written in English.

The International System of Units, i.e. SI System Unit (*Systeme International d'Unites*), shall be applied.

1.18 Technical Documentation, Data, Information, Samples and Models

1.18.1 Documentation and Information to be Submitted to the Client

1.18.1.1 General

For the equipment to be delivered by the Contractor according to this Contract, the following shall be submitted to the Client for approval: drawings, design data, calculations, samples, catalogues, brochures, test programs, instructions for installation and testing, operation and maintenance manuals, training programs, certificates, test protocols, reports and other documentation, which might be necessary, or reasonably requested by the Client, or requested by the Particular Technical Specifications.

Documentation submission schedule must be such as to make them available for inspection of each particular document upon its reception. Above mentioned documentation of the Contractor formally submitted, must be accompanied by official statement of the Contractor that thus presented information are checked by the Contractor and correct for application.

Preliminary documentation, submitted as information, must be clearly identified.

For the equipment to be supplied and assembled according to this Contract, the Contractor shall not make any changes, or deviations in execution of works in comparison to the technical documents, which is an integral part of the Contract. However, if the necessity arises, the Contractor shall previously obtain written assent of the Client.

The Contractor shall, within the deadlines stated in the Particular Technical Specifications, submit drawings, presenting the procedure of the equipment assembly, together with corresponding information, for preparation of

appropriate foundations on which the equipment shall be assembled and for realization of all the necessary links.

The Contractor is due to indicate all possible changes into the documentation, if made during Works execution.

All designs and other documentation shall be submitted by the Contractor to the Client in three (3) hard copies and one (1) electronic copy (pdf and editable version: word, excel, AutoCAD, etc.).

1.18.1.2 Program of Works

The Contractor shall, within one (1) month upon Contract Commencement Date (Letter of Acceptance), submit the Program of Works with key dates showing detailed partition of activities related to substations and equipment data acquisition, preparation of design documentation, manufacturing of the equipment including factory acceptance tests, transport of the equipment & materials to the delivery place (Aqaba port, Jordan), installation, commissioning and taking-over.

If at any time during the execution of the Contract, it is found necessary to modify the approved Program of Works, the Contractor shall inform the Client and shall submit a modified Program of Works for approval. Such approval shall not be deemed to be consent to any amendment of the completion dates stated in *Delivery and Completion Requirements (schedule B)*.

1.18.1.3 Reports on the Works Progress

The reports on the works progress shall be submitted to the Client monthly, containing information on the progress of works from the previous month, as well as the actual condition and expected trends of works in the factory and on the Site. The condition and trends of the works progress shall be illustrated by plans, schemes, diagrams, graphic charts, drawings, photographs, tables.

Each particular task, such as designing, materials acquisition, fabrication, testing in the factory, delivery to the Site, equipment installation, testing on the Site, commissioning, shall be included in separate chapters. The complete works will be presented in the chapter with summary.

If during execution of the Contract, the Client considers the progress position of any section of the work to be unsatisfactory, he will be at liberty to call such meetings, either at the Amman Office at Contractor Works or at Site, as

deemed to be necessary. If required by the Client, a responsible representative from the Contractor's works shall attend such meetings.

The Work Progress Report shall be submitted in Primavera or MS Project.

1.18.1.4 Test Program

Upon signing the Contract, the Contractor shall submit for the Client's approval the Detailed Test Program for the equipment in the Factory and recommended Test Program for the equipment on the Site.

1.18.1.5 Drawings

A list of the drawings shall be submitted by the Contractor with his Tender. The list of drawings shall be submitted after the Contract Commencement Date stated in the Particular Technical Specifications.

The Contractor shall submit all drawings for approval in sufficient time to permit modifications to be made if such are deemed necessary, and the drawings shall be re-submitted without delaying the completion dates stated in schedule B (*Delivery and Completion Requirements)*.

Three (3) copies of all drawings shall be submitted for approval and three (3) copies of any subsequent revision. Following approval, four (4) further paper copies and one (1) soft/electronic copy shall be submitted for Issue of Construction to the Client.

The Contractor shall submit to the Client's approval outline drawings of the equipment, which shall be delivered according to the Contract together with the estimated weights, forces, details on anchoring and sufficient total dimensions.

All dimensions marked on the drawings shall be correct ones.

All detailed drawings submitted for approval shall be to scale not less than 1:20. All important dimensions shall be given and the material of which each part is to be constructed shall be indicated.

The Contractor shall also provide free of charge any additional drawings and/or copies of any drawing required by the Client.

Drawings submitted by the Contractor and approved by the Client shall not be departed from, without the instruction in writing of the Client.

The Contractor shall be responsible for any discrepancies or errors or omissions from the drawings, whether such drawings have been approved or not by the Client. Approval given by the Client to any drawing shall neither

relieve the Contractor from his liability to complete the Contract Works in accordance with this Specification and the Conditions of Contract nor exonerate him from any of his guarantees.

All drawings shall be submitted in accordance with the provisions of this Technical Specification and shall become the property of the Client.

1.18.1.6 Electric Diagrams

The Contractor shall submit to the Client's approval complete connection diagrams, as well as circuit diagrams for control, regulation, measurements, protection, signalling, synchronization, etc., covering all the delivered equipment under the Contract, as well as existing equipment to which the equipment from this Contract is connected.

Cables between parts or apparatus shall be properly enumerated and marked. Individual drawings and diagrams shall show reference numbers for all outgoing cables, but the other accompanying drawings shall show all the data required for mutual interconnections.

Circuit diagrams shall be with particularly marked contacts and enumerated columns. Relays and control switches shall be shown on the same diagram with their coils and their contacts, with indication of columns where the contacts are used.

Circuit diagrams shall be completed with the indication of the reference numbers of the terminals to which apparatus are connected, the numbers being taken from the wiring diagram.

In circuit diagrams of measurements, all the measurement devices and transformers, measuring transmitters, indication instruments and all other equipment using measuring signals shall be provided.

1.18.1.7 Technical Solution (Design Principle & Concept)

Before starting with the manufacture of equipment to be delivered by the Contract, the Contractor shall submit for approval the Technical Solution (Design Principle & Concept) which shall contain the necessary technical descriptions, calculations, technical data, drawings, etc., to completely demonstrate that all equipment is in compliance with the provisions and the purpose of the Contract, as well as the installation, operation and maintenance requirements.

Equipment manufacturing can start only after approval of the Technical Solution by the Client.

1.18.1.8 Detailed Design

Prior to starting with equipment factory testing, the Contractor shall submit to the Client for approval the Detailed Design.

The Detailed Design shall be prepared in accordance with the provisions stated under Clauses 4.6.1.5, 4.6.1.6 and 4.6.1.7 above.

1.18.1.9 Instructions for Equipment Installation

For the equipment to be delivered, the Contractor shall submit to the Client for approval all required documentation providing satisfactory equipment installation on the Site. Special instructions for equipment installation shall be submitted together with reduced copies of applied drawings showing the installation sequence. Instructions and drawings shall include information on handling of equipment, installation tolerances and special safety measures to be undertaken during installation.

1.18.1.10 Operation and Maintenance Manuals

The Contractor shall submit to the Client complete and special Operation and Maintenance (O & M) Manuals for equipment and all special tools which are a part of the Contract. Such manuals shall be as clear as possible and contain complete plans and diagrams.

1.18.1.11 As Built Design

After completion of site works, the Contractor shall be obliged to perform Site Visit to Irbid S/S in order to collect all information necessary to prepare As Built Design.

As Built Design shall include introduction to the scope of work, design principle & concept, technical descriptions, substation layouts & cross sections, approved civil drawings, detailed circuit diagrams, wiring diagrams, cable lists, block schemes, technical data, panel views, approved calculations submitted during engineering/design stage, operation and maintenance manuals, detailed Manufacturer's catalogues for supplied equipment revised where necessary to show equipment as installed.

Furthermore, As Built Design for replacement and extension projects shall include all modifications on existing equipment and systems necessary for proper functioning of complete substations.

All drawings and other documentation shall be revised where necessary to show the equipment as installed, and two (2) copies shall be submitted for approval.

After Client's approval, three (3) copies of final As Built Design shall be submitted to Client and shall be reproduced as follows:

- Two (3) copies as Books of approximately square size bound into strong black durable imitation of leather with covers inscribed with gold letters,
- One (1) main electronic copy in mutually agreed version of AutoCAD format on CD or similar storage media.

After receiving the final version of As Built Design, the Client shall issue the Taking-Over Certificate (TOC) to the Contractor.

1.18.2 Review of Contractor Documentation

Each Contractorσ document shall be submitted to the Client for approval.

A copy will be returned to the Contractor marked with "*Approved*", "*Approved with corrections*" or "*Not approved*", or as agreed between the Contractor and the Client after the Contract Commencement Date. The approval does not release the Contractor from the obligation to deliver the equipment according to the Contract, completely fulfilling its purpose. No corrections are to be made upon return of the document marked "*Approved*" to the Contractor.

When documents copies are marked with "*Not approved*" or "*Approved with corrections*", the Contractor shall undertake the necessary corrections and to indicate them clearly in the documents and submit again for review and approval.

The Contractor shall be responsible for not clearly indicated corrections. Each revision shall be marked by number, date and subject, in the revision block. Besides, each revised document must have clearly written number, date and subject of all previous revisions.

If an omission is found on the Contractor document during equipment erection, corrections, including all required changes, shall be marked on the document and it will be submitted for approval once again, without additional expenses to the Client.

The Contractor shall be responsible for all discrepancies, omissions or errors on its documents notwithstanding the fact whether such documents and details are approved or not by the Client.

The Contractor shall make all the changes in the documentation necessary for the completion of Works in compliance with the provisions stated in schedule B: *Delivery and Completion Requirements*, without additional expenses to the Client.

1.19 – Drawings and models

A list of the drawings attached to the Specification is given in the Schedules.

A list of the drawings and models (if any) to be submitted by the Contractor with his Tender and a list of drawings, and models (if any) to be submitted after the Commencement Date, are also given in the Schedules. The Contractor shall also provide free of charge any additional drawings and/or copies of any drawing required by the Engineer.

The Contractor shall submit all drawings and models for approval, a period of Four weeks from receipt of the drawings by the engineer shall be allowed in the program for checking and permit modifications to be made if such are deemed necessary, and the drawings and models to be re-submitted without delaying the initial deliveries or completion of the Contract Works.

Three copies of all drawings shall be submitted for approval and three copies of any subsequent revision. Following approval, four further copies will be required for distribution to the Employer and to site for installation.

All dimensions marked on the drawings shall be considered correct although measurement by scale may differ therefrom. Detailed drawings shall be worked to where they differ from general arrangement drawings.

All detailed drawings submitted for approval shall be to scale not less than 1:20. All-important dimensions shall be given and the material of which each part is to be constructed shall be indicated.

Drawings and models submitted by the Contractor and approved by the Engineer shall not be departed from without the instruction in writing of the Engineer.

The Contractor shall be responsible for any discrepancies or errors in or omissions from the drawings, whether such drawings have been approved or not by the Engineer. Approval given by the Engineer to any drawing shall neither relieve the Contractor from his liability to complete the Contract Works in accordance with this Specification and the Conditions of Contract nor exonerate him from any of his guarantees.

If the Contractor needs urgent approval of any drawing in order to avoid delay in the completion of the Contract Works, he shall advise the Engineer to such effect when submitting the drawings.

All drawings and models shall be submitted in accordance with the provisions of this Specification and shall become the property of the Employer.

1.20 – Operating and maintenance instructions

When the general arrangements and details of the 132 Kv Control and protection Panels have been finalised and not later than three months before erection commences, the contractor shall submit to the Engineer for approval a fully detailed operating and maintenance instruction manual.

The details shall cover all associated ancillary equipment as supplied under the contract. It will not be sufficient to incorporate manufacturer's standard brochures as part of the text unless they refer particularly to the equipment supplied and are free of extraneous matter.

The information provided should include essential flow and circuit diagrams, pipe works general arrangement and detailed drawings of the installation, make mention of special materials were used and include schedules of lubricants, diagrams should be reduced to a convenient size and bound into the volume and not inserted into cover pockets.

If the complete text of the manual is unduly bulky, then this shall be appropriately sub-divided and produced in multi – volume form. When approved three copies of the complete text, diagrams and drawings as made up in the draft form shall be handed to the Engineer for use during erection commences.

1.21 Documents Review Period

All documentation submitted by the Contractor to the Client for review shall be returned to the Contractor with the revision seal of the Client, or with any other remark he may make, within 21 (twenty-one) days upon the reception in the Client's office.

Exception is documentation of complicated assemblies, Detailed Design and As Built Design, for which this procedure shall be completed within 30 days.

If the Contractor needs urgent approval of any document in order to avoid delay in the completion of the Contract Works, he shall inform the Client to such effect when submitting the document.

If the Client deems it necessary to take more time for review of some documentation, he shall inform the Contractor in written within 10 (ten) days after their reception.

1.22 - Fire precaution

All apparatus, connections and cabling shall be designed and arranged to minimize the risk of fire and any damage which might be caused in the event of fire.

1.23 Packing, Shipping and Transport

The Contractor shall be responsible for the packing, loading and transport of the equipment and materials from the place of manufacture, whether this is at his own works or those of any supplier, to the Site.

All apparatus shall be carefully packed for transport by sea, rail and road as necessary and in such a manner that it is protected against climatic conditions.

Where oil for the first filling is to be provided it shall be supplied in non-returnable drums or non-returnable oil tank.

Precautions shall be taken to protect parts containing electrical insulation against the ingress of moisture.

All parts liable to rust shall receive a coat of anti-rusting composition and shall be suitably protected. The machined face of all flanges shall be protected by means of a blank disc bolted to each face.

Where appropriate all parts shall be boxed in substantial crates or containers to facilitate handling in a safe and secure manner. Each crate or container shall be marked clearly on the outside of the case to show where the mass is bearing and the correct position for the slings. Each crate or container shall also be marked with the notation of the part or parts contained therein, contract number and port of destination, and shall become the property of the Client after delivery.

The Client may require inspecting and approve the packing before the items are dispatched but the Contractor shall be entirely responsible for ensuring that the packing is suitable for transit and such inspection will not exonerate the contractor from any loss or damage due to faulty packing.

All the equipment shall be protected against damage during various transport manipulations. For these manipulations, hooks and/or slings shall be provided in adequate places so as to avoid damaging of equipment. These places shall be marked precisely on the drawings and manuals, and special protection against climate influences shall be also adequately provided.

Parts of equipment susceptible to dust and moisture shall be properly protected in an airtight package, along with utilization of moisture absorbers.

Fragile and sensitive equipment and its parts have to be adequately packed in shock resistant boxes and clearly marked by an adequate warning.

The Contractor shall be responsible for all damages to the equipment in transport, and for all damages resulting from insufficient packing, improper packing, negligent handling and loading and insufficient protection against tumbling during transport, and such damages or defects shall be brought into proper condition by the Contractor, on his own expense.

1.24 Erection and Shipping Marks

Before leaving the Contractor's Works all equipment and materials shall be painted or stamped in two (2) places with a distinguishing number and/or letter corresponding to the distinguishing number and/or letter on an approved drawing and material list.

All equipment and materials shall be shipped separately for each substation.

The erection marks on galvanized material shall be stamped before galvanizing and shall be clearly legible after galvanizing.

All markings shall be legible; weatherproof tags, where used, shall be durable, securely attached and duplicated.

Prior to dispatch each separate box, crate or package of equipment shall be clearly labelled in the English language and bear the markings shown on the appropriate Tender Drawing.

Marking shall be by means of block letters not less than 13 mm high, stencilled on the box, crate or package with black paint in an easily read location. When stencilling is not possible the information shall be marked on a durable metal tag that shall be securely wired to the box, crate or package.

in foundations.

1.25 – Locking Facilities

Locking facilities shall be provided on each Panel

Locks and keys shall be in accordance with the requirements of this specification.

1.26 – Contractors Responsibilities

Unless stated specifically to the contrary in the tender with full supporting explanations the Contractor will be deemed to have concurred as a practical manufacturer with the design and layout of the works as being sufficient to ensure reliability and safety in operation freedom from undue stresses and working plant.

The contractor shall include the whole of the works, which are described in or implied by the contract document. All matters omitted from the contract document, which may be inferred to be obviously necessary for the efficiency, stability and completion of the work shall be deemed to be included in the contract price.

Works shown upon the drawings and not mentioned or described in the specification and works described in the specification and not shown on the drawings will nevertheless be held to be included in this contract and their execution shall be covered by the contract price in the same manner if they had been expressly shown upon the drawings and described in the specification.

The Engineer will set out a datum line from which the contractor on his own responsibility shall duly set out all other works but under the direction and to the satisfaction of the Engineer and according to the drawings supplied or approved by the Engineer.

1.27 - Design and standardization

The Contract works shall be designed to facilitate inspection, cleaning and repairs, and for operation where continuity of supply is the first consideration. All apparatus shall also be designed to ensure satisfactory operation in all atmospheric conditions prevailing at the Site(s) and during such sudden variation of load and voltage as may be met with under working conditions on the system, including those due to faulty synchronising and short circuit.

The design shall incorporate all reasonable precautions and provision for the safety of those concerned in the operation and maintenance of the Contract Works and of associated works supplied under other contracts.

All outdoor apparatus and fittings shall be designed so that water cannot collect at any point.

Cubicles and similar enclosed compartments shall be adequately ventilated to restrict condensation. All contactor or relay coils and other parts shall be suitably protected against corrosion.

All apparatus shall be designed to avoid the risk of accidental short circuit due to animals, birds, insects, mites, rodents or micro-organisms.

Corresponding parts shall be interchangeable. Where required by the Engineer the Contractor shall demonstrate this quality.

Fully detailed specifications and materials of several parts of the plants are to be submitted describing particularly the materials to be used.

All equipment is to operate without undue vibration and with the least possible amount of noise and is not to cause a nuisance.

1.28 - Topicalization

In choosing materials and their finishes, due regard shall be given to the humid tropical conditions under which equipment is to work, and the recommendations of British Standard Code of Practice 1014 or equivalent should be observed unless otherwise approved. Some relaxation of the following provisions may be permitted where equipment is hermetically sealed but it is preferred that tropical grade materials should be used wherever possible: -

a. Metals. Iron and steel shall generally be painted or galvanised as appropriate. Indoor parts may alternatively have chromium or copper-nickel plated or other approved protective finish. Small iron and steel parts (other than rustless steel) of all instruments and electrical equipment, the cores of electromagnets and the metal parts of relays and mechanisms shall be treated in an approved manner to prevent rusting. Cores, etc., which are built up of laminations or cannot for any other reason be anti-rust treated, shall have all exposed parts thoroughly cleaned and heavily enamelled, lacquered or compounded.

   When it is necessary to use dissimilar metals in contact, these should, if possible, so be selected that the potential difference between them in the electrochemical series is not greater than 0.5 volts. If this is not possible, the contact surfaces of one or both of the metals shall be electroplated or otherwise finished in such a manner that the potential difference is reduced to within the required limits, or if practicable, the two metals shall be insulated from each other by an approved insulating material or a coating of approved varnish compound.

b. Screws, nuts, springs pivots, etc. The use of iron and steel is to be avoided in instruments and electrical relays wherever possible. Steel screws, when used, shall be zinc, cadmium or chromium plated, or when plating is not possible owing to tolerance limitations, shall be of corrosion-resisting steel.

   All wood screws shall be of dull nickel-plated brass or of other approved finish. Instrument screws (except those forming part of a magnetic circuit) shall be of brass or bronze. Springs shall be of non-rusting material, e.g., phosphor-bronze or nickel silver, as fast as possible. Pivots and other parts for which non-ferrous material is unsuitable are to be of approved rustless steel where possible.

c. Fabrics, Cork, paper, etc. Fabrics, cork, paper and similar materials, which are not subsequently to be protected by impregnation, shall be adequately treated with an approved fungicide. Sleeving and fabrics treated with linseed oil or linseed oil varnishes shall not be used.

d. Wood. The use of wood in equipment shall be avoided as far as possible. When used, woodwork shall be of thoroughly seasoned teak or other

approved wood that is resistant to fungal decay and shall be free from shakes and warp, sap and wane, knots, faults and other blemishes. All woodwork shall be suitably treated to protect it against the ingress of moisture and from the growth of fungus and termite attack, unless it is naturally resistant to those causes of deterioration. All joints in woodwork shall be dovetailed or tongued and pinned as far as possible. Metal fittings where used shall be of non-ferrous material.

e. Adhesives. Adhesives shall be specially selected to ensure the use of types which are impervious to moisture, resistant to mould growth, and not subject to the ravages of insects. Synthetic resin cement only shall be used for joining wood. Casein cement shall be used.

f. Rubber. Neoprene and similar synthetic compounds, not subject to deterioration due to the climatic conditions, shall be used for gaskets, sealing rings, diaphragms, etc., instead of the standard rubber-based materials.

1.29 - Earthing

All metal parts, other than those forming part of any electrical circuit, shall be connected to the main earth system by means of a hard drawn high conductivity copper earth bar with a cross sectional area such that the current density is not greater than 200 A/mm^2 for 1 second fault durations and 115 A/mm^2 for 3 second fault durations with a minimum of

1.30 – Control and Protection Panels

All Control and Protection Panels shall be suitable for cables entering from below and beside as may be specified. They shall be weatherproof, rodent and insect-proof and be complete with all gaskets, compression glands wiping glands and associated fittings as may be required to make-off the cables.

Gland plates shall be insulated from the cable boxes and in the case of single core cables shall be of non-magnetic, or insulating material. If metallic gland plates are used, single core cable glands shall be insulated from the gland plate. Gland plate insulation shall be capable of withstanding a dry high voltage test of 2000 volts ac for one minute.

Where cable boxes are provided for three core cables, the sockets on the outer phases shall be inclined towards the centre to minimise opening of the cable cores. Cable sockets shall be supplied under this Contract.

Cable boxes for voltages up to and including 3.3 kV shall be suitable for XLPE or PVC insulated steel-wire armoured PVC covered cables with copper conductors. The boxes shall be air insulated and designed to accommodate all the fittings required by the cable manufacturer. Front

covers and gland plates shall be removable and a 12 mm diameter breathing hole covered with wire gauze shall be provided.

Cable boxes for 3.3 kV cables shall be air insulated and suitable for 3-core XLPE insulated, PVC covered cables with copper conductors.

Cable boxes shall be capable of withstanding on site the cable high voltage test level in accordance with IEC 60055, IEC 60141 or IEC 60502 as appropriate.

1.31 - Control and Protection Panels wiring

Control and Protection Panels connections shall be insulated with PVC to IEC 60227. Wires shall not be jointed or teed between terminal points. Bus wires shall be fully insulated and run separately from one another along the top or bottom of the cubicle. Fuses and links or miniature circuit breakers shall be provided to enable all circuits in a cubicle, except a lighting circuit, to be isolated from the bus wires.

The dc trip and ac voltage supplies and wiring to main protective gear shall be segregated from those for back-up protection and also from protective apparatus for special purposes. Each such group shall be fed through separate fuses or miniature circuit breakers from the bus wires. There shall not be more than one set of supplies to the apparatus comprising each group. All wires associated with the tripping circuits shall be provided with red ferrules marked "Trip".

It shall be possible to work on small wiring for maintenance or test purposes without making a switchboard dead.

Insulated stranded wire shall have not less than seven strands and each strand shall be not less than 0.67 mm diameter. If single conductor is used it shall be annealed copper of circular cross-sectional area of not less than 2.5 mm2.

Claw washers or crimped connectors of approved type shall be used to terminate all small wiring.

When connections rated at 380 volt and above are taken through junction boxes they shall be adequately screened and "DANGER" notices shall be affixed to the outsides of junction boxes or marshalling kiosk.

All metallic cases of instruments, control switches etc. mounted in cubical shall be connected by copper conductors of not less than 3.5 mm2 section to the nearest earth bar.

Where connections to other equipment and supervisory equipment are required, the connections shall be grouped together.

1.32- Termination of cables and wires

PVC sheathed auxiliary control and protection cables shall be terminated by compression glands complying with BS 6121 (or equivalent).

Auxiliary cables shall be terminated with compression type glands, clamps or armour clamps complete with all the necessary fittings.

Colours shall be marked on cable box tail ends and single core cables at all connecting points and/or any positions the Engineer may determine. Cable boxes shall be marked with stamped brass labels indicating the purpose of the supply where such supply is not obvious or where the Engineer may determine.

All cables shall be identified and shall have phase colours marked at their terminations.

All incoming and outgoing connections shall be terminated at a terminal block. Direct termination into auxiliary switches will not be accepted.

Where cable cores are liable to contact with oil or oil vapour the insulation shall be unaffected by oil.

1.33- Terminal boards and terminal blocks

Terminal boards shall be of good quality non-flammable insulating material, with a comparative tracking index (CTI) of not less than 500 V, relative to IEC 60112.

Terminal boards shall be spaced not less than 100 mm apart and the bottom of each board shall not be less than 200 mm above the incoming cable gland plate. Separate studs shall be provided on each terminal strip for internal connection and outgoing cables including spare cores.

Studs of stud type terminal boards shall be locked in the base to prevent turning and all connections shall be made on the front of the terminal board using lock nuts or lock washers.

Terminals shall be of the insertion clamp type incorporating captive pressure screws which do not bear directly on the wire but on a serrated clamping plate. The pressure screws shall have an inherent locking feature and terminal entries should be shrouded such that no current carrying metal is exposed.

Terminations shall be grouped according to function and labels shall be provided on the fixed portion of the terminal boards showing the function of the group.

The use of terminal boards as junction points for wires which are not required in the associated cubicle shall be avoided wherever practicable.

All terminal boards shall have a minimum of 20 per cent spare terminals.

Identification ferrules of the wires shall be according to the following:

For internal wires the ferrule shall have at each end the equipment and terminal number to which it connected and the other end equipment and terminal number (destination)

1.34 - Miniature circuit breakers, fuses and links

For protection and isolation of circuits associated with protection control and instruments, miniature circuit breakers or fuses and links should be used, although miniature circuit breakers are preferred.

Miniature circuit breakers shall be designed and tested in accordance with IEC 60947-5-1 and supplementary requirements of this specification. They shall be suitable for use over the full range of expected voltage variation as specified in the Schedules.

They shall be suitably rated for both the continuous and short circuit loadings of the circuits they are protecting, under all service and atmospheric conditions stated in the specification.

For three phase circuits, the miniature circuit breakers shall be of the three-pole type; for single phase circuits they shall be of the double pole type and for dc circuits they shall be of the double pole type.

Where miniature circuit breakers are used in circuits containing inductive loads, e.g., operating coils, it is essential that they are suitable for satisfactory operation in the circuit in which they are used, i.e., account is taken of the circuit time constant.

All miniature circuit breakers shall be provided with an auxiliary contact(s) for remote indication of circuit breaker operation.

Means shall be provided to prevent the miniature circuit breakers being inadvertently switched to the `OFF' position.

Miniature circuit breakers shall be mounted in such a manner so as to give easily visible indication in order to facilitate identification and easy replacement.

1.35 - Degrees of protection of the Control and Protection panels

The following degrees of protection shall be provided in accordance with IEC 60947-1and IEC 60529.

For indoor applications, IP 41.

1.36 - Supply voltage

All incoming supplies of greater than 125 V to earth shall have their terminations shrouded by a suitable insulating material.

1.37- Auxiliary Switches

Where appropriate, each item of plant shall be equipped with all necessary auxiliary switches, contactors and mechanisms for indication, metering, control, interlocking, supervisory and other services. All auxiliary switches shall be wired up to a terminal board on the fixed portion of the plant, whether they are in use or not in the first instance.

All auxiliary switches and mechanisms shall be mounted in approved accessible positions clear of the operating mechanisms and shall be protected in an approved manner. The contacts of all auxiliary switches shall be strong and shall have a positive wiping action when closing.

Banks of auxiliary switches and associated terminal boards shall be arranged to facilitate extension when required.

1.38– Allowance for Damage, Breakage and Loss

The contractor shall supply not less than 5 per cent of the net requirements for erection materials (insulators, hardware, fixing devices, cables, conductors, etc) as an allowance for damage, breakage and loss during erection.

1.39 – Standards

The contractor shall provide one copy of the latest standards (IEC, BS, ANSI, DIN or other applicable standards) which are applicable to this contract to the Employer.

2.0 – Testing

Every facility is to be provided by the Contractor to enable the Employer's representatives to carry out the necessary inspection and testing of the purchased materials. The costs of all tests during manufacturing and preparation of test records shall be borne by the Contractor.

Instruments shall be approved and shall, if required by the Employer's representative, be calibrated by the National physical Laboratory or such other body as may be approved at the expense of the contractor.

2.1 Type Tests:

Type test report for the 132 kV Control and Protection Panels should be in accordance to latest standards IEC 60255, IEC 61850, IEC 61010, IEC 60068, IEC 60529,60297 or such other standards as may be approved.

1- Functional requirements
2- Product safety requirements
3- EMC requirements

4- Energizing quantities
5- Contact performance
6- Communication requirements
7- Climatic environmental requirements
8- Mechanical requirements
9- Enclosure protection
10- Electromagnetic Compatibility (EMC) Tests
11- Temperature Rise Test
12- Dielectric Withstand Voltage Test (Power Frequency Withstand)
13- IP Protection Class Verification

2.2 Routine Tests:

Routine tests shall be according to the latest IEC 60255, IEC 60204, IEC 61010 or such other standards as may be approved and shall include the following:

1- Visual Inspection
2- Insulation Resistance Test (IR)
3- High Voltage / Dielectric Test
4- Functional Testing of Relays and Devices
5- Simulation of Protection Schemes
6- Continuity & Wiring Checks
7- Power Supply Verification

3.0 Materials Testing:

Three copies of the Contractor's record of tests shall be supplied to the Engineer. The purchaser will check test report/test results and if accepted a shipping release certificate will be issued within 14 days from the receipt of the report/ shipping release request.

4.0- STANDARDS:

Unless otherwise specified, the 132 kV Control and Protection Panels and ancillary equipment shall be fully designed and manufactured in accordance with these Technical Specifications and the latest editions of the following IEC, BS, and IEEE Standards:

- IEC 60050, International Electro technical Vocabulary (IEV),
- IEC 60417 DB, Graphical symbols for use on equipment,
- IEC 60617 DB, Graphical symbols for diagrams,
- IEC 60038, IEC standard voltages,
- IEC 60071, Insulation co–ordination,
- IEC 61936, Power installations exceeding 1 kV a.c.,
- IEC 60721, Classification of environmental conditions,
- IEC 60529, Degrees of protection provided by enclosures (IP Code),
- IEC 61000, Electromagnetic compatibility (EMC),
- IEC 60085, Electrical insulation,
- IEC 60068, Environmental testing,
- IEC 61850, Standard for Substation Automation,
- IEC 60255, Measuring relays and protection equipment,
- IEC 60068, Environmental testing of electronic equipment,
- IEEE C37.2, Standard for Electrical Power System Device Function Numbers, Acronyms, and Contact Designations,
- IEEE C37.90, Standard for Relays and Relay Systems Associated with Electric Power Apparatus,
- IEEE C37.113, Guide for Protective Relay Applications to Transmission Lines,
- IEEE Std C37.104, Guide for Automatic Reclosing of Line Circuit Breakers for AC Distribution and Transmission Lines,
- IEEE C37.91, Guide for Protecting Power Transformers,
- IEEE Std C37.119, Guide for Breaker Failure Protection of Power Circuit Breakers,

- IEEE Std C37.234, Guide for Protective Relay Applications to Power System Buses,
- IEC 60688, Electrical measuring transducers for converting A.C. and D.C. electrical quantities to analogue or digital signals,
- IEC 60359, Electrical and electronic measurement equipment - Expression of performance,
- IEC 60664, Insulation coordination for equipment within low-voltage systems,
- IEC 60051, Direct acting indicating analogue electrical measuring instruments and their accessories,
- BS 7194: Specification for direct-current and low-frequency electronic measuring instruments with a digital display,
- IEC 60269, Low-voltage fuses,
- IEC 62444, Cable glands for electrical installations,
- BS 6121-1, Mechanical cable glands. Armour glands. Requirements and test methods,
- IEEE Std 80, Guide for Safety in AC Substation Grounding,

If the Tenderer offers design, equipment, workmanship or testing in compliance with any Standard which deviates from the above-mentioned Standards, such deviations shall be submitted along with his Tender.

Application of any Standard other than the above mentioned, shall be the subject of the Client's approval.

5.0 Equipment and Material Requirements

5.1 General

The Contract works shall be designed to facilitate inspection, cleaning, and repairs, and for operation where continuity of supply is the first consideration. All apparatus shall also be designed to ensure satisfactory operation in all atmospheric conditions prevailing at the Site(s) and during such sudden variation of load and voltage as may be appeared with working under conditions on the system, including those due to faulty synchronising and short circuit.

The design shall incorporate all reasonable precautions and provision for the safety of those responsible for the operation and maintenance of the Contract Works and of associated works supplied under other contracts.

All outdoor apparatus and fittings shall be designed so that water cannot collect at any point.

All water and oil pipe flanges shall be according to BS EN 1092 as regards both dimensions and drilling, unless otherwise approved.

Cast iron shall not be used for chambers of oil filled apparatus or for any part of the equipment which is in tension or subject to impact stresses.

Kiosks, cubicles, and similar enclosed compartments shall be adequately ventilated to restrict condensation. All contactor or relay coils and other parts shall be suitably protected against corrosion.

All apparatus shall be designed to avoid the risk of accidental short circuit due to animals, birds, insects, mites, rodents, or micro-organisms.

Corresponding parts shall be interchangeable. Where required by the Client the Contractor shall demonstrate this quality.

All equipment is to operate without undue vibration and with the least possible amount of noise and is not to cause a nuisance.

5.2 Selection of Materials

In choosing materials and their finishes, due regard shall be given to the humid tropical conditions under which equipment is to work, and the recommendations of British Standard Institution shall be observed, unless otherwise approved by Client. Some relaxation of the following provisions may be permitted where equipment is hermetically sealed, but it is preferred that tropical grade materials shall be used wherever possible:

- Metals: Iron and steel shall generally be painted or galvanized as appropriate. Indoor parts may alternatively have chromium or copper-nickel plated or other approved protective finish. Small iron and steel parts (other than rustless steel) of all instruments and electrical equipment, the cores of electromagnets and the metal parts of relays and mechanisms shall be treated in an approved manner to prevent rusting. Cores, etc., which are built up of laminations or cannot for any other reason be anti-rust treated, shall have all exposed parts thoroughly cleaned and heavily enamelled, lacquered or compounded.

  When it is necessary to use dissimilar metals in contact, these should, if possible, so be selected that the potential difference between them in the electrochemical series is not greater than 0.5 volts. If this is not possible, the contact surfaces of one or both of the metals shall be electroplated or otherwise finished in such a manner that the potential difference is reduced to within the required limits, or if practicable, the two metals shall be insulated from each other by an approved insulating material or a coating of approved varnish compound.

- Screws, nuts, springs pivots, etc.: The use of iron and steel is to be avoided in instruments and electrical relays wherever possible. Steel screws, when used, shall be zinc, cadmium or chromium plated, or when plating is not possible owing to tolerance limitations, shall be of corrosion-resisting steel.

  All wood screws shall be of dull nickel-plated brass or of other approved finish. Instrument screws (except those forming part of a magnetic circuit) shall be of brass or bronze. Springs shall be of non-rusting material, e.g. phosphor-bronze or nickel silver, as far as possible. Pivots and other parts for which non-ferrous material is unsuitable are to be of approved rustless steel where possible.

- Fabrics, cork, paper, etc.: Fabrics, cork, paper and similar materials, which are not subsequently to be protected by impregnation, shall be adequately treated with an approved fungicide. Sleeving and fabrics treated with linseed oil or linseed oil varnishes shall not be used.

- Wood: The use of wood in equipment shall be avoided as far as possible. When used, woodwork shall be of thoroughly seasoned teak or other approved wood which is resistant to fungal decay and shall be free from shakes and warp, sap and wane, knots, faults and other blemishes. All

woodwork shall be suitably treated to protect it against the ingress of moisture and from the growth of fungus and termite attack, unless it is naturally resistant to those causes of deterioration. All joints in woodwork shall be dovetailed or tongued and pinned as far as possible. Metal fittings where used shall be of non-ferrous material.

- Adhesives: Adhesives shall be specially selected to ensure the use of types, which are impervious to moisture, resistant to mould growth, and not subject to the ravages of insects. Synthetic resin cement only shall be used for joining wood. Casein cement shall be used.
- Rubber: Neoprene and similar synthetic compounds, not subject to deterioration due to the climatic conditions, shall be used for gaskets, sealing rings, diaphragms, etc., instead of the standard rubber-based materials.

5.3 Equipment and Materials Workmanship

The materials to be used in fabrication of particular equipment shall be of such kind, composition and physical properties, which would best correspond to their purpose, and compliant with the most advanced practice in engineering. All the equipment shall comply with the standards applied regarding materials, fabrication, design and testing. Tolerance, adjustments, and final processing must comply with the most advanced contemporary practice in manufacture of products similar to those enclosed in the Special Technical Specifications.

All the equipment must be of reliable structure, designed for frequent putting into operation.

All the equipment shall operate without excessive vibrations and with minimum noise.

When the Contractor wishes to use materials which are not manufactured for the purpose of execution of the Works under this Contract, he must submit evidence that such materials correspond to the requirements of the General and Particular Technical Specifications, and in such case, material tests may be omitted, unless decided otherwise by the Client.

All the works shall be performed in detail and skilfully, and in compliance with the contemporary practice in the most advanced equipment fabrication, disregarding any possible shortages in the General and Particular Technical Specifications. All the works shall be performed by skilled labourers of various professions. All the parts shall be accurately produced according to the standard measure, wherever possible, to facilitate replacement and repair.

Similar parts shall be interchangeable unless the Client approves otherwise. Basic equipment elements and their spare parts shall be manufactured of the same material.

Equipment, accessories for adjustments, fastening and other, shall be brand new, of the approved fabrication and standards, and of the first-class quality.

In case any deviation from the contracted drawings may occur in the course of manufacture, a written report on the nature of the deviation shall be submitted to the Client by the Contractor, and the Client will decide whether the modified part of equipment should be accepted or not.

The Client's acceptance of the deviation shall in no way release the Contractor of his obligation to deliver the equipment according to the Contract.

Materials and equipment, manufactured, used or installed without the Client's consent can be subsequently rejected.

All apparatus, connections and cabling shall be designed and arranged to minimize the risk of fire and any damage which might be caused in the event of fire.

5.4 Bolts and Nuts

All bolts, studs, screw threads, pipe threads, bolt heads and nuts shall comply with the appropriate IEC, ISO or BS Standards for metric threads, or the technical equivalent.

Except for small wiring, current carrying terminal bolts or studs, for mechanical reasons, shall not be less than 6 mm in diameter.

All nuts and pins shall be adequately locked.

Wherever possible bolts shall be fitted in such a manner that in the event of failure of locking resulting in the nuts working loose and falling off, the bolt will remain in position.

All bolts, nuts and washers placed in outdoor positions shall be treated to prevent corrosion of the threads and electrolytic action between dissimilar metals.

Where bolts are used on external horizontal surfaces where water can collect, methods of preventing the ingress of moisture to the threads shall be provided.

Each bolt or stud shall project at least one thread but not more than three threads through its nut, except when otherwise approved for terminal board

studs or relay stems. If bolts and nuts are placed so that they are inaccessible by means of ordinary spanners, special spanners shall be provided.

The length of the screwed portion of the bolts shall be such that no screw thread may form part of a shear plane between members.

Taper washers shall be provided where necessary.

5.5 Galvanizing

All galvanizing shall be applied by the hot dip process and shall comply with BS EN ISO 1461. The thickness of the coating shall be such to secure 25 years of coating durability without maintenance, depending on site conditions, as per BS EN ISO 14713, but shall not be less than 0.61 kg/m^2. Coating thickness is subject to NEPCO approval.

All welds shall be de-scaled, all machining carried out and all parts shall be adequately cleaned prior to galvanizing. The preparation for galvanizing and the galvanizing itself shall not adversely affect the mechanical properties of the coated material.

The threads of all galvanized bolts and screwed rods shall be cleared of spelter by spinning or brushing. A die shall not be used for cleaning the threads unless specially approved by the Client. All nuts shall be galvanized with the exception of the threads which shall be oiled.

Surfaces which are in contact with oil shall not be galvanized or cadmium plated.

Partial immersion of the work shall not be permitted, and the galvanizing tank must therefore be sufficiently large to permit galvanizing to be carried out by one immersion.

Galvanizing of wires shall be applied by the hot dip process and shall meet the requirements of BS EN 10244-2.

5.6 Rating Plates, Labels and Markings

On each main and auxiliary item of equipment, permanent mark shall be fastened on a visible place and the mark shall be made of resistant material to atmospheric influence. It shall have engraved or impressed the name of the manufacturer and its hallmark, as well as type, serial number and mark of the equipment position and details related to performance characteristics.

On each panel, board, cubicle, boxes as well as on each equipment installed in such panel, board, cubicle and boxes, adequate rating plates shall be provided.

Rating plates for panels, boards, cubicles and boxes shall be fixed on front and rear side and shall contain the name of panel, board, cubicle and box including item designations.

Rating plates for equipment on which the item designations of equipment are indicated shall be fixed on the equipment themselves and in their immediate vicinity, to facilitate interchangeability, dismantling and assembly.

The rating plates of the equipment and data on them shall be in accordance with applicable IEC standards. NEPCO property plates of equipment shall be indicated as well. During engineering/design stage, the Client shall submit those details to the Contractor.

Thickness of rating plate shall be at least 2 mm.

Rating plates, labels and markings shall be subject of the Client's approval. The material of all labels and the dimensions, legend, and method of printing shall be subject of the Client's approval as well.

Colours shall be permanent and free from fading.

The surface of indoor labels shall have a matt or satin finish to avoid dazzle from reflected light.

All labels and rating plates for outdoor use shall be of stainless-steel material with black engraving.

Protective washers of suitable material shall be provided front and back on the securing screws.

All apparatus shall be clearly labelled indicating, where necessary, its purpose and service positions. Each phase of alternating current and each pole of direct current equipment and connections shall be coloured in an approved manner to distinguish phase or polarity.

Phases of three-phase alternating current systems shall be identified as follows:

Phases	Phases for Transformers	Colour
A R	U	Red
B S	V	Yellow
C T	W	Blue

Such nameplates or labels shall be of non-hygroscopic, non-transparent or translucent heat resisting material with engraved or impressed lettering of a contrasting colour or, alternatively, in the case of indoor circuit breaker, etc., of transparent plastic material with suitably coloured lettering engraved on the back. Size, colour and engravings shall be subject to acceptance by the Client.

All inscriptions on rating plates, labels and markings shall be in English except for "*Danger*" and "*Warning*" signs which shall be in both English and Arabic. Colour for "*Danger*" and "*Warning*" signs shall be approved by the Client.

Items of equipment, such as valves, which are subject to handling, shall be provided with an engraved chromium plated brass nameplate or label not less than 3 mm thick with engraving filled with enamel.

The interior of each piece of equipment shall be clearly marked to show the phases and for this purpose either coloured plastic discs screwed to fixed components or identification by means of plastic sleeve or tape shall be used.

In addition, each item of switchyard & switchgear shall have number plates bearing the switch number allocated by the Client according to his standard operational switch numbering scheme. Details of the number plates shall comply with NEPCO standard operational numbering system.

5.7 Cleaning and Painting

5.7.1 General

All paints shall be applied in strict accordance with the Manufacturer's instructions.

All painting shall be carried out on dry and clean surfaces and under suitable atmospheric and other conditions in accordance with the Manufacturer's recommendations.

5.7.2 Works Processes

All steelwork, equipment supporting steelwork and metalwork, except galvanised surfaces or where otherwise specified, shall be shot blasted to BS 7079 (second quality finish) or Swedish Standard SA2½.

All surfaces shall then be painted with one coat of epoxy zinc rich primer, two pack type, to a film thickness of 50 microns. This primer shall be applied preferably by airless spray and within twenty minutes (20 min) but not exceeding one hour (1 h) of shot blasting.

All rough surfaces of coatings shall be filed with an approved two pack filler and rubbed down to a smooth surface.

The interior surfaces of all steel tanks and oil filled chambers shall be shot blasted in accordance with BS 7079 (first quality finish) or SA3 and painted within a period of preferably twenty minutes (20 min) but not exceeding one hour (1 h) with an oil resisting coating of a type approved by the Client.

The interior surfaces of mechanism cubicles, boxes and kiosks, after preparation, cleaning and priming as required above, shall be painted with one coat zinc chromate primer, one coat phenolic based undercoating, followed by one coat phenolic based finishing paint to a light or white colour. For equipment for outdoor use this shall be followed by a final coat of anti-condensation paint of a type approved by the Client, to a light or white colour. A minimum overall paint film thickness of 150 microns shall be maintained throughout.

All steelwork and metalwork, except where otherwise specified, after preparation and priming as required above shall be painted with one coat metallic zinc primer and two coats of micaceous iron oxide paint to an overall minimum paint film thickness of 150 microns.

Galvanized surfaces shall not be painted in the works.

All nuts, bolts, washers etc, which may be fitted after fabrication of the equipment shall be painted as described above after fabrication.

5.8 Cubicle Wiring

Cubicle wiring shall be insulated with PVC according to IEC 60227. Wires shall not be jointed or tied between terminal points. Bus wires shall be fully insulated and shall run separately from one another along the top or bottom of the cubicle. Miniature circuit breakers or fuses and links shall be provided to enable all circuits in a cubicle, except a lighting circuit, to be isolated from the bus wires.

The DC trip and AC voltage circuits shall be segregated from each other. Circuits to main protection shall be segregated from those for back-up protection and also from protection apparatus for special purposes. Each such group shall be fed through separate miniature circuit breaker or fuse from the bus wires. There shall not be more than one set of supplies to the apparatus comprising each group. All wires associated with the tripping circuits shall be provided with red ferrules marked "*Trip*".

It shall be possible to work on small wiring for maintenance or test purposes without making a switchboard dead.

Insulated stranded wire shall have not less than seven (7) strands and each strand shall be not less than 0.67 mm diameter. If single conductor is used, it shall be annealed copper of circular cross-sectional area of not less than 2.5 mm^2. Flexible conductors of 1.5 mm^2 may be employed on indoor, independently mounted control and protection panels. Single strand 1.5 mm^2 or smaller sizes shall only be employed with a written approval of a Client.

Claw washers or crimped connectors of approved type shall be used to terminate all small wiring.

When connections rated at 380 V and above are taken through junction boxes they shall be adequately screened, and "*DANGER*" notices shall be affixed to the outsides of junction boxes or marshalling kiosk.

All metallic cases of instruments, control switches, relays, etc. mounted on control & protection panels or cubicles shall be connected by copper conductors of cross-sectional area not less than 3.5 mm^2 to the nearest earthing bar.

Where connections to other equipment and supervisory equipment are required the connections shall be grouped together.

For internal wires the identification ferrules shall have at each end the equipment and terminal number to which it connected and the other end equipment and terminal number destination.

5.9 Multicore and Conduit Wiring

All LV AC & DC power cables, control, signalling and measuring cables, communication cables, cable glands, ferrules, cable numbers, cable shoes, etc. shall be provided by Contractor

The cables shall be XLPE, or PVC insulated, steel-wire armoured, PVC covered cables with copper conductors, according to IEC 60228.

In addition, wiring diagrams, cable lists, cable markers, etc. shall be provided.

Where conduit is used, the runs shall be laid with suitable falls and the lowest parts of the run shall be external to the equipment. All conduit runs shall be adequately drained and ventilated. Conduits shall not be run at or below ground level.

Multicore cable tails shall be so bound that each wire may be traced to its cable without difficulty. The spare cores of all multicore cables shall be

numbered and terminated at a terminal block in the cubicle. Where cables are terminated in a junction box and the connections to a control and protection panel are continued in conduit, the spare cores shall be taken through the conduit and terminated in a cubicle.

The DC trip and AC voltage circuits shall be segregated from each other. Circuits to main protection and circuits to back-up protection shall be segregated from each other as well.

The screens of screened multicore cables shall be earthed at only one end of the cable. The position of the earthing connections shall be clearly indicated on the diagram.

All wires on panels and all multicore cables shall have ferrules that bear the same number at both ends. At those points of interconnection, between the wiring carried out by separate Contractors, where a change of number cannot be avoided double ferrules shall be provided on each wire. The change of numbering shall be shown on the appropriate diagram of the equipment. The same ferrule number shall not be used on wires in different circuits on the same panels.

5.10 Termination of Cables and Wires

Where cables leave the apparatus in an upward direction the cable boxes shall be provided with a barrier joint to prevent leakage of cable compound into the apparatus. Where cable cores are liable to contact with oil or oil vapour the insulation shall be unaffected by oil.

PVC sheathed cables shall be terminated by compression glands complying with BS 6121-1 and IEC 62444 (or equivalent).

Auxiliary cables in which the individual cores are not insulated with paper shall be terminated with compression type glands, clamps or armour clamps complete with all the necessary fittings.

Colours shall be marked on cable box tail ends and single core cables at all connecting points and/or any positions the Client may determine. Cable boxes shall be marked with stamped brass labels indicating the purpose of the supply where such supply is not obvious or where the purpose of the supply where such supply is not obvious or where the Client may determine.

All cables shall be identified and shall have phase colours marked at their terminations.

All incoming and outgoing connections shall be terminated at a terminal block. Direct termination into auxiliary switches shall not be accepted.

5.11 Terminal Blocks

Terminal blocks shall be of good quality non-flammable insulating material, with a Comparative Tracking Index (CTI) of not less than 500 according to IEC 60112.

Terminal boards shall be spaced not less than 100 mm apart and the bottom of each board shall not be less than 200 mm above the incoming cable gland plate. For relay panels, they shall be mounted at the sides of the cubicle and set indirectly towards the rear doors to give easy access to terminations and to enable ferrule numbers to be read without difficulty. Separate studs shall be provided on each terminal strip for internal connection and outgoing cables including spare cores.

Studs of stud type terminal boards shall be locked in the base to prevent turning and all connections shall be made on the front of the terminal block using lock nuts or lock washers. Where crimped type terminations are provided, at least two (2) sets of crimping tools shall be supplied for each installation.

Terminals shall be of the insertion clamp type incorporating captive pressure screws, which do not bear directly on the wire but on a serrated clamping plate. The pressure screws shall have an inherent locking feature and terminal entries should be shrouded such that no current carrying metal is exposed.

Where connections are to be made between the multicore cables supplied and telephone type multicore cables, then the terminal block shall comprise a stud or clamp type terminal for the multicore cable and a soldered tag for the telephone cable joined by a withdrawable insulated link. These terminals shall also be provided with facilities for the insertion of test probes on both sides of the link.

Terminations shall be grouped according to function and labels shall be provided on the fixed portion of the terminal blocks showing the function of the group.

The use of terminal blocks as junction points for wires which are not required in the associated cubicle shall be avoided wherever possible.

Terminal blocks shall include short circuiting links for CT circuits and open circuiting links for VT and other circuits as necessary and shall be suitable for the connection of test plugs.

All terminal blocks shall have a minimum of 20% spare terminals.

5.12 Miniature Circuit Breakers, Fuses and Links

For protection and isolation of circuits associated with protection, control and instruments, miniature circuit breakers or fuses and links shall be used, although miniature circuit breakers are preferred.

Miniature circuit breakers (MCBs) shall be designed and tested in accordance with IEC 60947-5-1 and supplementary requirements of this Technical Specification. They shall be suitable for use over the full range of expected voltage variations as specified in these Technical Specifications.

They shall be suitably rated for both the continuous and short circuit loadings of the circuits they are protecting under all service and climate conditions at the Site defined within Clause 3 of these General Technical Specifications.

For three phase circuits, the miniature circuit breakers shall be of the three-pole type, for single phase circuits they shall be of the single-pole type and for DC circuits they shall be of the double-pole type.

Where miniature circuit breakers are used in circuits containing inductive loads, e.g. operating coils, it is essential that they are suitable for satisfactory operation in the circuit in which they are used, i.e. account of the circuit time constant shall be considered.

All miniature circuit breakers shall be provided with an auxiliary contact(s) for remote indication of circuit breaker operation.

Means shall be provided to prevent the miniature circuit breakers being inadvertently switched to the "*OFF*" position.

Miniature circuit breakers shall be mounted in such a manner to give easily visible indication in order to facilitate identification and easy replacement.

Carriers and bases for fuses and links shall be in accordance with IEC 60269 and shall be colour coded to permit identification of the circuit rating.

The fuses and links mounted in cubicles for tripping circuits and protective gear test links shall be mounted on the front of the panel. Other links and fuses shall be accommodated within the cubicle or above the cubicle doors. Fuses and links shall be grouped and spaced according to their function in order to facilitate identification.

All incoming circuits in which the voltage exceeds 125 volts shall be fed through insulated fuses and/or links, and the supplies shall be connected to the bottom terminal. The contacts of the fixed portion of the fuse or link shall

be shrouded so that accidental contact with live metal cannot be made when the moving portion is withdrawn.

Main supply fuse links shall be of the high rupturing capacity cartridge type.

Where fuse carriers are mounted vertically the incoming (supply) side shall be the bottom terminal.

Where either fuses or circuits breakers shall be used, it should be ensured that proper discrimination between main and sub-circuits is achieved.

5.13 Spare Parts and Materials

The Tenderer shall include in his Tender, the spare parts and materials that are stated in Price Schedules – Optional Goods.

The prices for these defined additional goods shall be stated within the Price Schedules – Optional Goods (Tender *Forms*) and the price of those additional activities shall not be included in the Total Tender Price.

The Client may order all or any of the stated spare parts and materials. These items shall be optional and shall be included in the definite work only with the written request from the Client.

Any spare apparatus, parts and tools shall be subject to the same technical specifications, tests and conditions as similar equipment supplied under the Definite Work section of the Contract. They shall be strictly interchangeable and suitable for use in place of the corresponding parts supplied with the equipment and must be suitably marked and numbered for identification and prepared for storage by greasing or painting to prevent deterioration.

All spare apparatus or materials containing electrical insulation shall be packed and delivered in cases suitable for storing such parts or material over a period of years without deterioration. Such cases shall have affixed to both the underside and topside of the lid a list detailing its contents. The cases shall remain the property of the Client.

5.14 Degrees of Mechanical Protection

The degree of protection For Control and Protection Panels shall be IP41. (In accordance with IEC 60529).

5.15 Supply Voltage

All incoming supplies, greater than 125 V (phase-to-earth) shall have their terminations shrouded by a suitable insulating material.

5.16 Control and Protection Panels and Facilities

All remote control, protection relay, alarm and instrumentation facilities shall be located in a control room within the substation control building, and mounted on panels arranged in suites according to their function i.e. control, protection, metering, etc.

All control, alarm and indication facilities shall be grouped on a per circuit basis each on its own section or complete control panel.

Protection relays shall also be panel mounted on a per circuit basis, each circuit being allotted its own panel.

All power-operated equipment shall be operable either locally on site or remotely from the control room, but the two systems shall not be in operation simultaneously. Facility for selection of "*remote*" or "*local*" control shall be provided on site adjacent to the equipment being controlled.

Each cubicle shall be fully wired and equipped with all necessary equipment, including alarms, indication and test facilities, isolating facilities, instruments, fuses and cable terminations, etc. as specified.

All circuits, equipment, control switches, etc shall be clearly labelled with their purpose and function.

Indicating devices shall preferably be of the hand dressed discrepancy type.

Panels shall be constructed from steel sheet, designed to be self-supporting and be vermin and termite proof. They shall not be less than 600 mm wide, and in no case shall the depth exceed the width. The doors shall be hinged to lie back flat to avoid restricting access. Hinges shall be of the lift-off type. Doors shall be secured by lockable handles, which shall be placed not more than 1.8 m above floor level.

Circuit labels shall be provided on the front and back of each panel and on the outside of the cubicle doors.

Where specified, accommodation shall be provided for ancillary apparatus (remote metering and signalling equipment, transducers and interposing current transformers, etc.).

Alarm and indication equipment as specified, shall be provided in the control room to indicate the operation of the main and back-up system protections, operation of the equipment alarms including those on the power transformers, switchgear and all other alarms which are required for the satisfactory operation of the complete substation.

Alarm annunciator equipment as specified, shall be mounted adjacent to the mimic diagram panel, capable of accepting all the alarms required within the substation, and compatible with the relay equipment provided, i.e. capable of accepting the alarm signal generated.

Where mimic diagrams are not specified, indicating devices shall be provided adjacent to the circuit breaker control handle or switch to show whether the circuit breaker is open or closed.

A common bell or buzzer shall be provided to give audible alarm when any circuit breaker has tripped automatically. Means shall be provided for silencing the audible alarms whilst leaving it free to sound when the tripping of any other circuit breaker occurs.

Indicating lamps and lamp-holders shall be so arranged that replacement of lamps and the cleaning of glasses and reflectors can be readily carried out.

Indicating lamp glasses on control & protection panels shall be white.

All control and protection panels shall have a continuous earthing bar of sectional area not less than 70 mm^2, run along the bottom of the panels, each end being connected to the substation earthing system. Metal cases of instruments and metal bases of relays on the panels shall be connected to this bar by conductors of cross-sectional area not less than 3 mm^2.

The closing circuit, signalling circuits and each tripping circuit shall be separately fused.

All control circuits shall be provided with suitable means of isolation.

Control and protection panels shall be equipped with single-phase, service socket-outlet of an approved type and an interior light controlled by a door operated switch. Anti-condensation heaters controlled by thermostat shall be provided as well.

5.17 Control and Selector Switches

Switches shall comply with the requirements of IEC 60947, and they shall be designed according to the duty imposed by the particular application.

Switches shall be designed to prevent them from being operated inadvertently.

Means shall be provided for locking the control switches when they are in the "*neutral*" position.

Control switches of the discrepancy type shall require two independent movements to effect operation. The control switch shall be so designed that

when released by the operator it shall return automatically to the "*neutral*" position after having been turned to the "*closed*" position and shall at the same time interrupt the supply current.

Means shall be provided for locking selector switches in the "*remote*" position. Where selector switches are required to have a "*neutral*" position, means for locking in this position shall be provided.

5.18 Indicating Lamps and Fittings

Indicating lamps shall be fitted onto the front of the cubicles & panels and shall be adequately ventilated. Lamps shall be easily removed and replaced from the front of the panel by manual means not requiring the use of extractors.

The base of metal or other approved material holding the lamp glass shall be of an approved finish and shall be easily removable from the body of the fitting so as to permit access to the lamp and lamp glass.

The lamps shall be clear and shall fit into an accepted standard form of lamp holder. The rated lamp DC voltage shall be 10% in excess of the auxiliary, supply voltage.

Color	Class of Indication	Example
Red	Circuit breaker or contactor closed	Reserved only for the function mentioned.
Green	Circuit breaker or contactor open	Reserved only for the function mentioned.
White	Lamp normally alight	Voltage healthy, trip supply healthy, equipment in normal service, etc.

Annunciator Windows

Color	Class of Indication	Example
Crimson Red	Trip indication on which action is necessary	Circuit breaker tripped due to fault, etc.
Amber	Alarm indication on which action is necessary	Transformer over temperature alarm, charger failure, circuit breaker tripped due to fault, etc.
Blue	Signal (with label)	Circuit breaker closing spring being charged, tap change in progress.

The colour shall be in the glass and not an applied coating and the different coloured glasses shall be interchangeable. Transparent synthetic materials may be used instead of glass, provided it can be shown that such materials have bright colours and are completely suitable for operating in tropical climates.

5.19 Instruments

All indicating instruments shall comply with IEC 60051 and shall have adequate scale. Unless otherwise indicated all indicating instruments shall have 100 mm dials. Instruments dials shall in general be white with black markings and shall be reversible where double scale instruments are specified.

Induction type watt hour meters shall comply with IEC 62053-11 and 62052-11. They shall be suitable for working from a 3-phase, 3-wire supply and be of the 2 or 3-element unbalanced load type (where applicable). Test terminals shall be provided to permit calibration checks to be made when required.

All instruments shall be flush-mounted.

5.20 Auxiliary Switches

Where appropriate, each item of equipment shall be equipped with all necessary auxiliary switches, contacts and mechanisms for indication, metering, control, interlocking, supervisory and other services. All auxiliary switches shall be wired up to a terminal block on the fixed portion of the equipment, whether they are in use or not in the first instance.

All auxiliary switches and mechanisms shall be mounted in approved accessible positions clear of the operating mechanisms and shall be protected in an approved manner. The contacts of all auxiliary switches shall be strong and shall have a positive wiping action when closing.

Groups of auxiliary switches and associated terminal blocks shall be arranged to facilitate extension.

The timing of the auxiliary contacts shall suit the particular application.

Auxiliary switch repeat relays may only be used where the requirements cannot be met by actual auxiliary switch contacts and with the specific approval of the Client.

5.21 Digital Multifunction Meters

The digital multifunction meters characteristics shall be as follows:

- Measurement of current and voltage, active, reactive and apparent power, active and reactive energy, power factor and frequency,
- Accurate measured values with error limits of less than 0.5% for U and I,
- Good legibility with high-contrast 14 mm LED displays,
- Electrically isolated current inputs,
- 4-quadrant operation,
- Connection options: single-phase or three-phase, 3 and 4-wire, suitable for balanced or unbalanced load,
- Nominal voltage input: phase-to-phase, up to 240 V, programmable (primary and secondary),
- Nominal current input: 1 A (primary shall be programmable),
- Current and voltage ratio programming shall be wide range from 1 ÷ 9999,
- The programming of the device shall be from the front panel keypad and via PC software separately,
- Dimensions: 96×96×..... mm,
- Auxiliary power supply: 110 V DC,
- Multiple displays (at least three lines).

The connection between the multi-function meter and the RTU in the substation shall be done through Modbus/TCP on Ethernet and Modbus ASCII and Modbus RTU modes with the following frame structure on RS-485 interface:

- ASCII framing (7-bit ASCII characters),
- RTU framing (8-bit characters).

The RS-485 serial communication must have a configurable range of communication speeds:

- 4800 Bits/seconds,
- 9600 Bits/seconds,
- 19200 Bits/seconds.

With any of the following transmission settings for the RS-485 interface:

- Even parity, 1 stop bit,
- Odd parity, 1 stop bit,
- None parity, 1 stop bit.

Note: (none parity, 2 stop bits) option can be supported in addition to any of the above mentioned and the multi-function meter should also support Modbus/TCP with the following speeds for Ethernet interfaces, where it uses default TCP port number (502):

- 10 MBit/s
- 100 Mbit/s

The message length on both serial and Ethernet should be ≤ 255 characters it shall be Contractor's responsibility to troubleshoot together with NEPCO team and try to resolve and rectify the problems if occurred during connection between the meters and RTU 560 from ABB.

The multi-function meter shall provide the following basic (but not limited to) function codes as per the Modbus standard:

< 03 > Read Holding Registers

< 04 > Read Input Registers

1 - Range (16 bit): 0 ... 65535 (unipolar)

-32768 ... 32767 (bipolar)

2 - Range (32 bit): 0 ... 2147483647 (unipolar)

-2147483648 ... 2147483647 (bipolar) (High word in first register or High word in second register)

All the values shall have the option to be scaled or not.

5.22 Transducers

The Transducers shall have the following characteristics:

- Type of connection: 3-phase, 4- wire,
- Programmable inputs primary and secondary for CT, VT and programmable analog outputs between full (0 mA DC to +20 mA DC) and (4 mA DC to +20 mA DC) the programmable shall be done via software programming without changing hardware jumper.

- Multi outputs 4 analog outputs (MW,MVAr,V,A), each output to be programmed for any quantity (not fixed or dedicated output, i.e. each output shall be programmable via software to choose any quantity of the above mentioned quantities),
- Response time: ≤ 300 ms,
- Auxiliary supply: 125 V DC,
- Accuracy class: 0.5 for (MW, MVAr, V, A) or better,
- The continues overload rating of the transducers shall not be less than 1.3 times rated voltage and 2 times the rated current,
- Programming kit (software and communication cables) via RS 485 port,
- Additional USB programming port is preferable,
- The transducer shall support Modbus Protocol.

The connection between the transducer and the RTU in the substation shall be done through Modbus/TCP on Ethernet and Modbus ASCII and Modbus RTU modes with the following frame structure on RS-485 interface:

- ASCII framing (7-bit ASCII characters),
- RTU framing (8-bit characters).

The RS-485 serial communication must have a configurable range of communication speeds:

- 4800 Bits/seconds,
- 9600 Bits/seconds,
- 19200 Bits/seconds.

With any of the following transmission settings for the RS-485 interface:

- Even parity, 1 stop bit,
- Odd parity, 1 stop bit,
- None parity, 1 stop bit.

Note: (none parity, 2 stop bits) option can be supported in addition to any of the above mentioned and the transducer should also support Modbus/TCP with the following speeds for Ethernet interfaces, where it uses default TCP port number (502):

- 10 MBit/s
- 100 Mbit/s

The message length on both serial and Ethernet should be ≤ 255 characters it shall be Contractor's responsibility to troubleshoot together with NEPCO team and try to resolve and rectify the problems if occurred during connection between the meters and RTU 560 from ABB.

The transducer shall provide the following basic (but not limited to) function codes as per the Modbus standard:

< 03 > Read Holding Registers

< 04 > Read Input Registers

1 - Range (16 bit): 0 ... 65535 (unipolar)

-32768 ... 32767 (bipolar)

2 - Range (32 bit): 0 ... 2147483647 (unipolar)

-2147483648 ... 2147483647 (bipolar) (High word in first register or High word in second register)

All the values shall have the option to be scaled or not.

The following real time measurements shall be supplied by the meter:

- Total Power,
- Total Reactive Power,
- Line to line voltage,
- Current,
- Power factor.

5.23 Supervisory Control Facilities

Facilities shall be provided on all equipment to permit the repeat of appropriate indications, alarms and controls by telemetry to a remote-control centre. This shall suit a conventional SCADA system with hard wired connections taken to an interface-marshalling cubicle.

5.24 Power Supply Voltages

The available power supply voltages at the Substations shall be:

- 400 V, 50 Hz, 3-phase, 4-wire,
- 230 V, 50 Hz, single-phase,
- 110 V DC & 50 V DC.

Equipment provided under this Contract shall operate reliably within the voltage limits stated in the Particular Technical Specifications or in the appropriate IEC Standard. Where different limits are stated in the Particular Technical Specifications and the IEC Standard, the Particular Technical Specifications shall prevail. Where no limits are specified, the equipment shall be capable of operating reliably within the following operation ranges:

- AC equipment: From 80% to 110% of nominal voltage,
- DC equipment: From 80% to 120% of nominal voltage for general loads. For closing and opening releases required DC voltage range is specified in Particular Technical Specifications,

PARTICULAR TECHNICAL

SPECIFICATIONS

1. Technical Description, Requirements and Data

1.1. General

These Particular Technical Specifications together with the General Technical Specifications (Sub-Section 1) refer to the special technical requirements for the design, engineering, manufacture, inspection and testing in factory, packing for export, supply CFR (Cost and Freight) Aqaba port, supervision of erection and commissioning activities at sites, and guarantee (maintenance) for a period of 12 calendar months from the date of receipt of last consignment at site for the required 132 kV Control and Protection Panels and ancillary equipment

Wherever possible, these Particular Technical Specifications shall be applied in conjunction with the General Technical Specifications. In case of discrepancies between the Particular and Special Technical Specifications, the Particular Technical Specifications shall prevail.

Single line diagrams, layout and cross section drawings of the substation and main equipment have been presented within the *Figures*.

1.2. Main Requirements for New Equipment

The 132 kV Control and Protection Panels and ancillary equipment, which are subject of these Technical Specifications, shall be installed in the following Substation:

- Substation Irbid 132/33 kV

132 kV Control and Protection Panels and ancillary equipment shall be designed in such a manner to meet the requirements required in this Technical Specifications, Schedules of Technical Data and Drawings at climate conditions at the Site defined within Clause 3 of General Technical Specifications

The rated characteristics of 132 Control and Protection Panels and ancillary equipment are given in schedule A: Scope of Supply

All Contractor's Design documentation shall be a subject of Client's approval.

The Tenderer/Contactor shall visit the Sites and make himself aware of the details of the existing system/facilities. The modification work at the associated substation shall be compatible with the existing system.

1.3. Technical Description and Data of remote end substations

Irbid S/S AIS with double 132 kV busbar system (main & reserve).

1.4. Guarantees, Penalties and Rejection of Supply

Contractor shall guarantee that 132 kV Control and Protection Panels and ancillary equipment shall fully comply with characteristics given in the Schedule of Technical Data.

In case that the supplied equipment does not comply with requirements stated in these Particular Technical Specifications, as well as those stated in the Schedule of Technical Data, the Client has a right to reject the Supply.

2. Design, Materials and Workmanship

General

The design, materials and workmanship shall be in compliance with the General Technical Specifications (and particularly with the Clause 3 of these Particular Technical Specifications.

The 132 kV Control and Protection Panels and ancillary equipment shall be designed and manufactured to fully correspond to the climatic and operating conditions specified in the General Technical Specifications (Sub-Section 3.1).

2.1. Applicable Standards

Unless otherwise specified, the 132 kV Control and Protection Panels and ancillary equipment shall be fully designed and manufactured in accordance with these Technical Specifications and the latest editions of the following IEC, BS, and IEEE Standards:

- IEC 60050, International Electro technical Vocabulary (IEV),
- IEC 60417 DB, Graphical symbols for use on equipment,
- IEC 60617 DB, Graphical symbols for diagrams,
- IEC 60038, IEC standard voltages,
- IEC 60071, Insulation co–ordination,
- IEC 61936, Power installations exceeding 1 kV a.c.,
- IEC 60721, Classification of environmental conditions,
- IEC 60529, Degrees of protection provided by enclosures (IP Code),
- IEC 61000, Electromagnetic compatibility (EMC),
- IEC 60085, Electrical insulation,
- IEC 60068, Environmental testing,
- IEC 61850, Standard for Substation Automation,
- IEC 60255, Measuring relays and protection equipment,
- IEC 60068, Environmental testing of electronic equipment,
- IEEE C37.2, Standard for Electrical Power System Device Function Numbers, Acronyms, and Contact Designations,

- IEEE C37.90, Standard for Relays and Relay Systems Associated with Electric Power Apparatus,
- IEEE C37.113, Guide for Protective Relay Applications to Transmission Lines,
- IEEE Std C37.104, Guide for Automatic Reclosing of Line Circuit Breakers for AC Distribution and Transmission Lines,
- IEEE C37.91, Guide for Protecting Power Transformers,
- IEEE Std C37.119, Guide for Breaker Failure Protection of Power Circuit Breakers,
- IEEE Std C37.234, Guide for Protective Relay Applications to Power System Buses,
- IEC 60688, Electrical measuring transducers for converting A.C. and D.C. electrical quantities to analogue or digital signals,
- IEC 60359, Electrical and electronic measurement equipment - Expression of performance,
- IEC 60664, Insulation coordination for equipment within low-voltage systems,
- IEC 60051, Direct acting indicating analogue electrical measuring instruments and their accessories,
- BS 7194: Specification for direct-current and low-frequency electronic measuring instruments with a digital display,
- IEC 60269, Low-voltage fuses,
- IEC 62444, Cable glands for electrical installations,
- BS 6121-1, Mechanical cable glands. Armour glands. Requirements and test methods,
- IEEE Std 80, Guide for Safety in AC Substation Grounding,

If the Tenderer offers design, equipment, workmanship or testing in compliance with any Standard which deviates from the above-mentioned Standards, such deviations shall be submitted along with his Tender.

Application of any Standard other than the above mentioned, shall be the subject of the Client's approval.

2.2. General Design Requirements

The design and manufacture of the entire equipment shall be in accordance with the latest international standards in this field and it shall be envisaged for a long-term operation.

Particular attention shall be paid to preparation of adequate conceptual solution, easy access, simple operation, and logical arrangement of individual parts.

Parts of the equipment having the same rated values and characteristics shall be identical and completely interchangeable.

Spare parts shall be fabricated to enable easy installation and accurate fitting, without the need for subsequent adjustments.

During continuous operation with rated characteristics, no part of the equipment shall be damaged due to overheating.

132 kV Control and Protection Panels and ancillary equipment shall be designed in accordance with the values of short-circuit currents specified in Technical Data schedule. 132 kV equipment and ancillary equipment shall be designed so that the influences of maximum short-circuit currents, which may occur due to any reason, do not cause any damage (electrical or mechanical) on the equipment.

3. Detailed Requirements for the Equipment

3.1. Control Equipment

3.3.1 General

At all substation the Control facilities shall comply with these Technical Specifications, schedule A Scope of Supply and schedule D: Schedule of Technical Data and the facilities required for supervisory operation from the National Control Centre shall be terminated in a Main Distribution Cubicle. The RTU required for the SCADA connection to NCC is described in a separate section.

Control panels and control desk supplied and installed in the substation control/relay room under this Contract shall provide all necessary facilities for the safe and effective control of the substation and equipment being supplied under this and other Contracts. A control selector switch labelled "*Remote/Supervisory*", lockable in both positions shall be provided for each bay (each Control & Protection panel) as detailed in the Sub-Section 1: Scope of Supply. A selector switch "*Substation Attended/Substation Unattended*" on Alarm and Control Station Desk shall in the "*Unattended*" position disconnect all indications, visual and audible alarms in the substation.

At all substations, the control philosophy for new equipment shall match the existing schemes.

3.3.2 Mimic Diagrams

Control panels shall be provided with a mimic diagram, which shall be aligned and clearly showing the main power connections in single line schematic form at a convenient height so as to permit operation and visual inspection of discrepancy control switches and indicator switches shall be incorporated. The single line to be formed from a plastic strip, minimum dimensions 2×10 mm (thickness X width), which must be permanently fixed to the panels by screws or an approved adhesive. The strip colour should be as follows:

System voltage kV	Color acc. to BS 381C
132	Black
33	Green No 221
0.4	Light orange No 557

For replacement and extension projects, the mimic diagrams shall comply and shall be aligned with the existing mimic diagrams on existing control & protection panels.

Discrepancy control switches and semaphore indicators shall be incorporated into the mimic diagrams. Discrepancy control switches shall be provided for all circuit breaker, disconnector and fault making earth switches. Semaphore indicators shall be provided for non-fault making earth switches and for indication of the position of certain circuit breakers and disconnectors as required by schedule A: *Scope of Supply*. Discrepancy lamps shall be arranged to light when the position of the main power device is at variance with the indicator and shall extinguish when the main power device and indicator are in agreement. An audible warning (control room buzzer) shall also sound during the discrepancy condition.

Discrepancy switches shall be push-to-rotate type (two actions). Each discrepancy switch shall be marked with corresponding operation number.

3.3.3 Annunciators

Multi-way alarm annunciators shall be provided on each control panel for the display of alarms for the circuits controlled from that control panel. Initiation of the alarm shall cause an individual alarm window to give flashing illumination and an audible alarm to sound. Alarm annunciator ways shall be suitable for initiation by contacts closing or opening and for fleeting or persistent alarms. Each alarm annunciator shall be provided with accept, reset and lamp test facilities. Operation of the accept facility shall cause the individual alarm window to be steadily illuminated and the audible alarm to silence. Resetting should cause the individual alarm window to extinguish but only after the alarm initiating contacts have reset. Initiation of a second alarm when a previous alarm has been accepted shall cause the alarm window of the second alarm to give flashing illumination and the audible alarm to sound. A common audible alarm silence facility should be provided on the control board to silence the audible alarm without causing change in alarm window illumination. Initiation of another alarm should cause the audible alarm to re-sound. "Non trip" alarms shall activate a buzzer in the control room (separate from the discrepancy buzzer) and "trip" alarms shall activate a bell.

The alarm equipment shall be suitable for power supply of 110 V DC. A DC supply failure alarm relay shall operate a separate annunciator on the station control desk. The supply for this alarm shall be a separate supply from the 110 V DC batteries.

20% of spare alarm windows, with a minimum of two (2) shall be provided on each alarm annunciator.

3.3.4 Alarms

A "*Non-Trip*" alarms shall activate a buzzer at all substations (distinctive from discrepancy switch buzzer). A "*Trip*" alarms shall activate a bell at all substations. Substations shall have means of cutting out all audible and illuminated alarms when unattended.

The alarms for National Control Centre (NCC) transmission shall, however, always be operative, whether attended or not.

The scheme shall include alarm relays, auxiliary relays, flasher relays, etc., for use with the Control panel alarm annunciators complete with spare alarm contacts (at least 20%). All individual alarms shall have facility for selection to trip and non-trip ("*urgent*" or "*non-urgent*") classification and arranged to operate a common bell or buzzer.

A common fascia for each circuit shall be provided and mounted on the associated Control panel. Common alarm fascia shall be of the multi-window type (preferably with individually replicable windows) with individual alarms operated from self seal-in relays and indicated by flashing illumination of an inscribed transparent window.

All alarms shall have three (3) conditions:

- Alarm operated (Bell or Buzzer sounding, light flashing on annunciator),
- Alarm accepted (Bell or Buzzer silenced, light lit continuously on annunciator),
- Alarm cancelled (Bell or Buzzer silenced, light extinguished on annunciator, alarm ready to receive further alarm initiations.

All alarms grouped together on one annunciator display panel shall have common "lamp test", "accept" and "cancel" push buttons.

Alarms shall be capable of being "accepted" but not "cancelled" before the initiating relay or fault condition has been reset or cleared.

Acceptance of one alarm in any group shall not prevent the normal individual operation of any other alarms within the group.

One potential free contact of each of the alarms is to be wired, either individually or connected in parallel with other alarms as specified, to the remote control and supervisory for transmission to the system Control Centre.

The alarm scheme is to have, its own “DC supply failure” alarm relay, to operate a separate annunciator to be installed on approved location. The supply for this alarm shall be taken from a separate supply from the 110 V DC system.

The alarm scheme shall be supplied with an alarm bell and buzzers.

Facility shall be incorporated for switching off all lamps and audible alarms while the substation is unattended (controlled by switch to be located on station control desk). When in the “*unattended*” position, alarm relays shall be capable of receiving alarms and transmitting them to the supervisory control equipment. On changing over to “*attended*” position, all alarms which have operated shall display their flashing lights and initiate their alarms. Alarms shall only be accepted or cancelled locally when selected to “*attended*”.

Selector switch for “Substation unattended”/ “Substation attended” is to disconnect all audible alarms and signal lamps when in the “unattended” position. Two pairs of potential- free contacts, one pair arranged to close in the “attended” position and the other pair in the “unattended” position, shall be wired for the remote control and supervisory.

3.3.5 Instruments and Meters

Indicating instruments and integrating meters shall be provided as specified in the appropriate sections of this Specification.

Where specified instruments shall be provided with internal recording facilities.

3.3.6 Supervisory Control, Telemetering and Indication

At all the substations, the equipment supplied shall allow control from, and provide indication and measurands to the National Control

Centre. RTU equipment for connection to National Control Centre is defined in Clause 3.6.

3.3.7.1 Control

Equipment shall be provided to allow control of the following from the National Control Centre, when the remote/supervisory switch is in the supervisory position:

- Close/trip of all circuit breakers,
- Close/open of disconnectors,
- Acceptance of all active alarms incoming from a substation,
- Resetting of all electrically reset trip relays.

The duration of the control pulse from the supervisory equipment is two seconds and any equipment required to obtain satisfactory operation with the two second pulse shall be provided.

3.3.7.2 Indications

On/off position indication shall be provided to the National Control Centre for the following items:

- For each feeder or transformer circuit:
    - Circuit breaker,
    - Disconnectors,
    - Line or transformer earthing switch,
    - Supervisory control in service,
    - Local/remote control in service.
- For each main transformer:
    - Control selection (auto/manual),
    - Control selection (remote/supervisory),
    - Tap change in progress,
    - Tap position indication (potential free contacts on multi position switch).

These indications shall be transmitted to the NCC via RTU irrespective of the position of the panel mounted “Local/Remote/Supervisory” selector switch or the “Local/Remote” selector switch.

3.3.7.3 Alarms

All alarms annunciate in the station control room shall be repeated to the National Control Centre (NCC).

3.3.7.4 Measurements and Transducers

Programmable Transducers with multi outputs shall have the following characteristics:

- Type of connection: 3-phase, 4-wire,
- Programmable inputs primary and secondary for CT, VT and programmable analogue outputs between full range (0 mA DC to +20 mA DC) and (4 mA DC to +20 mA DC).
- Multi outputs 4 analogue outputs (MW, MVAr, V, A), each output to be programmed for any quantity,
- Response time: less than or equal 300 ms,
- Aux supply: 125 V DC,
- Accuracy class: 0.5 for (MW, MVAr, V, A) or better,
- The continuous overload rating of the transducer shall not be less than 1.3 times rated voltage and 2 times the rated current,
- Programming kit (software + communication cables) via RS485 port,
- Additional USB programming port is preferable.

The peak-to-peak noise current delivered by transducers shall not exceed 2 per cent of the maximum signal current. The response time shall be approximately 300 milliseconds or less to reach 90 per cent of the full rated output.

Signals shall be provided for the National Control Centre (NCC) as follows:

- Transformer A (on HV side),
- Transformer MW, MVAr, kV and A (on LV side),

- Busbar (phase to phase) voltage,
- Busbar frequency,
- Substation temperature,
- Substation humidity.

3.3.7 Control & Relay Panels General

Each Control and Relay cubicle shall form a complete enclosure and should be associated with only one circuit.

Cubicle arrangement shall be divided into two equal sections segregated from each other by steel sheet sectioning barriers. The upper part for Control equipment and the lower is for protection equipment. With separating all wiring and termination of each section from the other, noting that flexible conductors and wiring shall be used for connection hinged equipment and terminations.

Control and Relay cubicle shall have front access with one separate door for each section. Those doors should be separate from each other and should have glass door for relay section of control and relay panels, should have close fitting lockable and lift-off, opened through 180, hinged so that control and relay equipment movements shall be controlled to be as minimum as possible.

Relay equipment should be flush mounted in dust proof cases with filter breather.

The interior of each cubicle section shall be finished with a light-coloured paint and interior 240 V AC lamp controlled by a door-operating switch and shall be fitted at the top of each section. In addition, anti-condensation heaters controlled be thermostats are also to be fitted in each section, and each cubicle shall be well-ventilated top and bottom through vermin proof louvers fitted with brass gauze screens.

Panel dimension shall be 800×800x2040 mm (Width × Depth x height).

Panel degree of protection shall be IP41.

Panel exterior finish and colour of all indoor equipment and cubicles shall be RAL 6019.

Schematic drawings of control and protection circuits should be separate from each other and typical schematic for similar circuits shall not be accepted.

Equipment for each circuit shall be installed and mounted on one panel as specified and shall be erected in substation control building.

Trip links should be used as open/close terminals marked and labelled to be distinguished from other terminals, CT terminals should be of short/open terminals type and VT terminals should be of open/close terminals type.

3.3.8 Inter-tripping Schemes (General)

All 132 kV feeders with distance protection at both ends will be fitted with high-speed permissive transfer tripping via PLC circuits or fibre optic cable to ensure that all line faults are cleared at each end of the feeder in as near as possible to the first zone time, provided the starting relays have operated. The necessary contacts, wiring, push buttons, selector switches, indication lamps and fuse links, etc., shall be included in order to send to and receive from signals from the communication equipment.

3.2. Protection Equipment

3.4.1 Protection Philosophy

The primary network shall be considered as consisting of a number of elements, the limits of each element being its associated circuit breakers.

For the 132 kV network, each element shall be provided with a single high-speed discriminative protection, capable of detecting all "credible" faults and issuing tripping commands to the associated circuit breakers within the prescribed time. The high-speed discriminative protection shall be augmented with back-up overcurrent and earth fault protection, incorporating directional characteristics and sensitive earth fault protection as necessary. Circuit breaker failure protection is required for the 132 kV circuit breakers.

High-speed discriminative protection systems shall be engineered as complete schemes, due account being taken of CT and VT (or CVT) performance. The defined fault clearance time shall take account of the circuit breaker response and shall include the total time to elimination of the primary fault current irrespective of the magnitude, fault location or fault current characteristic subject only to an upper limit of circuit breaker specified duty.

Attention shall be paid to the total performance including the behaviour pattern in the presence of system transients for faults "in zone", faults "out-of-zone", and during the period immediately following a switching operation irrespective of whether that operation is to eliminate a network short-circuit or is to energise or to de-energize any part of the network.

The protective equipment shall remain unoperated following the normal and correct discharge operation of one or more surge arresters.

3.4.2 Discrimination

On the occurrence of a fault on the power system network high speed discriminating protection systems shall rapidly detect the fault and initiate the opening of only those circuit breakers which are necessary

to disconnect the faulted electrical element from the network. Protection equipment associated with adjacent electrical elements may detect the fault but must be able to discriminate between an external fault and a fault on the electrical element which it is designed to protect. Sequential time delayed tripping is not permitted except in the following specific circumstances:

- Operation of time graded back-up protection takes place as a result of either the complete failure of the communication links associated with the main protection systems, or the fault resistance is substantially greater than the value specified in this specification.
- Operation of line back-up protection to disconnect primary system faults in the case of a circuit breaker failing to operate, (i.e. circuit breaker failure protection).

All back-up protection systems shall be able to discriminate with main protection systems, circuit breaker fail protection and with other back-up protection systems installed elsewhere on the transmission system.

3.4.3 Fault Clearance Times

Fault clearance times (from fault initiation to arc extinction) for the 132 kV system shall not exceed the following:

- Substation and transformer faults: 80 msec,
- Line faults: 100 msec,
- Breaker failure with direct transfer tripping 300 msec.

3.4.4 Construction and General Facilities

Protection systems shall preferably be accommodated in 19-inch rack or hinged rack cubicles and be of modular construction with factory assembled and tested wiring. The construction method shall offer the benefits of minimum site construction times and circuit outage requirements.

For modular protection systems, means shall be provided to lock positively each withdrawable module or unit in the "service" position.

It shall not be possible to remove any module without first short-circuiting all associated current transformer circuits.

Protection relays shall, with the exception of high impedance differential protection relays, be of numeric design.

Modular relays (e.g. rack mounted numeric relaying equipment) shall be tested as a complete assembly and details of such tests shall be agreed with the Client when details of the construction are known.

All relays which are accommodated in cubicles having a separate cubicle door shall be provided with individual relay covers. The intent of this requirement is to enable access to indication reset facilities without also allowing unauthorised access to relay setting adjustments.

For extension to existing installations, all new relay panels shall match the existing method of construction and installation as closely as possible.

3.4.5 Indications

Each relay or protection scheme shall be provided with an adequate number of indications to ensure that the appropriate faulted phase, zone, etc can be easily identified after a fault condition. Each indicator shall be visible and capable of being reset without removing the relay cover. Unless otherwise approved, indications shall only be given by the protection(s) causing the fault to be cleared.

Where illuminated indicators are used (e.g. light-emitting diodes) the following shall apply:

- Long term storage of the indication must not be dependent upon an auxiliary supply,
- A lamp test facility shall be provided.

3.4.6 Contacts

Each protection relay or protection scheme shall be provided with an adequate number of output contacts of suitable rating to carry out the prescribed tripping functions, alarms, indication and fault recorder functions and such supplementary signalling functions as may be necessary for the initiation of automatic reclosing or automatic switching control, etc. In all cases, contacts intended for tripping duty

shall be designed so that they cannot inadvertently interrupt trip coil current.

For contacts intended to be used to energise circuit breaker trip coils directly, information shall be provided to show that the contact rating is compatible with the trip coil parameters of the associated circuit breaker. Where appropriate, details shall also be given of the operating characteristics of any reinforcing contactor and, in particular, the pick-up and drop-off threshold levels of series connected (current dependent) contactors.

3.4.7 Numeric Relays

Numeric protection relays shall utilise numerical techniques for both measurement and logic functions and in addition to the main protection functions, shall incorporate communication, fault, event and disturbance recording, instrumentation, configurable scheme logic, alternative setting groups, self-supervision facilities and control commands.

The communication facility should allow all information available locally at the relay front panel to be accessed remotely. It shall also be possible to carry out bulk transfer of settings, fault record information etc using the appropriate PC based software.

All protection systems shall be provided with an integral local operator interface facility 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 operator interface.

The protection relay shall also be supplied with the facilities identified below:

- Identification: Each protection system shall have a unique identifier which is clearly visible, and the software reference and issue level shall be identified.
- Settings: Each protection system shall provide a means by which the user can easily access the protection system to apply the required settings. Access to this shall be password protected. A display of the selected settings shall be provided on the protection system.

- Indications: Each protection system shall provide indications as specified in the appropriate second level protection system specification.

The Contractor shall be obliged to provide adequate compatibility between protection relays and corresponding current transformer cores and shall submit all necessary calculations and analysis as evidence to Client for approval.

3.4.8 Trip Circuit Supplies

The 132 kV circuit breakers (are) provided with duplicate trip coils. The 132 kV main and backup protection shall trip both trip coils, each protection utilising separate contacts for each trip coil and each trip coil supplied from a different battery.

3.4.9 Trip Circuit Supervision and Auxiliary Supply Monitoring

Means shall be provided to continuously supervise the integrity of the circuit breaker tripping circuits and give an alarm in the event of the following fault conditions:

- Loss of DC tripping supply, e.g. removal of DC trip fuse,
- An open circuit in the trip circuit including the trip coil, circuit breaker auxiliary switch and all associated connections (supervision to be effective with the circuit breaker in either the open or closed condition).

The alarm shall be time-delayed preventing it operating during momentary dips in the DC supply. The alarm shall also be inhibited when the circuit breaker auxiliary switch interrupts the trip coil circuit, on circuit breaker opening.

All DC auxiliary supplies, essential for the operation of the protection relay scheme shall be monitored and the loss of any supply shall be indicated on the relay panel and an alarm given.

3.4.10 Commissioning and Routine Testing Facilities

Each functional relay scheme shall be so arranged that operational and calibration checks can be carried out with the associated primary circuit(s) in service.

Adequate test facilities shall be provided within the protection system to enable the protection and auto-reclosing equipment to be tested from the front of the protection equipment with the primary circuit(s) in service.

Adequate facilities shall be provided to isolate all DC and AC incoming and outgoing circuits so that work may be carried out on the equipment with complete safety to personnel and without loss of security in the operation of the switching station.

All test equipment required for commissioning and routine testing of the offered protection equipment shall be listed in the tender documents. Where test equipment is specified, it shall include such injection transformers, test leads and plugs as are necessary to carry out secondary injection tests on each type of relay scheme and, for the more complex schemes, such special test equipment as may be necessary to verify the accuracy of timing and verify the effective operating characteristics of the equipment.

For numeric equipment, such test equipment as may be required to carry out on-site investigation into the performance of individual modules or printed circuit cards shall be listed in the tender documents. At least one complete set of any special test equipment shall be included within this Contract together with such additional connections, dummy extension boards, etc as may be necessary.

3.4.11 Relay Settings

Not less than 6 months before commissioning, suitable settings shall be recommended for all relays and protection to be supplied for all substation equipment (excluding OHL and cables). The recommended settings will ensure satisfactory operation in accordance with the intent of this Specification and the specified system operating conditions. The recommended setting shall not only include those normally available on the front of a relay but also the positions/settings of any internal links, plugs, etc not normally adjusted after installation. These settings shall be applied to the equipment prior to performing the commissioning tests. The settings for line protection shall be such as to permit correct operation of the protection for earth faults up to 100 ohms fault resistance. Any limitations imposed on the power system as a result of the settings

proposed shall be explicitly stated, settings regarding capacitor banks to be provider from the manufacturer. The used relays should be suitable for handling multi-stage settings at the same type.

3.4.12 Environmental Requirements

3.4.12.1 Temperature

The standard nominal range of ambient temperature shall be -10°C to +55°C.

The protection system shall operate satisfactorily when tested to the following requirements:

- IEC Publication 60068-2-1 with severity class -10°C, 96 hours,
- IEC Publication 60068-2-2 with severity class 55°C, 96 hours

The protection system shall be able to withstand the temperature requirements for storage and transportation and shall be tested to the following requirements:

- IEC Publication 60068-2-1 with severity class -25°C, 96 hours,
- IEC Publication 60068-2-2 with severity class 70°C, 96 hours.

3.4.12.2 Relative humidity

The protection system shall operate correctly with a relative humidity of 93 per cent and shall be tested to IEC Publication 60068-2-78 with severity class 56 days.

3.4.12.3 Enclosure

The protection relay shall meet the requirements of the tests detailed in IEC Publication 60529 with classification IP50 (dust protected). If the individual enclosure of the relay is to a class less than IP50 then the Tenderer shall provide a cubicle to classification IP50 to accommodate the relay.

3.4.13 Mechanical Environment

3.4.13.1 Vibration

The protection system shall meet the requirements of the tests detailed in IEC Publication 60255-21-1 with severity class 1.

3.4.13.2 Shock and Bump

The protection system shall meet the requirements of the tests detailed in IEC Publication 60255-21-2 with severity class 1.

3.4.13.3 Seismic

The protection system shall meet the requirements of the tests detailed in IEC Publication 60255-21-3 with severity class 1.

3.4.14 Electrical Environment

3.4.14.1 DC Auxiliary Energizing Quantity

The protection systems shall be capable of being energised from a DC auxiliary energising voltage of 110 V (nominal).

The protection system or its associated power supply for use in a 110 V (nominal) DC supply system shall operate correctly over a voltage range of 88 V to 137.5 V and shall withstand a maximum voltage of 143 V.

Numeric protection systems shall meet the requirements of IEC Publication 60255-26 with interruptions to the DC auxiliary energizing quantity of 10 ms.

3.4.14.2 Frequency

The standard rated frequency shall be 50 Hz.

The nominal range of frequency shall be -5 per cent to +5 per cent.

3.4.15 Insulation

3.4.15.1 Rated Insulation Voltage

The rated insulation voltage of circuits connected to current transformers of high impedance relays shall be 1000 V. All other circuits shall have an insulation voltage of 250 V.

All open contacts of the protection system shall withstand a voltage of 1000 V.

3.4.15.2 Dielectric Tests

The protection system shall comply with the dielectric test requirements of IEC Publication 60255-27. The test voltage shall be selected according to the rated insulation voltage of the circuits being tested form Series C of Table 1 of IEC Publication 60255-27.

3.4.15.3 Impulse Voltage

The protection system shall comply with the impulse test requirements of IEC Publication 60255-27 with test voltage of 5 kV.

3.4.16 Electromagnetic Compatibility.

The requirements of this section of the specification are specifically applicable to numeric protection systems. The requirements may also be applied to some electro-mechanical relays that are very sensitive or of high speed, at the discretion of the Client.

3.4.16.1 1 MHz Burst Disturbance

The protection system shall comply with the requirements of IEC Publication 60255-26 with severity Class III.

3.4.16.2 Electrostatic Discharge

The protection system shall comply with the requirements of IEC Publication 60255-26 with severity Class III.

3.4.16.3 Radiated Electromagnetic Field Disturbance

The protection system shall comply with the requirements of IEC Publication 60255-26 with severity Class III. The test shall be carried out by using Test Method A and by sweeping through the entire frequency range 27 MHz to 500 MHz.

3.4.16.4 Fast Transient Disturbance

The protection system shall comply with the requirements of IEC Publication 60255-26 with severity level IV.

3.4.17 Thermal Requirements

The requirements of this section apply to protection systems rated at 1 A associated with line circuits where the load current is carried by current transformers which supply the protection system.

The protection systems shall have a minimum continuous thermal withstand of 2.4 A.

The thermal withstand currents for short duration overloads, after having reached a steady temperature with an input current of 2.0 A, shall not be less than given in the table shown below.

Duration (mins)	20	10	5	3	2
Current (amps)	2.5	3.5	4.0	5.0	6.0

3.4.18 Inverse Time Overcurrent and Earth Fault Relays

Inverse time overcurrent and earth fault relays shall be of the numeric type and shall have selectable characteristics, i.e. normal inverse, very inverse and extremely inverse. Different characteristics could be used for different protection stages without affecting the overall relay performance.

The operating time characteristic shall be continuously variable over the minimum range 0.1 to 1.0 times the nominal time at any multiple of current setting.

The current settings shall be adjustable as a percentage of nominal relay rating over setting ranges which are at least:

- Overcurrent relays: 50 to 250%,
- Earth-fault relays: 10 to 80%.

The actual relay pick-up current shall not exceed 1.3 times the relay setting, and the reset value shall not be less than 90 per cent of the pick-up current.

All relays shall comply with the accuracy requirements of IEC 60255, the required class index of the reference limiting error being 5.

3.4.19 High Set Overcurrent, Instantaneous Overcurrent and Earth Fault Protection

High set overcurrent, instantaneous overcurrent and earth fault protection shall be of the high-speed type and provided with a current independent selectable time delay with a setting range from instantaneous (no intentional time delay) to 100 secs in steps of 0.01 secs.

High set over current elements shall be of the low transient overreach type, i.e. the magnitudes of the current with and without the presence of a DC transient at which operation occurs shall be approximately the same. The value of the system reactance to resistance ratio at which the performance of the element is claimed should be stated. When applied to the protection of power transformers, high set overcurrent elements must be capable of being set to remain stable for maximum through fault currents associated with faults across the remote winding terminals.

3.4.20 Directional Overcurrent and Earth Fault Relays

Directional relays may either be provided as separate relays or as part of an overcurrent or earth fault inverse time relay combination.

A range of characteristic angle settings shall be provided so that correct directional discrimination will be achieved for all credible system faults. Preference will be given to relays in which voltage polarising, current polarising or dual polarising can be achieved.

Where directional features are applied to overcurrent and earth-fault inverse-time relays, the following requirements apply:

- The operating time of the directional element shall have negligible influence on the total operating time of the composite relay,
- The current setting of the directional element shall be low enough so as not to increase the overall setting of the composite relay for all faults in the operate direction,
- The angle setting of the directional element shall be selectable.

3.4.21 Overcurrent and Earth Fault Definite Time Delay Relays

Preference will be given to relay designs in which the current settings for phase-to-phase faults are the same as those for three phase faults and in which the current settings for single phase to earth faults are the same irrespective of the phase involved.

The current measuring elements shall be of the low transient overreach type and the value of the system reactance to resistance ratio at which the transient overreach performance claim is made shall be stated. Their operating time shall be less than 30 milliseconds at 5 times setting and their drop off to pick up ratio shall not be less than 90 per cent.

The associated timing relay shall have a timing range (or ranges) adjustable between 0.1 and 10 seconds minimum, the setting adjustment being either continuous or stepped, with a maximum of 20 milliseconds per step. The accuracy of setting shall be at least ± 5 per cent of setting or 20 milliseconds whichever is the greater.

3.4.22 Circulating Current Protection

The principle of operation of the circulating current protection shall be based upon the well-known differential, current balance system with high impedance type relays.

The protection shall remain unoperated for all out of zone fault currents ranging from 0 to 15 times full load rating of the protected circuit and all other system transient conditions, such as inrush currents, which are not due to internal faults.

Definite operation shall occur for faults between windings of different phases involving as few turns as is practical within the fault loop. A setting of 10 per cent or less is preferred.

The operating time shall be 30 ms or less at 5 times setting.

3.4.23 Tripping Relays

The tripping relays shall be of the low burden, multi-contact type.

All multi-contact tripping relays shall be suitable for panel mounting. The design of the operating coil shall be such as to permit operation in conjunction with series trip flag relays should these be specified. When provided on the relays, economy contacts used to reduce the

level of energisation of the operating coil after operation shall be delayed in operation sufficiently long enough to ensure that series flag relays operate correctly.

All contacts shall operate within the prescribed time for the particular category which shall not, in any case, exceed 10 milliseconds from the time at which the operating coil is first energised to the time of complete contact closure.

Tripping relays shall be with flags and shall be of the mechanically latched type and shall be self-reset or electrical/hand reset type as specified.

3.4.24 Circuit Breaker Failure Protection

The purpose of circuit breaker fail protection is to clear a fault which has been correctly detected by the appropriate protection but for which the associated circuit breaker(s) has (have) failed to open.

In the event of a circuit breaker failing to operate, the circuit breaker fail protection shall be arranged to trip all circuit breakers capable of feeding fault current to the faulted circuit. For this purpose, the tripping circuitry of busbar protection may be used. Inter tripping shall also be initiated where appropriate.

Two basic criteria shall be satisfied before tripping can take place. Fault current must be flowing, and the appropriate protection must have failed to reset within a pre-set time. Initiation of a circuit breaker fail trip condition should therefore be dependent on both the pre-set time elapsing and the current detecting elements being operated, outputs from both these functions being effectively connected in series.

A time delay shall be available to provide the pre-set time delay. This shall have facilities for continuous adjustment of time over the range 50 - 500 ms unless it is clearly shown that the range of settings provided is sufficient to meet the particular application requirements.

The current detecting elements shall have settings which are low enough to ensure correct operation during minimum plant conditions. The settings shall be equal to or lower than the settings of the associated protection.

The continuous current rating of the current detecting elements shall be at least twice their nominal current rating, the current settings selected being the lowest available.

The resetting time of the current detecting elements on cessation of fault current shall not be greater than 20 ms. The current detecting circuits must be arranged so that, when single pole tripping is specified, correct operation of the scheme occurs during the dead time, i.e. the presence of load current in the healthy phases should not cause maloperation operation of the scheme.

3.4.25 Manual Synchronising Facilities

The following equipment, plus any additional auxiliary equipment necessary to ensure correct functioning of the scheme, shall normally be provided:

- A socket into which a synchronizing trolley plug must be inserted. This shall enable the appropriate incoming and running supplies to be applied to a check synchronizing relay and synchronizing instruments. The insertion of the plug also prepares for closure of the circuit breaker via the discrepancy control switch and a contact of the check synchronizing relay.
- A check synchronizing relay as specified in the appropriate section of this Specification. Where check synchronizing relays for manual synchronizing are provided, these may be utilized for auto-reclose requirements. A guard feature shall be provided to ensure that the check synchronizing relay contact is closed before the closing switch is operated to close the circuit breaker. If the closing switch is operated before the check synchronizing relay, contact closes then circuit breaker closing should be prevented. A facility should also be included to detect welding or permanent closure of the synchronizing relay contacts and prevent closing of the circuit breaker.
- Interposing transformers for incoming and running voltage supplies. Phase to neutral voltages shall be used for synchronizing purposes and the synchronizing equipment shall operate satisfactorily over the range of 80 to 120 per cent of its rated value.

- Voltage selection equipment, either auxiliary contacts from primary equipment or voltage selection relays, where specified.
- Synchronizing instruments consisting of incoming and running voltmeters, frequency meters and synchroscope. These instruments shall be continuously rated.

A synchronising trolley, containing the common synchronising equipment together with cable and plug is required.

DBC/DLC interlocks. If check synchronising is provided, closure of a circuit breaker interconnecting two circuits may be required where the conditions for synchronising cannot be satisfied due to the absence of either running or incoming supply. In these cases, and where specified, Dead Line Check (DLC), Dead Bar Check (DBC) and "Synchronising Override" interlocks shall be provided.

A DBC interlock permits reclosure only if the busbar is de-energized on all three phases. A DLC interlock permits reclosure if the associated line is de-energized on all three phases. In both cases the opposite supply to that which is de-energized must be energized. A busbar or line is considered to be de-energized when the voltage is less than 20 per cent of rated voltage and considered to be energized when at least 80 per cent of rated voltage.

A key interlocked check synchronising override switch per circuit breaker shall be provided to enable the contact of the check synchronising relay in the closing circuit to be by passed. Operation of this switch shall be interlocked with the voltage interlocks of DBC or DLC above, to prevent override of check synchronising unless one or both voltage supplies are absent.

3.4.26 Check Synchronising Relay

Check synchronising relays shall be provided as specified to enable a check of synchronism between appropriate incoming and running voltages for manual and automatic reclosure of each circuit breaker.

Measurement of the following parameters of incoming and running voltages must be provided:

- Phase angle difference. Adjustment of the phase angle between incoming and running voltages over which, the relay contacts will

close shall be provided over the range 20°to 45°. (Note this results in a total angular segment over which circuit breaker closure is permitted of 40° minimum to 90° maximum).

- Rate of change of phase (slip). The maximum slip frequency at which closure is permitted is a function of circuit breaker closure time and adjustment shall be provided for this. The method of measurement of slip in which it is ensured that the true phase angle difference does not exceed the set phase angle difference for more than a given time, is preferred. A time range of 2 to 10 seconds is required. Alternative methods, e.g. direct instantaneous measurement of true slip frequency, are permitted and a range of settings of 0 to 0.125 Hz/sec is required. If the preferred measurement method is not used, a timer shall be provided so that at least 2 seconds must elapse between application of both ac supplies to the check synchronizing relay and an output being given.
- Voltage difference. A voltage check feature shall be incorporated which shall inhibit operation of the check synchronizing relay if either one or both of the synchronizing voltages is less than a pre-set percentage of rated voltage. The voltage check feature shall be adjustable over the range 80 per cent to 90 per cent of the relay rated voltage.

3.4.27 132 kV OHTL Protection

3.4.27.1 Distance Protection

Distance protection for 132kV feeders a single three zone distance relay shall be provided. 132 kV distance protection shall operate in conjunction with tele-protection channels over power line carrier (PLC) and/or fibre optic circuits.

The 132 kV distance protection relays and tele-protection channels shall form either of the above schemes as defined in the Schedules.

The 132 kV protection schemes shall be:

- Suitable for complete simultaneous multi-phase and earth fault three zone measurement. Phase selection and sequential measurement are not acceptable,
- Suitable three pole tripping and auto-reclose operation,
- Suitable for application on a double circuit line, i.e. include mutual zero sequence compensation,
- Provided with power swing blocking facilities suitable for blocking zones 1, 2, 3 as required.

Overcurrent starting will not be accepted. However, schemes employing overcurrent elements that act as a check to prevent maloperation of the measuring elements during line de-energisation or resetting measuring elements during single-pole auto-reclose dead time are acceptable.

132 kV distance protection relays shall have facilities for independently tripping circuit breakers and initiating auto-reclosing, breaker failure protection, inter-tripping, alarms, fault recorders, etc.

The Contractor must guarantee that any distance relay offered will operate satisfactorily under the conditions described herein and with the distance relays at the remote substation.

Each distance relay shall operate for all types of phase and earth faults. Separate phase and earth fault distance measuring elements shall be provided; separate elements shall also be provided for each zone. Phase and earth fault compensation features shall be incorporated to ensure accurate distance measurement for all types of faults and to allow for the variation in the path of earth faults on the system.

Distance relays zone 1 and 2 elements shall operate only for faults on the protected line direction. Under no circumstances shall the relay operate for reverse faults even when the voltage supplied to the relay falls to zero on all three phases, nor shall they operate due to the transient response of the line capacitive voltage transformers during or following the clearance of close-up faults behind the relay. Details of methods used for polarizing relays to deal with all types of faults close to the relaying point shall be provided. The relay characteristics shall ensure adequate fault resistance coverage under minimum plant

and single outage conditions. Zone 3 shall be non-directional and shall be capable of being independently off-set in both directions. No measuring element shall operate during normal system switching or during de-energisation of the transmission line.

The relay characteristic of impedance measuring starting relays shall cover the protected line plus the longest line emanating from the remote station taking current in-feed into account. This requirement may be relaxed at the Client's discretion in the case of extremely long lines. The starting relays shall not operate during maximum power transfer. When single phase to earth faults coincides with maximum power transfer, only the starting or measuring relay associated with the faulted phase shall operate. The starting relays can be employed as zone 3.

On long lines the minimum load impedance presented to the relay during maximum power transfer may encroach an offset mho zone 3 characteristic. Zone 3, therefore, (and any associated power swing blocking characteristics, if applicable) shall be capable of being shaped to avoid load impedance.

The reach of each measuring zone and starting relay shall be individually adjustable. The characteristic angle shall be adjustable between approximately 60 and 85 degrees.

Zone 2 and zone 3 shall have time delay setting ranges of 0 - 1 seconds and 0 - 3 seconds respectively.

The sensitivity of the protection shall be adequate for definite operation under minimum plant conditions and single outage conditions and shall not exceed 30 per cent rated current.

The operating time of each zone shall be substantially independent of fault current magnitude. Curves shall be provided showing the effect on operating time of line and source impedance, fault position and operating current and point on wave of fault application.

A switch on to fault feature shall be incorporated to ensure instantaneous tripping in the event that the circuit breaker is closed onto a fault on a previously de-energized line.

The switch onto fault feature in the relay proposed for use in the permissive under reach transfer tripping scheme shall also be capable of being enabled during the auto-reclose dead time. This is to ensure

fast clearance of non-transient end zone faults where delayed zone 2 clearance would normally occur when the local end is reclosed before the remote end.

The distance protection shall include a voltage transformer supervision unit to prevent possible unwanted operation of the distance relay comparators in the event of a failure of one, two or three phases of voltage caused by open or short circuit faults in the voltage transformer secondary circuits or due to removal of VT fuses. In the event of loss of one, two or three phases the distance relay shall be blocked, and a time delayed alarm initiated.

The VT supervision shall not operate during energisation of the line or of any power system transformers, nor during any other power system primary disturbance. It shall also be inhibited during a single pole auto reclose cycle to ensure there is no delay in tripping remaining poles if a second fault occurs during the single pole dead time. Single pole auto-reclosing is not utilised at 132 kV, however the above requirements of the VT supervision during a single pole reclose cycle shall also be met for the 132 kV distance protection

The VT supervision unit shall be faster than the distance relay measuring units under all circumstances.

Distance to fault (fault locator) feature shall be included and have an accuracy such that the maximum error of any measurement will not exceed ± 3 per cent of the total line length, irrespective of the total fault clearance time.

Tele-protection channels over power line carrier and/or fibre optic circuits will be used in conjunction with the distance relays to form:

- A permissive under reaching transfer trip scheme,
- An overreaching blocking scheme, and any other standard scheme.

A separate fully adjustable timer delayed on reset shall be provided to delay the resetting of the blocking signal received during fault current reversal conditions on a parallel circuit. The Tenderer shall recommend a minimum time setting for this timer.

A reverse looking, fast operating element shall be provided for initiating the transmission of the blocking signal. This element shall preferably have an offset mho characteristic to ensure that a blocking

signal is definitely sent for any type of fault immediately behind the relay. As the relay will also respond to faults in the forward direction of the protected line, the blocking signal shall be interlocked with the forward-looking zone 2 elements and shall not be sent if zone 2 elements operate. Under no circumstances shall a blocking signal be transmitted for faults in front of the relay. Since the reverse looking element must definitely operate for any type of fault behind the relay, its sensitivity must be at least equal to and preferably higher in all respects to the remote end zone 2 overreaching elements.

The distance relays shall incorporate indicators to show the zone in which the relay tripped, and phase or phases faulted, whether the relay operation was due to aided trip, switch onto fault, power swing blocking, VT fuse fail or directional earth fault if appropriate. Indication must not be lost in the event of a supply failure.

In addition to sufficient tripping contacts, the protection shall have, where necessary, contacts for initiating three pole auto-reclosing, two sets of circuit breaker failure protection, fault locators, fault recorders, protection signalling and alarms.

Each distance protection shall be suitable for single and three pole tripping and for use in single and three phase auto-reclosing schemes as specified.

Selection facilities are required to permit or inhibit auto-reclosing if the carrier is or is not in service.

Where appropriate the protection and associated auto-reclose equipment shall incorporate whatever means are necessary to ensure that all measuring and starting elements in the healthy phases of the faulted line and all measuring elements on the parallel circuit remain reset and are unaffected by the fault and load currents which flow in the healthy and parallel circuit during the single phase reclosure dead time. Additionally, the inter-phase fault measuring elements on the faulted circuit shall be stable in the presence of a heavy close-up earth fault. The methods used to ensure correct stability of healthy phase elements during single phase dead times and during fault conditions shall in no way prejudice the ability of the protection and auto-reclosing scheme to respond to faults during the dead time and reclaim time.

The necessary feature shall be incorporated in the relay to inhibit the zone 1 and zone 2 phase fault elements when necessary during single phase to earth faults and during the single pole auto-reclose dead time. Provision shall also be made to ensure the faulty phase earth fault elements definitely reset during the single pole auto-reclose dead time.

The effect of zero sequence mutual coupling between the double circuit lines on the protection shall be described together with any measures considered necessary to overcome this effect.

The 132 kV distance relays shall include power swing blocking function.

Power swing blocking for offset zone 3 characteristics or starters shall comprise a characteristic, which encompasses the distance relay impedance starter or zone 3 characteristics.

Facilities shall be provided to block zones 1, 2 and 3 of the distance relays as required and an alarm signal to be initiated.

Blocking logic shall be derived by determining the time taken for the apparent impedance of the power swing locus to pass from the characteristic of the power swing relay to the distance relay starter characteristic. Blocking shall not take place until the apparent impedance has passed through the two power swing characteristics and the timer has expired.

The associated time delay relay shall have a setting range encompassing 50 - 250 msecs.

Relays shall be of numeric design. The setting range of the power swing relay characteristic angle shall at least be adjustable over the same range as the distance relay starting or zone 3 characteristic.

Reset times shall be fast enough to ensure that the associated distance relay reverts to its normal role as soon as possible following a power swing.

Where applicable, power swing blocking shall be inhibited during the single pole dead time of an auto-reclose cycle so that if a power swing develops during this period the distance protection can give an immediate three phase trip. The Tenderer shall advise whether it is possible to extend the inhibition of the power swing blocking to cover a period immediately following auto-reclosing so that if a power swing

develops on reclosing onto a permanent fault a three-phase trip would be permitted. The Tenderer shall also advise whether power swing blocking can be inhibited if an earth fault occurs during a power swing.

If the associated VT supplies are lost due to VT fuse failure, the power swing blocking relay shall not operate.

3.4.27.2 Auto-Reclosing

Three-pole only, single shot auto-reclosing equipment shall be provided for 132 kV overhead line circuit breakers. All auto-reclosing schemes shall include synchronising relays with dead line and dead busbar checks.

Reclosure shall only take place on overhead line circuits and shall be initiated following tripping by the distance relay zone 1 equipment or following an aided trip in the permissive under reach transfer trip scheme or in the blocking scheme. Reclosure shall not be initiated in the event of a three-phase fault, any type of fault in the second or third back-up zones or when the circuit breaker is closed onto a fault on a previously de-energized line.

For 132 kV overhead line circuits the backup directional overcurrent, directional earth fault and sensitive earth fault protection shall not initiate an auto-reclose sequence.

The following options are available for auto-reclosing in NEPCO 132 kV systems:

- Three pole delayed auto-reclosing: Delayed auto-reclosing shall only be initiated in the event of a single phase or two-phase fault. Three-phase faults shall result in tripping without auto-reclosing.
- No auto-reclosing for three-phase tripping.

For 132 kV overhead line circuits, three pole delayed auto-reclosing and no auto-reclosing shall be selectable by means of a lockable switch, located adjacent to the auto-reclose relay.

Tentative range of the delayed three-pole reclose dead time shall be 3 to 30 seconds, and equipment offered should cover these ranges. Tenderer shall state the available ranges.

The reclaim time shall be chosen to match the duty cycle of the circuit breakers, assuming the shortest available dead time is chosen. The reclaim time shall not, however, be less than 10 seconds, and the reclaim timer range shall extend to 180 seconds. The duration of the closing command shall be limited to two seconds, after which time the reclosing equipment shall be automatically reset without resetting the reclaim timer. The reclosing equipment shall also reset if dead line check, dead busbar check or synchronism check conditions are not satisfied within five seconds of the check relays being energised.

A counter shall be provided to record the number of reclosures and shall lockout after a pre-selected number of protection trips has been reached.

Check synchronising relays and dead line check and dead busbar check interlocks shall be provided for three-phase auto-reclosing as specified elsewhere in this Specification.

A signal shall be provided from the dead line check relays for interlocking of the line earth switches to prevent the switches being closed on a live line.

3.4.27.3 Tele-protection Signals

Cable lists for the protection signalling and direct inter-tripping signals between the protective relay panels and the tele-protection equipment are to be provided under this Contract. At the tele-protection equipment end, the cables are to be terminated in cable glands, cable cores identified and marked with identification ferrules. Cable glands are to be provided in this contract. Separate cables are to be used for each tele-protection channel.

At the protective relay panels, the cables for the tele-protection signals are to be terminated on terminals, which are wired directly to isolating links. This is to enable the tele-protection equipment to be readily isolated from the protective relays and the 110 V DC tripping and control supplies. Disconnecting links incorporated in the terminal blocks will not be accepted for this purpose.

For each discrete tele-protection channel, a two-position test switch ("test/service") is to be installed on the front of the relay panel to enable the functioning of the tele-protection channel to be tested. The switch is to be lockable and provided with a lock and duplicate keys.

An indication lamp is to be provided for indicating that the test switch is in the "test" position. A push-button is to be provided to initiate a test signal to the tele-protection equipment. A second indicating lamp shall be provided to indicate that a test signal has been received from the remote station.

3.4.27.5 Directional Phase Overcurrent Protection

The directional phase overcurrent protection shall operate for transformer and 132 kV line faults.

The protection shall comprise overcurrent elements and directional elements. The directional elements shall control the overcurrent elements such that the overcurrent elements operate only when current flows towards the transformers.

The overcurrent elements shall be of the inverse definite minimum time type and shall comply with the requirements specified for non-directional relays.

The directional elements shall utilize current from one phase and voltages from the other two phases, for example, the relay in phase A shall use phase A current and the voltage between phases B and C. The relay shall be compensated such that maximum torque occurs when the current lags the system phase to neutral voltage by 45 degrees. Positive operating torque shall be assured for line voltages down to 5 percent rated voltage.

3.4.27.6 Sensitive Earth Fault Protection

Sensitive earth fault protection shall be provided to cater for high resistance earth faults which remain undetected by the main protection and shall comprise a definite time overcurrent relay.

The current setting shall be adjustable between 3 and 5% of CT rated secondary current. The time delay shall be adjustable between 1 and 10 seconds.

As the relay has a very low setting, it is essential that the burden imposed by the relay is small.

3.4.27.7 132 kV Back-up Protection

Back-up protection for 132kV OHL feeders shall comprise three phase directional overcurrent, directional earth fault and non-directional sensitive earth fault relays. These relays shall initiate a three-phase trip of the associated 132 kV circuit breaker and prevent auto reclosing. The directional overcurrent relays are to have setting ranges of at least 0.5 to 2 times nominal current, the directional earth fault relay shall have a setting range of at least 0.1 to 0.8 times nominal current and the non-directional sensitive earth fault relay shall have a setting range of at least 0.005 to 0.05 times nominal current.

Back-up protection for the 132 kV transformer circuits shall comprise three phase non-directional overcurrent and earth fault relays. These relays shall initiate a three-phase trip of the associated 132 kV circuit breaker. The overcurrent relays are to have setting ranges of at least 0.5 to 2 times nominal current and the earth fault relay shall have a setting range of at least 0.1 to 0.8 times nominal current.

Back-up overcurrent and earth fault protection relays, both non-directional and directional shall be of the numeric type and shall have selectable characteristics, i.e. normal inverse, very inverse and extremely inverse and at least one high set instantaneous element. They shall also incorporate circuit breaker fail facilities which can be initiated both from operation of the relay or an external trip. The high set instantaneous elements shall have separate trip output terminals which shall be disconnectable.

3.4.28 Transformer Protection

3.4.28.1 Differential Protection

The protection shall remain unoperated for all out of zone faults up to a minimum of 15 times the transformer nominal rating at all transformer tapping settings and all steady state and transient power transformer magnetising in rush currents.

The protection shall operate for all internal faults with a sensitivity of at least 20 per cent of full load rating of the protected circuit.

The operating time shall be 40 milliseconds or less at 5 times setting current.

Biased differential protection relays shall be provided with integral ratio and vector group compensation, eliminating the need for interposing current transformers.

3.4.28.2 HV Restricted Earth Fault (REF) Protection

Transformer windings with YN connection shall be provided with restricted earth fault protection. Relay shall be of the high impedance circulating current type necessary protection against over-voltage.

The sensitivity of the protection scheme shall not exceed 25 per cent of the rated current of the protected winding in the case of solidly earthed systems and 15 percent of the minimum current available for an earth fault at the transformer terminals in the case of resistance earthed systems. These values are to include the effect of current transformer magnetising current and the current taken by the voltage limiting device.

The protection shall remain stable up to the maximum through fault current corresponding to the rated system short circuit level. This may be taken as 16 times the rated current of the protected winding of the power transformer, unless otherwise advised by the Client.

Associated current transformers shall be class X (PX according to IEC 61869-2), or other class as recommended by the relay manufacturer and approved by the Client. Contractors shall submit at an early stage, design calculations for current transformers for approval.

3.4.28.3 Protection of Tee-Off Circuits, Auxiliary/Earthing Transformers

Where a tee off transformer is included within the high-speed protection zone of the main transformer, faults which occur beyond the tee off transformer LV fuses or LV circuit breaker shall be regarded as out of zone faults. The Contractor shall supply evidence to show that for such faults the magnitude of the operating current as seen by the protection or, in the case where LV fuses are provided, the duration of the operating current, is low enough not to operate the high-speed protection.

If non-operation cannot be ensured for the above out of zone faults, the Contractor shall provide current transformers on the tee off circuit so as to exclude the tee off transformer from the high-speed protection zone of the main transformer.

Whichever of the above arrangements are provided, the fault settings of equipment protecting the tee off transformer shall be comparable with the anticipated fault currents which may arise for faults in the tee off transformer zone.

3.4.28.4 Buchholz and Temperature Indicator Repeat Relays

The Buchholz, temperature and other trip devices at the power transformer will, normally, have only one contact each. For maximum security it is preferred that these contacts shall operate the appropriate trip relays directly. For local and remote alarms, a current operated repeat relay shall be connected in series with each transformer protection trip device and the trip relay. These repeat relays shall have hand reset flag indicators and sufficient contacts for all remote alarm and indication functions.

Similarly, Buchholz, temperature and other alarm devices at the power transformer will have only one contact. To provide flag indication and sufficient contacts for all remote alarms and indication functions, voltage operated repeat relays shall be provided.

The number of repeat relays required will depend upon the number of transformer protection devices, details of which will be supplied to the Contractor when the design of the transformers has been finalised.

3.4.28.5 Over-Flux Protection

The protection shall monitor one or more of the phase voltages and tripping shall occur in time to prevent damage to the primary equipment due to over fluxing etc, when the phase voltages exceed the setting. Preference will be given to schemes in which the operating time decreases with increase in voltage so as to match the overheating characteristics of the protected plant.

The voltage settings shall be adjustable within the range of 110 ÷ 130 per cent of nominal voltage.

The drop-off/pick-up ratio shall be greater than 95 per cent at any setting. The setting error shall be less than 5 per cent.

The operating times shall be adjustable. Typical operating time at 125 per cent voltage is 5 seconds.

The voltage circuit shall be designed with an adequate factor of safety to withstand the anticipated overvoltage's without damage to the relay and without saturation of the relay circuit.

3.4.28.6 Transformer Tripping Scheme

Tripping circuits with its own electrical/hand reset tripping relay and DC supply shall be provided. The transformer protection tripping circuit shall be arranged as follows:

Both 132 kV & 33kV circuit breakers shall be tripped by the following relays:

- Biased differential,
- Over-flux protection,
- HV restricted earth fault,
- HV over current,
- 132 kV busbar protection,
- LV restricted earth fault,
- HV Stand-by earth fault protection,
- Buchholz surge of the main and earthing/auxiliary transformers,
- HV earth fault,
- Tap changer surge (main Transformer),
- Pressure Relief valve.

The 132 kV circuit breakers are equipped with duplicate tripping coils; only one trip coil is allocated for protection tripping functions. Each trip relay shall operate into the 132kV trip coil allocated for protection functions, i.e. each 132 kV circuit breaker shall receive a total of two trip commands.

The winding temperature trip devices shall be arranged to trip the appropriate circuit breaker only, i.e. HV and LV winding temperature shall trip the LV breaker only.

3.4.29 Combined Protection Relays for 132 kV Circuits

Combined protection relays for 132 kV circuits are acceptable only as follows:

1- 132 kV OHL :

Item	Protection - Function
1	Distance / Auto reclose / Synchro check
2	Directional over current / Directional Earth fault / Sensitive Earth fault
3	Self-reset trip relays
4	Circuit breaker failure
5	Trip circuit supervision

2- 132/33 kV Transformer circuit:

Item	Protection - Function
1	Differential Protection / HV Restricted Earth fault / Over-flux
2	Over current/ Earth fault
3	Stand-by earth fault.
4	Auxiliary relays for transformer mechanical protections
5	Electrical reset trip relay.
6	Circuit breaker failure
7	Trip circuit supervision

3- 132 Kv Bus Coupler circuit:

Item	Protection - Function
1	Over current/ Earth fault / Synchro check
2	Self-reset trip relay
3	Circuit breaker failure
4	Trip circuit supervision

Communication standard (IEC 61850) shall be included in protection relays.

3.9.3 Multicore, Control and LV AC & DC Power Cables

Cables for power supplies at voltages up to 600/1000 V and for all 240 V AC and DC protection, control, alarm and indication shall have copper conductor with XLPE or PVC insulation and an overall PVC over sheath and galvanized steel wire armour if required by the Schedules.

The conductors shall be plain annealed copper wire complying with IEC 60228 as applicable or equivalent and all cores shall be clearly identified by printed numbers at regular intervals.

The minimum conductor size shall be not less than seven strands of 0.67 mm diameter wire, or in the case of single wire conductors the minimum cross-sectional area shall be not less than 2.5 mm^2. In special cases for light current installations single strand, annealed copper conductors with a cross-section of 1.5 mm^2 may be used.

Multicore, control and LV AC & DC power cables shall be protected from rodent attack and other physical damage by a suitable non-corrosive wire armouring.

All sheaths shall be free from defects and impervious to water.

All cores of each multicore cable shall be marked with a unique and indelible identifying number or symbol to easily distinguish one core from another.

Multicore and control cables shall be terminated in accordance with the manufacturer's recommendations and the cable cores shall be left long enough to be terminated without the addition of separate tails.

The Contractor shall provide fully detailed wiring diagrams covering all parts of the plant. Detail diagrams shall be cross referenced and shall show multicore cable schedule reference numbers to facilitate cable identification.

The Contractor shall submit full details of all loadings on cables and in the case of interposing current transformer connections, the loop resistance of each circuit.

Section 6

Technical Schedules

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48/2025
SUPPLY OF 132KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

Schedule A

MANUFACTURER TECHNICAL PARTICULARS AND GURANTEES

(Information to be submitted with tender)

Item No.	Brief Description	Quantity Set
A1. Control & Protection Panels for 132 kV Transformer Bays	• Control & Protection Panels for 132 kV Transformers Bays for indoor installation with IP41 degree of mechanical protection, completely wired, arranged in two (2) parts/sections (upper and lower section). • The upper section of Control & Protection Panel for 132 kV Transformer Bay shall be equipped with the following equipment and devices: 1. Mimic diagram with discrepancy-type control switch for circuit breaker, discrepancy indicators for disconnectors and earthing switches with buzzer to indicate discrepancy conditions, 2. Lockable control selector switch ("Remote/Supervisory"), 3. Digital multifunction meter. 4. Annunciator with accept, reset and lamp test push buttons with alarms according to Contractor's Design approved by Client (with at least 20% spare), 5. Auxiliary relays for supervisory control of the circuit breaker (50 V DC), 6. Transducers for supervisory indications. • The lower section of Control & Protection Panel for 132 kV Transformer Bay shall be equipped to provide the following: 1. Biased differential protection. 2. HV Restricted Earth Fault (REF) protection. 3. Overcurrent and earth fault protection.	**2 Sets**

	4. Transformers mechanical protection current operated relays with hand reset indicators flags for the alarms according to Contractor's Design approved by Client. 5. Trip circuit supervision function. 6. Electrical reset trip relay. • All necessary switches, MCBs, auxiliary relays, interposing transformers (if applicable), transducers, links (fuse block: link in fuse holder), terminals, labels, test blocks for main relays, wiring, etc. to complete the scheme. • Note: Several protection functions can be implemented in one IED as per Particular Technical Specifications. ----------	
A2. **Control & Protection Panel for 132 kV OHTL Feeder Bay**	• Control & Protection Panel for 132 kV OHTL Feeders Bays for indoor installation with IP41 degree of mechanical protection, completely wired, arranged in two (2) parts/sections (upper and lower section). • <u>The upper section</u> of Control & Protection Panel for 132 kV OHTL Feeder shall be equipped with the following equipment and devices: 1. Mimic diagram with discrepancy-type control switch for circuit breaker, discrepancy indicators for disconnectors and earthing switches with buzzer to indicate discrepancy conditions. 2. Lockable control selector switch ("Remote/Supervisory"). 3. Lockable selector switch ("Off/Synchro/Override") with indicating lamp for override position. 4. Auto-reclosure selector switch ("On/Off"). 5. Digital multi-function meter. 6. Annunciator with accept, reset and lamp test push buttons with alarms according to Contractor's Design approved by Client (with at least 20% spare). 7. Auxiliary relays for supervisory control of the circuit breaker (50 V DC). 8. Synchronizing trolley socket. 9. Transducers for supervisory indications.	**2 Sets**

	• The lower section of Control & Protection Panel for 132 kV OHTL Feeder shall be equipped to provide the following: 1. Line distance protection. 2. Directional overcurrent protection. 3. Directional earth fault protection. 4. Sensitive earth fault protection. 5. Synchro-check relay. 6. Trip circuit supervision relays. 7. Delayed auto-reclosure. 8. Inter-trip sends and receive relays, circuit test switch with appropriate test push buttons, signal lamps and inter-trip circuit isolating links. Inter-trip sends initiated from 132 kV CB fail relay. 9. Voltage transformer supervision. 10. Self-reset trip relay. • All necessary switches, MCBs, auxiliary relays, interposing transformers, transducers, links (fuse block: link in fuse holder), terminals, labels, test blocks for main relays, wiring, etc. to complete the scheme. • Note: Several protection functions can be implemented in one IED as per Particular Technical Specifications. --- • Control & Protection Panel for 132 kV Bus Coupler Bay for indoor installation with IP41 degree of mechanical protection, completely wired, arranged in two (2) parts/sections (upper and lower section). • The upper section of Control & Protection Panel for 132 kV Bus Coupler Bay shall be equipped with the following equipment and devices: 1. Mimic diagram with discrepancy-type control switch for circuit breaker, discrepancy indicators for disconnectors with buzzer to indicate discrepancy conditions. 2. Lockable control selector switch ("Remote/Supervisory"). 3. Lockable selector switch ("Off/Synchro/Override") with indicating lamp for override position.	
A3. **Control & Protection Panel for** **132 kV Bus Coupler Bay**		**1 Set**

	4. Digital multifunctional meter. 5. Annunciator with accept, reset and lamp test push buttons with alarms according to Contractor's Design approved by Client (with at least 20% spare), 6. Auxiliary relays for supervisory control of the circuit breaker (50 V DC). 7. Synchronizing trolley socket. 8. Transducers for supervisory indications. • The lower section of Control & Protection Panel for 132 kV Bus Coupler Bay shall be equipped to provide the following: 1. IDMT overcurrent protection. 2. Earth fault protection. 3. Synchro-check relay. 4. Trip circuit supervision relays. 5. Self-reset trip relay. • All necessary switches, MCBs, auxiliary relays, interposing transformers, transducers, links (fuse block: link in fuse holder), terminals, labels, test blocks for main relays, wiring, etc. to complete the scheme. • Note: Several protection functions can be implemented in one IED as per Particular Technical Specifications	
A4. **Alarm and Control Station Desk**	• Alarm and Control Station Desk in 132 kV control room for indoor installation, completely wired, equipped with the following equipment and devices: 1. Annunciator with accept, reset and lamp test push buttons with station alarms according to Contractor's Design approved by Client (with at least 20% spare). 2. Selector switch for "Substation unattended/Substation attended". The selector switch shall disconnect all audible alarms and single lamps when in the "Unattended" position. Two (2) pairs of potential free contacts, one pair arranged to close in the "Attended" position and the other pair "Unattended position", shall be wired to the remote control and supervisory marshalling	**1 Set**

	cabinet. A further set of two (2) pairs of contacts (closed with the switch in the "Attended" position) shall be provided as well. 3. For accept / reset command for acceptable and cancellation of alarms should be controllable from NCC. 4. Temperature and humidity indicator (0-10 mA DC) and range scale for temperature (-20 ºC ÷ 60 ºC) and for humidity (0 ÷ 100%).	
A.5 Synchronizing Trolley	--- • Synchronizing trolley with rubber-tired wheels to be provided for plugging into 132 kV Control & Protection panels with the following equipment and devices: 1. 200 mm dial synchro scope (20-minute rating), 2. Two (2) voltmeters (running and incoming), with dual scales to suit 132 kV and 33 kV systems, 3. Two (2) frequency indicators (running and incoming) dial-type, scale 45÷55 Hz, 4. Two (2) indicator lamps arranged for bright lamps at synchronism, 5. Phase shifting transformer, 6. Transducers, if necessary, 7. Synchro scope switch, 8. Flexible lead and plugs (including 1 spare plug) complete with all necessary wiring, terminals, fuses, etc.	**1 Set**

- **Notes:**

  1- The Door for Control and Protection Panels must be opened from front side.

  2- We propose a double-layer door system, The primary door will be a glass and metal-framed entrance. Behind it, an internal layer will be integrated, serving as a dedicated surface for mounting equipment.

SCHEDULE B

PERIODS OF READINESS FOR INSPECTION AND DELIVERY
(Information to be supplied with Tender)

Item No.	Description	Completion Of Manufacturing
1	**Within which the materials will be ready for inspection and testing:**	
1.1	Control & Protection Panels for 132 kV Transformers Bays.	
1.2	Control & Protection Panels for 132 kV OHTL Feeders Bays.	
1.3	Control & Protection Panel for 132 kV Bus Coupler Bay.	
1.4	Alarm and Control Station Desk.	
1.5	Synchronizing Trolley.	
2	**Within which the materials will be ready for shipping:**	
2.1	Control & Protection Panels for 132 kV Transformers Bays.	
2.2	Control & Protection Panels for 132 kV OHTL Feeders Bays.	
2.3	Control & Protection Panel for 132 kV Bus Coupler Bay.	
2.4	Alarm and Control Station Desk.	
2.5	Synchronizing Trolley.	

SCHEDULE C

MANUFACTURERS AND PLACE OF MANUFACTURE, TESTING AND INSPECTION
(Information to be supplied with Tender)

Item No.	Description	Manufacturer	Place of manufacture	Place of testing and inspection
MAIN EQUIPMENT				
1	Control & Protection Panels for 132 kV Transformer Bay			
2	Control & Protection Panel for 132 kV OHTL Feeder Bay			
3	Control & Protection Panel for 132 kV Bus Coupler Bay			
4	Alarm and Control Station Desk.			
5	Synchronizing Trolley.			

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48/2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

SCHEDULE OF TECHNICAL DATA (STD) D
CUBICLES DESIGN CHARACTERISTICS

(Information to be submitted with tender and shall be completed by the contractor)

Item No	Description	Unit	Data Required	Offered
1.	Control & Protection Panels for 132 kV OHL Feeders Cubicles.	Set	2	
1.1	General Data			
1.1.1	Manufacturer			
1.1.2	Place of Manufacture			
1.1.3	Place of Factory Inspection and Testing			
1.1.4	Type		Free-standing type	
1.1.5	Serial number			
1.1.6	Standards			
1.1.7	Installation		indoor	
1.1.8	Panels painting colour (RAL)		RAL 6019	
1.1.9	Degree of mechanical protection		IP41	
1.2	Main Protection Relay – OHL			
1.2.1	Manufacturer			
1.2.2	Place of Manufacture			
1.2.3	Place of Factory Inspection and Testing			
1.2.4	Type			
1.2.5	Serial number			
1.2.6	Standards			
1.2.7	Supply voltage	V		
1.2.8	Consumption	W		
1.2.9	Number and type of current analogue inputs	No		

1.2.10	Number and type of voltage analogue inputs	No		
1.2.11	Number of RTD inputs	No		
1.2.12	Number of mA inputs	No		
1.2.13	Number and type of binary inputs (110 V DC)	No		
1.2.14	Number and type of binary outputs (110 V DC)	No		
1.2.15	Number of Ethernet ports for IEC 61850 communication	No		
1.2.16	Protection functions (to specify)			
1.2.17	Software (to specify)			
1.3	Back-up Protection Relay			
1.3.1	Manufacturer			
1.3.2	Place of Manufacture			
1.3.3	Place of Factory Inspection and Testing			
1.3.4	Type			
1.3.5	Serial number			
1.3.6	Standards			
1.3.7	Supply voltage	V		
1.3.8	Consumption	W		
1.3.9	Number and type of current analogue inputs	No		
1.3.10	Number and type of voltage analogue inputs	No		
1.3.11	Number of RTD inputs	No		
1.3.12	Number of mA inputs	No		
1.3.13	Number and type of binary inputs (110 V DC)	No		
1.3.14	Number and type of binary outputs (110 V DC)	No		
1.3.15	Number of Ethernet ports for IEC 61850 communication	No		
1.3.16	Protection functions (to specify)			

1.3.17	Software (to specify)			
1.4	**Trip Circuit Supervision Device**			
1.4.1	Manufacturer			
1.4.2	Place of Manufacture			
1.4.3	Place of Factory Inspection and Testing			
1.4.5	Type			
1.4.6	Serial number			
1.4.7	Standards			
1.4.8	LED signalization		Yes	
1.4.9	Number of auxiliary contacts			
1.5	**Tripping Relays**			
1.5.1	Manufacturer			
1.5.2	Place of Manufacture			
1.5.3	Place of Factory Inspection and Testing			
1.5.4	Type			
1.5.5	Serial number			
1.5.6	Standards			
1.5.7	Supply voltage	V		
1.5.8	Consumption at rated voltage	W		
1.5.9	Number of auxiliary contacts	No		
1.5.10	Contacts data:			
	- voltage	V		
	- current carrying capacity, continual	A		
	- breaking capacity at 110 V DC	A		
	- trip time	ms		
1.6	**Synchro-check relay**			
1.6.1	Manufacturer			
1.6.2	Place of Manufacture			
1.6.3	Place of Factory Inspection and Testing			
1.6.4	Type			
1.6.5	Serial number			

1.6.6	Standards			
1.7	**Transducers for Supervisory Indications**			
1.7.1	Manufacturer			
1.7.2	Place of Manufacture			
1.7.3	Place of Factory Inspection and Testing			
1.7.4	Type			
1.7.5	Serial number			
1.7.6	Standards			
1.8	**Panel Design Characteristics**			
1.8.1	Mimic diagram		Yes	
1.8.2	Annunciator		Yes	
1.8.3	Lockable control selector switch ("*Remote/Supervisory*")		Yes	
1.8.4	Lockable selector switch ("*Off/Synchro/Override*")		Yes	
1.8.5	Synchronising socket		Yes	
1.8.6	Anti-condensation heater		Yes	
1.8.7	Internal lighting		Yes	
1.8.8	Type of indication lamps		LED	
1.8.9	Panel steel sheet thickness	mm		
1.8.10	Dimensions and masses of the Control and Protection panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	Kg		
1.8.11	The Door for Control and Protection Panels must be opened from front side.		Yes	
2.	**Control & Protection Panels for 132 kV Transformers Cubicles**	**Set**	**2**	
2.1	**General Data**			
2.1.1	Manufacturer			
2.1.2	Place of Manufacture			

2.1.3	Place of Factory Inspection and Testing			
2.1.4	Type		Free-standing type	
2.1.5	Serial number			
2.1.6	Standards			
2.1.7	Installation		indoor	
2.1.8	Panels painting colour (RAL)		RAL 6019	
2.1.9	Degree of mechanical protection		IP41	
2.2	**Main Protection Relay**			
2.2.1	Manufacturer			
2.2.2	Place of Manufacture			
2.2.3	Place of Factory Inspection and Testing			
2.2.4	Type			
2.2.5	Serial number			
2.2.6	Standards			
2.2.7	Supply voltage	V		
2.2.8	Consumption	W		
2.2.9	Number and type of current analogue inputs	No		
2.2.10	Number and type of voltage analogue inputs	No		
2.2.11	Number of RTD inputs	No		
2.2.12	Number of mA inputs	No		
2.2.13	Number and type of binary inputs (110 V DC)	No		
2.2.14	Number and type of binary outputs (110 V DC)	No		
2.2.15	Number of Ethernet ports for IEC 61850 communication	No		
2.2.16	Protection functions (to specify)			
2.2.17	Software (to specify)			
2.3	**Back-up Protection Relay**			
2.3.1	Manufacturer			

2.3.2	Place of Manufacture			
2.3.3	Place of Factory Inspection and Testing			
2.3.4	Type			
2.3.5	Serial number			
2.3.6	Standards			
2.3.7	Supply voltage	V		
2.3.8	Consumption	W		
2.3.9	Number and type of current analogue inputs	No		
2.3.10	Number and type of voltage analogue inputs	No		
2.3.11	Number of RTD inputs	No		
2.3.12	Number of mA inputs	No		
2.3.13	Number and type of binary inputs (110 V DC)	No		
2.3.14	Number and type of binary outputs (110 V DC)	No		
2.3.15	Number of Ethernet ports for IEC 61850 communication	No		
2.3.16	Protection functions (to specify)			
2.3.17	Software (to specify)			
2.4	**Trip Circuit Supervision Device**			
2.4.1	Manufacturer			
2.4.2	Place of Manufacture			
2.4.3	Place of Factory Inspection and Testing			
2.4.4	Type			
2.4.5	Serial number			
2.4.6	Standards			
2.4.7	LED signalization		Yes	
2.4.8	Number of auxiliary contacts	No		
2.5	**Tripping Relays**			
2.5.1	Manufacturer			
2.5.2	Place of Manufacture			

2.5.3	Place of Factory Inspection and Testing			
2.5.4	Type			
2.5.5	Serial number			
2.5.6	Standards			
2.5.7	Supply voltage	V		
2.5.8	Consumption at rated voltage	W		
2.5.9	Number of auxiliary contacts	No		
2.5.10	Contacts data:			
	- voltage	V		
	- current carrying capacity, continual	A		
	- breaking capacity at 110 V DC	A		
	- trip time	ms		
2.6	**Transducers for Supervisory Indications**			
2.6.1	Manufacturer			
2.6.2	Place of Manufacture			
2.6.3	Place of Factory Inspection and Testing			
2.6.4	Type			
2.6.5	Serial number			
2.6.6	Standards			
2.7	**Panel Design Characteristics**			
2.7.1	Mimic diagram		Yes	
2.7.2	Annunciator		Yes	
2.7.3	Lockable control selector switch (“*Remote/Supervisory*”)		Yes	
2.7.4	Lockable selector switch (“*Off/Synchro/Override*”)		Yes	
2.7.5	Synchronising socket		Yes	
2.7.6	Anti-condensation heater		Yes	
2.7.7	Internal lighting		Yes	
2.7.8	Type of indication lamps		LED	
2.7.9	Panel steel sheet thickness	mm		

2.7.10	Dimensions and masses of the Control and Protection panel:			
	- width	mm	800	
	- depth	mm	800	
	- height	mm	2040	
	- weight	Kg		
2.7.11	The Door for Control and Protection Panels must be opened from front side.		Yes	
3.	**Control & Protection Panel for 132 kV Bus Coupler Cubicle**	**Set**	**1**	
3.1	**General Data**			
3.1.1	Manufacturer			
3.1.2	Place of Manufacture			
3.1.3	Place of Factory Inspection and Testing			
3.1.4	Type		Free-standing type	
3.1.5	Serial number			
3.1.6	Standards			
3.1.7	Installation		indoor	
3.1.8	Panels painting colour (RAL)		RAL 6019	
3.1.9	Degree of mechanical protection		IP41	
3.2	**Protection Relay**			
3.2.1	Manufacturer			
3.2.2	Place of Manufacture			
3.2.3	Place of Factory Inspection and Testing			
3.2.4	Type			
3.2.5	Serial number			
3.2.6	Standards			
3.2.7	Supply voltage	V		
3.2.8	Consumption	W		
3.2.9	Number and type of current analogue inputs	No		

3.2.10	Number and type of voltage analogue inputs	No		
3.2.11	Number of RTD inputs	No		
3.2.12	Number of mA inputs	No		
3.2.13	Number and type of binary inputs (110 V DC)	No		
3.2.14	Number and type of binary outputs (110 V DC)	No		
3.2.15	Number of Ethernet ports for IEC 61850 communication	No		
3.2.16	Protection functions (to specify)			
3.2.17	Software (to specify)			
3.3	**Trip Circuit Supervision Device**			
3.3.1	Manufacturer			
3.3.2	Place of Manufacture			
3.3.3	Place of Factory Inspection and Testing			
3.3.4	Type			
3.3.5	Serial number			
3.3.6	Standards			
3.3.7	LED signalization		Yes	
3.3.8	Number of auxiliary contacts			
3.4	**Tripping Relays**			
3.4.1	Manufacturer			
3.4.2	Place of Manufacture			
3.4.3	Place of Factory Inspection and Testing			
3.4.4	Type			
3.4.5	Serial number			
3.4.6	Standards			
3.4.7	Supply voltage	V		
3.4.8	Consumption at rated voltage	W		
3.4.9	Number of auxiliary contacts	No		

3.4.10	Contacts data:			
	- voltage	V		
	- current carrying capacity, continual	A		
	- breaking capacity at 110 V DC	A		
	- trip time	ms		
3.5	**Synchro-check relay**			
3.5.1	Manufacturer			
3.5.2	Place of Manufacture			
3.5.3	Place of Factory Inspection and Testing			
3.5.4	Type			
3.5.5	Serial number			
3.5.6	Standards			
3.6	**Transducers for Supervisory Indications**			
3.6.1	Manufacturer			
3.6.2	Place of Manufacture			
3.6.3	Place of Factory Inspection and Testing			
3.6.4	Type			
3.6.5	Serial number			
3.6.6	Standards			
3.7	**Panel Design Characteristics**			
3.7.1	Mimic diagram		Yes	
3.7.2	Annunciator		Yes	
3.7.3	Lockable control selector switch (“*Remote/Supervisory*”)		Yes	
3.7.4	Lockable selector switch (“*Off/Synchro/Override*”)		Yes	
3.7.5	Synchronising socket		Yes	
3.7.6	Anti-condensation heater		Yes	
3.7.7	Internal lighting		Yes	
3.7.8	Type of indication lamps		LED	
3.7.9	Panel steel sheet thickness	mm		

3.7.10	Dimensions and masses of the Control and Protection panel:			
	- width	mm	800	
	- depth	mm	800	
	- height	mm	2040	
	- weight	Kg		
3.7.11	The Door for Control and Protection Panels must be opened from front side.		Yes	
4.	**132 Kv Alarm & Control Desk.**	**Set**	**1**	
4.1	**General Data**			
4.1.1	Manufacturer			
4.1.2	Place of Manufacture			
4.1.3	Place of Factory Inspection and Testing			
4.1.4	Type		Free-standing type	
4.1.5	Serial number			
4.1.6	Standards			
4.1.7	Installation		indoor	
4.1.8	Panels painting colour (RAL)		RAL 6019	
4.1.9	Degree of mechanical protection		IP41	
4.1.10	Panel steel sheet thickness	mm		
4.1.11	Dimensions and masses of the Control and Protection panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
5.	**132 Kv Synchronizing Trolly.**	**Set**	**1**	
5.1	**General Data**			
5.1.1	Manufacturer			
5.1.2	Place of Manufacture			
5.1.3	Place of Factory Inspection and Testing			

5.1.4	Type		Free-standing type	
5.1.5	Serial number			
5.1.6	Standards			
5.1.7	Installation		indoor	
5.1.8	Panels painting colour (RAL)		RAL 6019	
5.1.9	Degree of mechanical protection		IP41	
5.1.10	Panel steel sheet thickness	mm		
5.1.11	Dimensions and masses of the Control and Protection panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		

SCHEDULE E

DRAWINGS, OPERATING AND MAINTENANCE INSTRUCTIONS MANUALS

Attention is called to the general requirements for submission of drawings for approval and to the details laid out below:

Drawing sizes should be from the ISO `A' series, shall not exceed A0 standard dimensions and shall contain the title block shown in the tender drawing at the bottom right-hand corner of the drawing containing the following information:

National Electric Power Co.

Contract No. 48 / 2025

132kV Irbid Substation

NEPCO Drawing No.

All drawings must contain the Contractor's name, date, scale, number and title irrespective of whether they are drawings produced specifically for the Contract or standard drawings.

All drawings shall have a NEPCO drawing number, which shall be selected from a block of numbers issued by the Employer.

Drawing outlines shall be 0.5 mm thick, dimension lines 0.3 mm thick and characters at least 3.5 mm high.

On completion of installation the Contractor is required to provide a complete drawing schedule listing the drawings in the order of the NEPCO drawing numbers. The maximum drawing schedule size shall be A3.

Each drawing must have its own individual number, and the use of sheet numbers will only be permitted for the drawing schedule.

After completion of work on site all drawings shall be revised where necessary to show the equipment as installed and two copies submitted for approval. Following approval, one reproducible 0.75 mm transparency, three prints and an electronic copy in AutoCAD release 14 format should be provided within two months after the provisional taking over date, and shall be of sufficient detail to enable all parts to be identified. These shall be sent directly to the Employer.

1. The following is a list of drawings attached to this Specification: -

Drawing Revision	Title
001	Title block for drawings
002	Shipping Mark
Drawing 1	132kv Control and Protection Panel for Irbid S/S

2. The following is a list of the drawings, which shall be submitted by the Contractor with the tender.

Description

a. Layout of the 132kv Control and Protection Panel.

3. The following drawings to be submitted by the Contractor for approval within the period stated in the Schedules.

Description

a. Contract Works Progress Chart (submitted monthly).

b. Detailed Sub-Order Chart.

c. Final drawings corresponding to all drawings submitted by the Contractor with his Tender.

d. Structures. Detail drawings showing dimensions of principal members.

e. Arrangement and details of disconnectors and earthing switches.

k. Details of maintenance and handling equipment.

n. Details of test equipment.

o. Material lists.

OPERATING AND MAINTENANCE INSTRUCTIONS MANUALS

Two months before erection commences of the Control and Protection Panel, the Contractor shall submit operating and maintenance instructions and diagrams for approval by the Engineer.

Details of any equipment to be supplied for erection and maintenance shall be provided at the time of tendering, as shall the procedures to be adopted. The equipment shall include the instruments etc. necessary for ensuring the integrity and compliance of the insulating and interrupting medium of the main equipment being supplied.

The instructions shall be fully detailed and shall cover all associated ancillary equipment as supplied under the Contract. Manufacturer's standard brochures will not be accepted as part of the text unless they refer particularly to the equipment supplied and are free from extraneous matter.

The information provided should include essential flow and circuit diagrams, pipework, general arrangement and detailed drawings of the installation, make mention of special materials were used and include schedules of lubricants and all ball and roller races employed. The drawings and diagrams, which may be approved existing drawings, reduced to a convenient size, should be bound into the volume and not inserted into cover pockets. If the complete text of the manual is unduly bulky, then this shall be appropriately sub-divided and produced in multi-volume form.

When approved, three copies of the complete text, diagrams and drawings as made up in draft form shall be handed to the Engineer for use during erection and these shall be provided not later than one month before erection commences.

A further three copies of the manual shall be reproduced as books of approximately quarto size bound into strong black durable imitation leather covers inscribed with gold letters upon the front generally in the form of the title page to this document except that the reference to

Specification, Conditions of Contract, Drawings, etc, will be replaced by "Operating and Maintenance Instructions".

The name of the main Contractor, but not that of any sub-contractor, may also be inscribed upon the cover.

- CONSTRUCTION AND ERECTION MANUALS

  Three copies of construction and erection manuals should be supplied before the erection work start. The construction and erection manuals should include erection, drawings, and schematic details of any equipment to be supplied under this contract.

SCHEDULE F

TESTS

GENERAL

1. GENERAL TESTS REQUIREMENTS

Test shall include all routine, electrical, mechanical and hydraulic tests in accordance with the relevant standards, and in addition any tests, called for by the Engineer to ensure that the plant being supplied meets the requirements of the specification. The costs of all tests including the provision of the necessary test equipment at the manufacturer's works shall be borne by the contractor and shall be deemed to be included in the contract price.

Not less than 30 days' notice shall be given to the Engineer when equipment is ready for test.

The contractor shall supply four copies for all test certificates.

After satisfactory completion of the witnessed tests at the works, the contractor shall submit shipping release request for NEPCO.

No item of plant shall be despatched to site until the Engineer has given his approval and issued the relevant shipping release.

2.1 Type Tests:

- Type test report for the 132 kV Control and Protection Panels should be in accordance to latest standards IEC 60255, IEC 61850, IEC 61010, IEC 60068, IEC 60529,60297 or such other standards as may be approved.
- Type tests may be omitted at the discretion of the Engineer if the Tenderer provided documentation, certified by the owner (Type Test), to show that the 132 kV Control and Protection Panels, having similar type or above and the same place of manufacture, passed the type test successfully within last 12 years (2013 - 2024).

2.2 Routine Tests:

- Routine tests shall be carried out in presence & witness of FAT Tests by the Employer's inspectors.
  Routine tests shall be according to the latest IEC 60255 , IEC 60204, IEC 61010 or such other standards as may be approved and shall include the following:

  Every facility is to be provided by the Contractor to enable the Employer’s representatives to carry out the necessary inspection and testing of the purchased materials. The costs of all tests during manufacturing and preparation of test records shall be borne by the Contractor.

  Instruments shall be approved and shall, if required by the Employer's representative, be calibrated by the National physical Laboratory or such other body as may be approved at the expense of the contractor.

SECTION 7

PRICE SCHEDULES

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48 / 2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

SCHEDULE G

PRICE OF EQUIPMENT

NOTE:

All equipment tabulated in the technical schedule (A) are to be supplied and considered in the scope of work although if they are not mentioned in these financial schedules, any discrepancy can be indicated during the Tendering stage.

ITEM	Description	Qty	Unit	Price			
				Foreign Currency			
				Unit price FOB	Total price FOB	Freight	Total price CFR
1	Control & Protection Panels for 132 kV Transformers Bays.	2	Set				
2	Control & Protection Panel for 132 kV OHTL Feeders Bays.	2	Set				
3	Control & Protection Panel for 132 kV Bus Coupler Bay.	1	Set				
4	Alarm and Control Station Desk.	1	Set				
5	Synchronizing Trolley.	1	Set				
TOTAL TO OVER ALL SUMMARY SCHEDULE G							

SCHEDULE S

SUMMARY OF LUMP SUM PRICES FOR DEFINITE WORK

The prices entered below for the various items, whether or not the items are fully described, shall include everything necessary to leave the equipment complete and in working order in accordance with the provisions of the Contract.

The following Schedule to be filled in completely and without omission by Tenderers and their manner and breakdown should not be changed. However, this Schedule may be supplemented by extra sheets, should this is necessary.

NATIONAL ELECTRIC POWER COMPANY
TENDER NO. 48/2025
SUPPLY OF 132 KV CONTROL AND PROTECTION PANELS
AT IRBID S/S

O**VERALL SUMMARY OF PRICES (SCHEDULE S)**

REFERENCE	ITEM	FOREIGN CURRENCY Total Price CFR
SCHEDULE G	Supply of 132 Kv CONTROL AND PROTECTION PANELS	
Inspection as per tender specifications	Witnessing of FAT Tests by the Employer's inspectors	
TOTAL TENDER PRICE		

TOTAL TENDER PRICE:

_____ _____

Foreign Currency **Total Jordanian Dinars**

Total Price for the Equipment CFR – Aqaba port, Say (in words):

……

……

- **The above price shall appear on the Form of Tender.**
- **Note: The total Tender price should be filled the Form of Tender.**
- **Prices shall be excluding all custom duties and sales tax.**

Figures

Figure - (1)

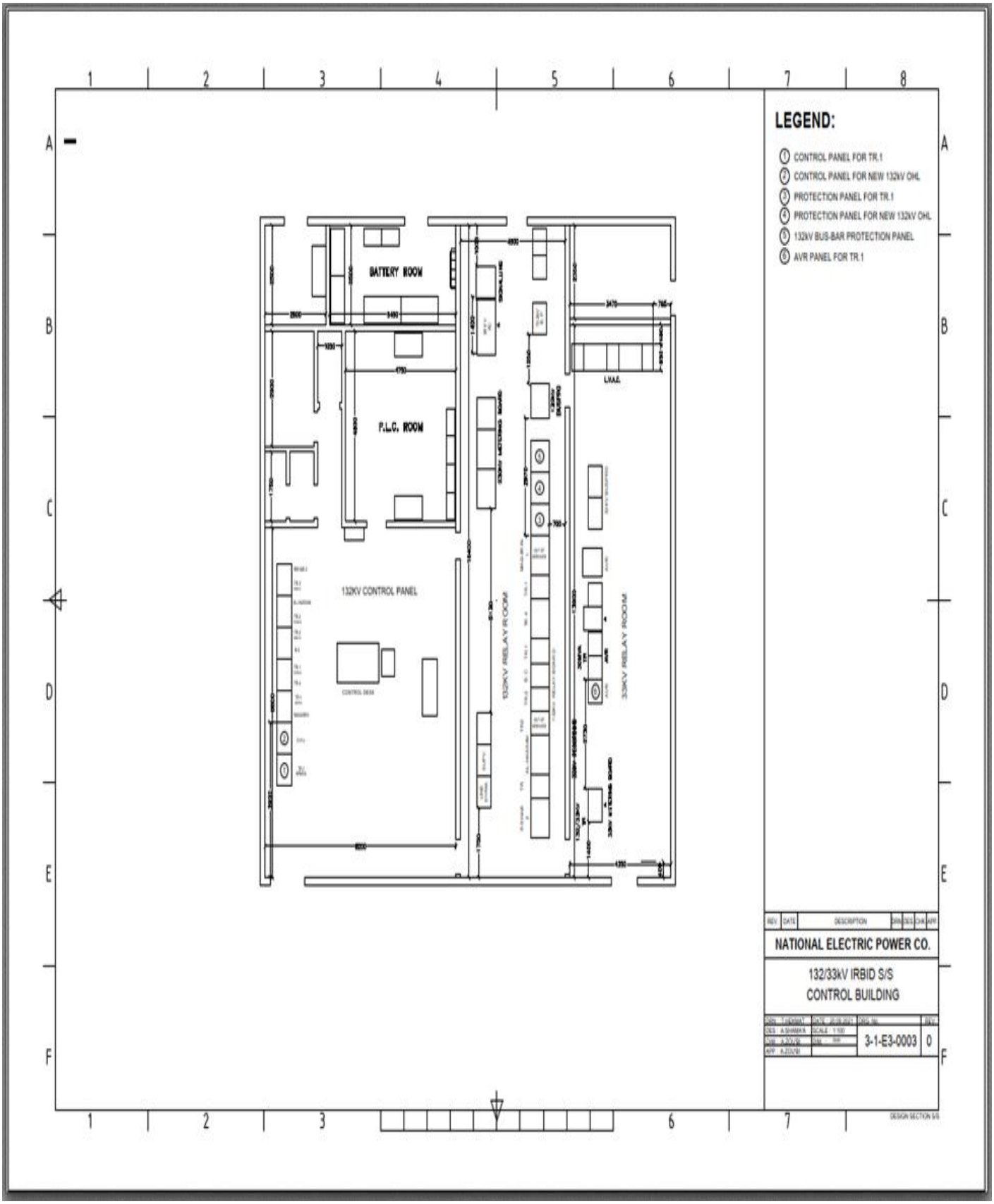
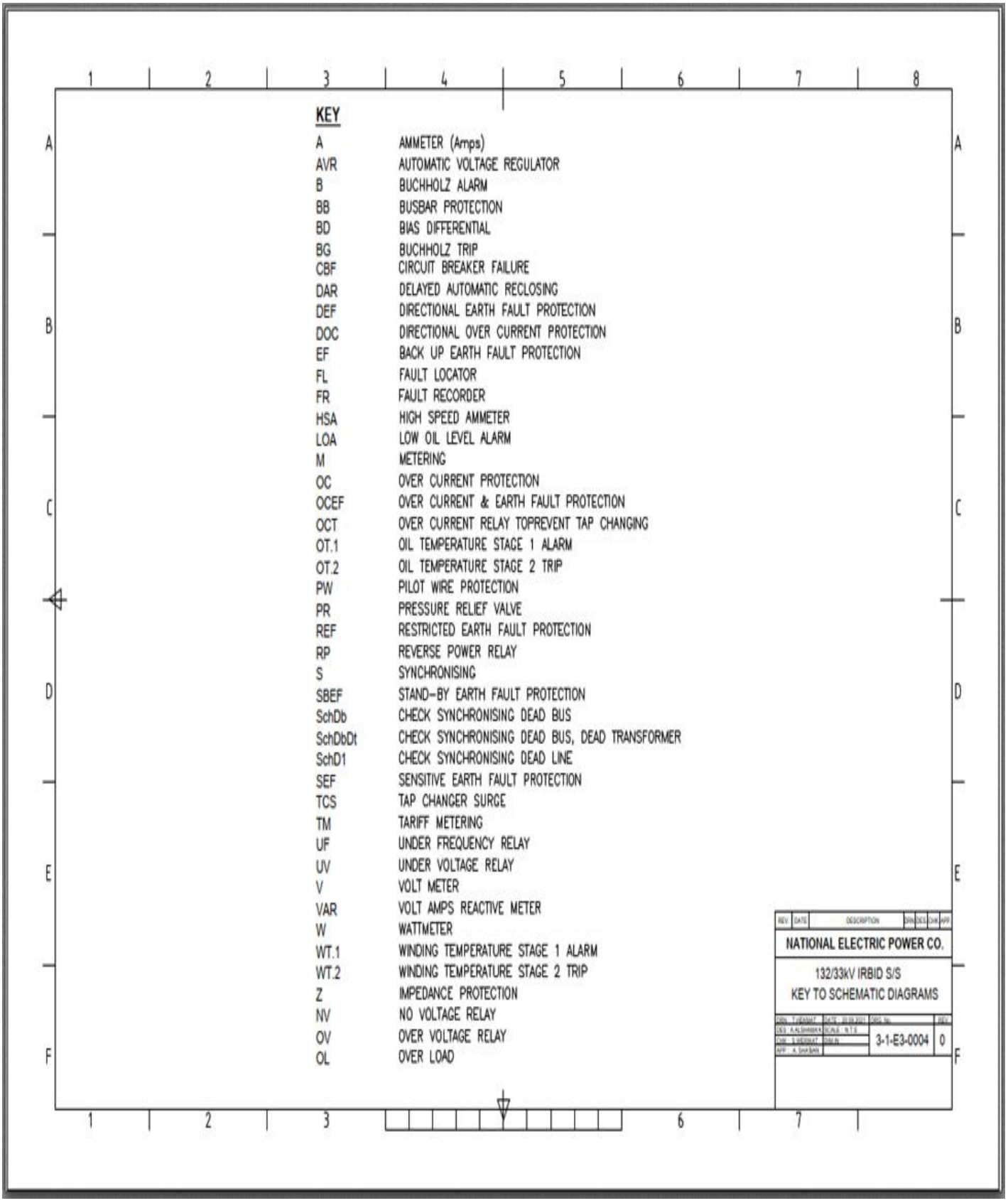

LEGEND:
1 CONTROL PANEL FOR TR.1
2 CONTROL PANEL FOR NEW 132kV OHL
3 PROTECTION PANEL FOR TR.1
4 PROTECTION PANEL FOR NEW 132kV OHL
5 132kV BUS-BAR PROTECTION PANEL
6 AVR PANEL FOR TR.1
BATTERY ROOM
P.L.C. ROOM
132KV CONTROL PANEL
132KV RELAY ROOM
33KV RELAY ROOM
LHAZ
NATIONAL ELECTRIC POWER CO.
132/33kV IRBID S/S
CONTROL BUILDING
3-1-E3-0003
0

Figure - (2)



KEY

A	AMMETER (Amps)
AVR	AUTOMATIC VOLTAGE REGULATOR
B	BUCHHOLZ ALARM
BB	BUSBAR PROTECTION
BD	BIAS DIFFERENTIAL
BG	BUCHHOLZ TRIP
CBF	CIRCUIT BREAKER FAILURE
DAR	DELAYED AUTOMATIC RECLOSING
DEF	DIRECTIONAL EARTH FAULT PROTECTION
DOC	DIRECTIONAL OVER CURRENT PROTECTION
EF	BACK UP EARTH FAULT PROTECTION
FL	FAULT LOCATOR
FR	FAULT RECORDER
HSA	HIGH SPEED AMMETER
LOA	LOW OIL LEVEL ALARM
M	METERING
OC	OVER CURRENT PROTECTION
OCEF	OVER CURRENT & EARTH FAULT PROTECTION
OCT	OVER CURRENT RELAY TOPREVENT TAP CHANGING
OT.1	OIL TEMPERATURE STAGE 1 ALARM
OT.2	OIL TEMPERATURE STAGE 2 TRIP
PW	PILOT WIRE PROTECTION
PR	PRESSURE RELIEF VALVE
REF	RESTRICTED EARTH FAULT PROTECTION
RP	REVERSE POWER RELAY
S	SYNCHRONISING
SBEF	STAND-BY EARTH FAULT PROTECTION
SchDb	CHECK SYNCHRONISING DEAD BUS
SchDbDt	CHECK SYNCHRONISING DEAD BUS, DEAD TRANSFORMER
SchDl	CHECK SYNCHRONISING DEAD LINE
SEF	SENSITIVE EARTH FAULT PROTECTION
TCS	TAP CHANGER SURGE
TM	TARIFF METERING
UF	UNDER FREQUENCY RELAY
UV	UNDER VOLTAGE RELAY
V	VOLT METER
VAR	VOLT AMPS REACTIVE METER
W	WATTMETER
WT.1	WINDING TEMPERATURE STAGE 1 ALARM
WT.2	WINDING TEMPERATURE STAGE 2 TRIP
Z	IMPEDANCE PROTECTION
NV	NO VOLTAGE RELAY
OV	OVER VOLTAGE RELAY
OL	OVER LOAD

NATIONAL ELECTRIC POWER CO.

132/33kV IRBID S/S
KEY TO SCHEMATIC DIAGRAMS

3-1-E3-0004 | 0

Figure - (3)

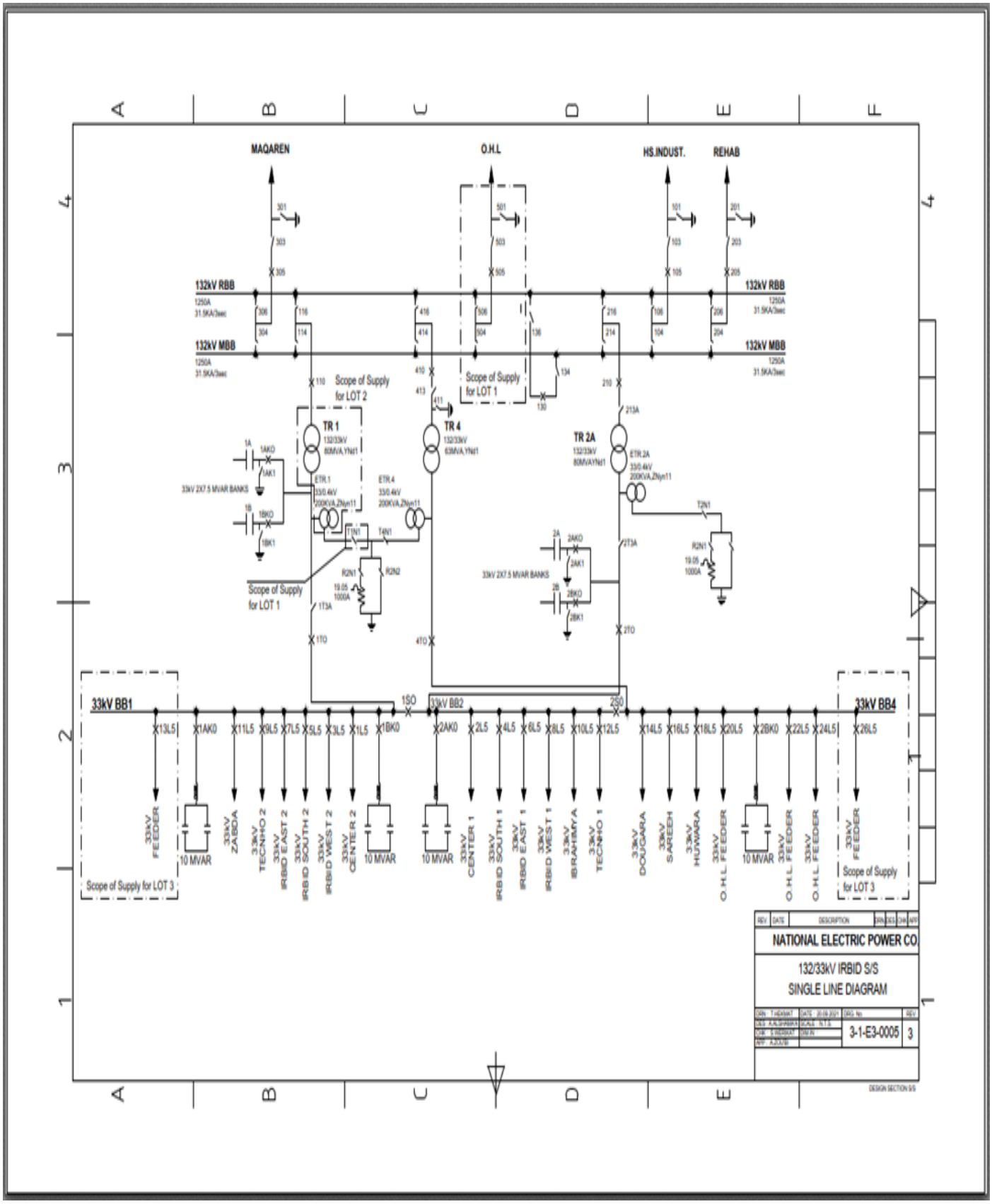

MAQAREN
O.H.L
HS.INDUST.
REHAB
132kV RBB
132kV MBB
Scope of Supply for LOT 2
Scope of Supply for LOT 1
TR 1
TR 4
TR 2A
33kV BB1
33kV BB2
33kV BB4
10 MVAR
Scope of Supply for LOT 3
NATIONAL ELECTRIC POWER CO.
132/33kV IRBID S/S
SINGLE LINE DIAGRAM
3-1-E3-0005
3

Figure - (4)

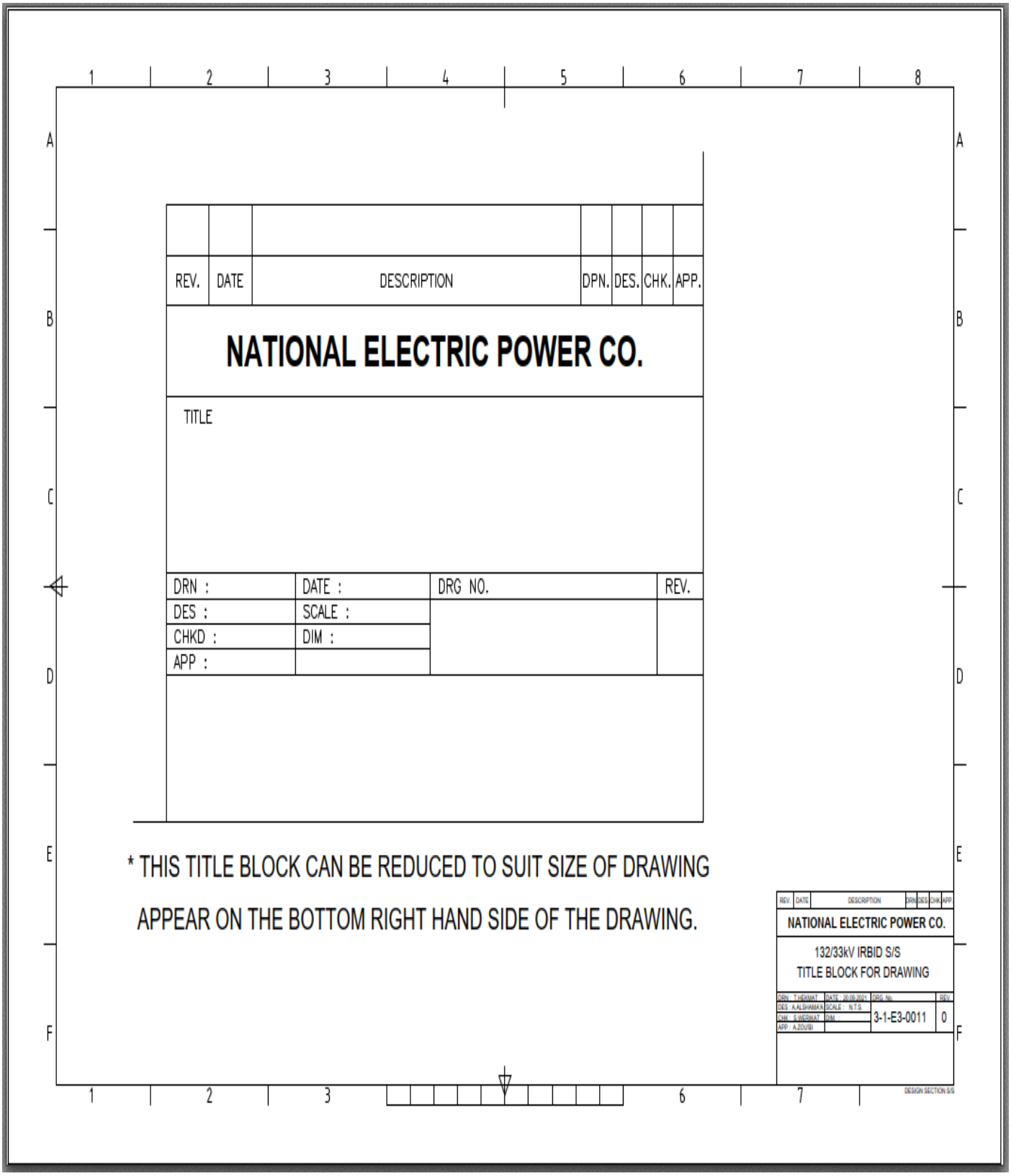
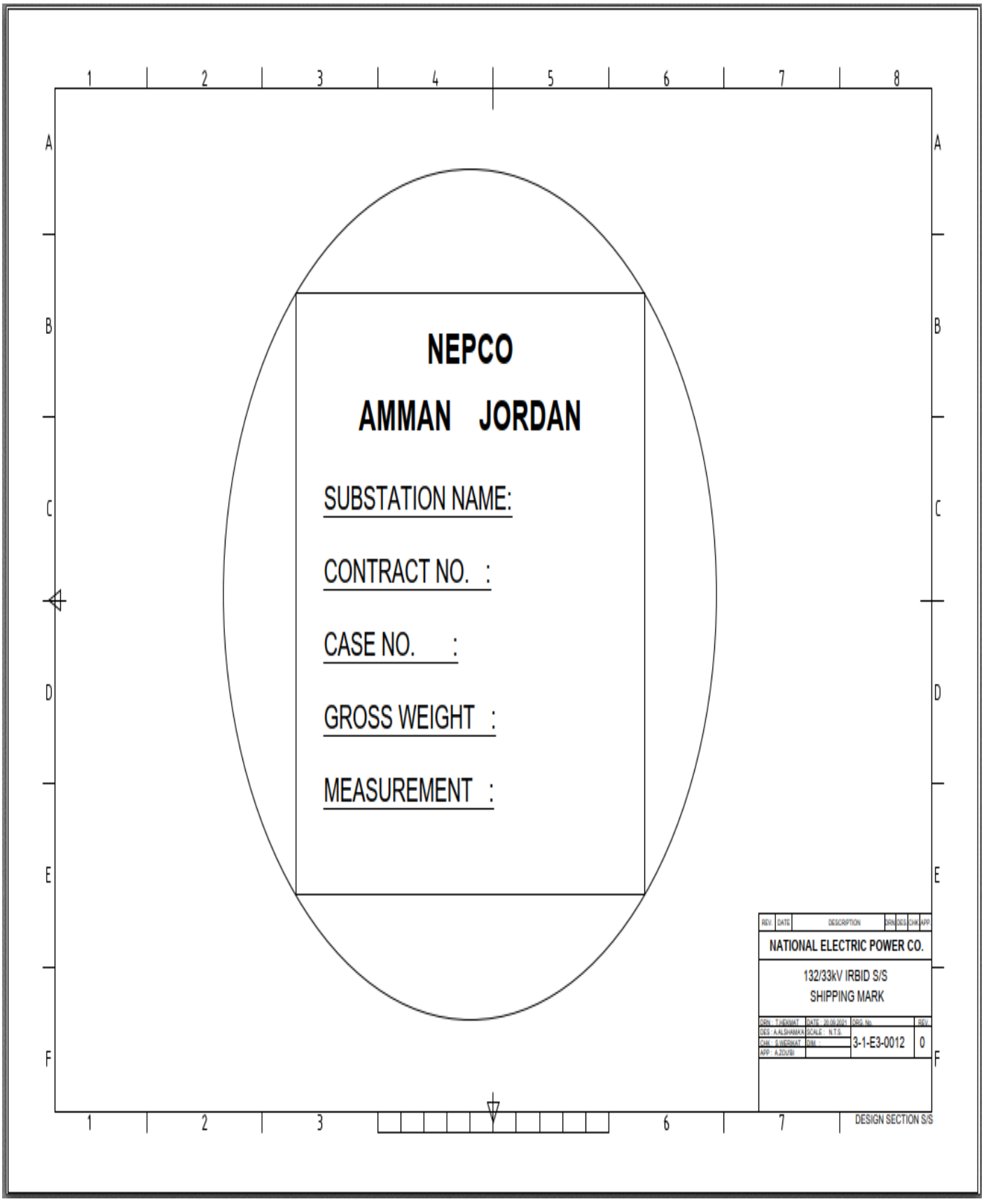

REV.
DATE
DESCRIPTION
DPN.
DES.
CHK.
APP.
NATIONAL ELECTRIC POWER CO.
TITLE
DRN :
DATE :
DRG NO.
REV.
DES :
SCALE :
CHKD :
DIM :
APP :
* THIS TITLE BLOCK CAN BE REDUCED TO SUIT SIZE OF DRAWING
APPEAR ON THE BOTTOM RIGHT HAND SIDE OF THE DRAWING.
NATIONAL ELECTRIC POWER CO.
132/33kV IRBID S/S
TITLE BLOCK FOR DRAWING
3-1-E3-0011
0

Figure - (5)


NEPCO
AMMAN JORDAN
SUBSTATION NAME:
CONTRACT NO. :
CASE NO. :
GROSS WEIGHT :
MEASUREMENT :
NATIONAL ELECTRIC POWER CO.
132/33kV IRBID S/S
SHIPPING MARK
3-1-E3-0012
0
DESIGN SECTION S/S