**DELI TRANSCO LIMITED**  
(A Government of NCT of Delhi Undertaking)

**WEB NOTIFICATION**  
(Proforma for publication of Web Notification on DTL website)

Two part open Domestic Competitive Bidding (DCB) tender is invited through Delhi Govt. E-procurement website [https://govtprocurement.delhi.gov.in](https://govtprocurement.delhi.gov.in) by DGM (T) M&S C&MM division, Delhi Transco Limited, Room No.-105, 1st Floor, Rajghat Power House, Pre- fabricated RPH Building, New Delhi-110002 (India), from eligible bidders who have registered with e- procurement portal of GNCTD and have obtained digital signature, as per the following schedule:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Quotation/ Tender Enquiry No.</th>
<th>Name of work</th>
<th>Estimated Amount</th>
<th>Earnest Money Deposit (EMD) (Rs.)</th>
<th>Quotation/Tender Fee (Rs.)</th>
<th>Work Completion Period</th>
<th>Scheduled Date/Time</th>
</tr>
</thead>
</table>
| 1.     | T23P111611                     | Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis (400kV Sub-Stations Bawana, Bamnauli and Tikri-Kalan). | Rs. 222,02,41,985 /- | Rs. 4,44,04,840/- | NA | 20 months | Start Date & Time for Bid submission 17.01.2024 06:00 PM  
Date and Time of Pre-Bid Conference 24.01.2024 11:30 AM  
Last Date & Time for Bid submission 08.02.2024 01:30 PM  
Date & Time for Opening of Tender 08.02.2024 03:00 PM |
Note:-  
1. The complete Bidding Documents can be downloaded from the Delhi Govt. website http://govtprocurement.delhi.gov.in (Tender Id No.: 2024_DTL_252067).
2. The Tender will be opened at Tender Opening Cell, Delhi Transco Limited, DGM (T) M&S C&MM division, Room No.-105, 1st Floor, Rajghat Power House, Pre- fabricated RPH Building, New Delhi-110002 (India).
3. The Pre-Bid Conference will be held at Conference Room, Delhi Transco Limited, 4th Floor, Shakti Sadan Building, Kotla Road, New Delhi-110002 (India).

Designation/ Deptt. : Dy. General Manager (M&S), C&MM  
Address : Pre-fabricated Building, 1st Floor, 
Rajghat, New Delhi-110002, Fax no. 2325175
Bidding Document

for

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

Volume – I, II & III

Tender No: T23P111611
Bidding Document
For
Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

Volume – I

Tender No: T23P111611
VOLUME-I

CONDITIONS OF CONTRACT

CONTENTS

Section - I Invitation for Bid (IFB)

Section - II Instruction to Bidders (ITB)

Section - III Bid Data Sheet (BDS)

Section - IV Conditions of Contract (CC)

Section –V Special Conditions of Contract (SCC)

Section - VI Forms and Procedures (F&P)
SECTION-I

INVITATION FOR BID (IFB)
DELHI TRANSCO LIMITED  
(A Government of NCT of Delhi Undertaking)  
INVITATION FOR BID (IFB)  
(DOMESTIC COMPETITIVE BIDDING)  

WEB NOTIFICATION

Tender is invited in Two-part Bid system (i.e. Technical bid and Price bid) through e-procurement portal of Delhi Govt. by DGM (T) M&S C&MM division, Delhi Transco Limited, Room No.-105, 1st Floor, Rajghat Power House, Pre-fabricated RPH Building, New Delhi-110002 (India), from eligible bidders who have registered with e-procurement portal of GNCTD and have obtained digital signature.

<table>
<thead>
<tr>
<th>Tender Name</th>
<th>Design, Supply, Erection, Testing &amp; Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tender Enquiry No.</td>
<td>T23P111611</td>
</tr>
<tr>
<td>Estimated Amount (in Rs.)</td>
<td>Rs. 2220241985/- (Rs. Two hundred Twenty two Crores two Lacs forty one Thousand nine Hundred eighty five Only)</td>
</tr>
<tr>
<td>Bid Security (BS) in Rs.</td>
<td>Rs. 44404840/- (Rs. Four Crore forty four Lacs four thousand eight Hundred and forty only)</td>
</tr>
<tr>
<td>Tender Fee</td>
<td>Nil</td>
</tr>
<tr>
<td>Bid Validity</td>
<td>180 days from the date of bid opening.</td>
</tr>
</tbody>
</table>
| Completion Period | 20 Months from the date of award of work order. Transformer shall be supplied in Phased manner with following tentative delivery Schedule:  
  1st and 2nd Transformer 12 Months from date of award  
  3rd and 4th Transformer 15 Months from date of award  
  5th, 6th and 7th Transformer 17 Months from date of award  
  The Price Variation clause for transformers shall be governed by latest IEEMA (Indian Electrical & Electronics Manufacturers Association) formula as per Appendix 2 of Form of Contract Agreement, Section Forms & Procedures, Volume-I, Attachment 14 of Section-2, Volume-III.  
  The transformers are required for the following 400kV substations:  
  i. 400kV Tikrikalan-04 Nos.  
  ii. 400kV Bawana- 02 No.  
  iii. 400 KV Bamnauli-01 No.  
  Note: The location of site for transformer may undergo change if so required by the Employer within Delhi. |

<table>
<thead>
<tr>
<th>Date and Time of downloading of bidding document</th>
<th>DATE</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>-</td>
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<tr>
<td>Close</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Date and time of submission of bids</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Date and Time of opening of Techno-Commercial part of bids (Part-I)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
DELHI TRANSCO LIMITED invites tenders for the aforesaid package in Two-part Bid system (i.e. Techno-Commercial and Price bid) through e-procurement portal from eligible bidders who are registered at e-procurement portal of Delhi Govt. website i.e. http://govtprocurement.delhi.gov.in and have obtained digital signature.

1.1 Bidding Documents are available for downloading date and time mentioned in the web notification.

1.2 No purchase preference shall be given.

1.3 The submission of bids date and time has been mentioned in the web notification. Bids shall be received up to date and time mentioned in the web notification and Techno-Commercial Bid (Part-I) shall be opened on the same day through e-procurement portal of Delhi Govt. website i.e. http://govtprocurement.delhi.gov.in in the presence of Bidder’s representative who chose to attend at the address given below:-

Tender Opening Cell, Delhi Transco Limited, DGM (T) M&S C&MM division, Delhi Transco Limited, Room No.-105, 1st Floor, Rajghat Power House, Pre-fabricated RPH Building, New Delhi-110002 (India), Email: dgmms.cmm@dtl.gov.in, dgmms105@gmail.com

1.4 In case any of the above dates are declared holiday/ closing day, these shall be extended to next working day.

1.5 The complete Bidding Documents including tender drawings are available on DTL website https://www.delhitransco.gov.in and Delhi Govt. website http://govtprocurement.delhi.gov.in

1.6 The Qualifying Requirements are given in the bidding document of the subject package. In addition to submission of scanned copies of mandatory documents through e-procurement portal, the bidder shall also submit (02) two copies of the bid in Book Bonded form, clearly marking each “Original Bid” and “Copy of bid” including, the signed hard copies of all relevant pre-qualification documents being submitted in support of Bid (all Forms, Annexures etc. Experience certificate, supporting documents copies, type test reports, Guaranteed Technical Particulars and any other documents required as per the bidding document etc.) at least one and half hour before the time of bid opening in the office of Tender Opening Cell, Delhi Transco Limited, DGM (T) M&S C&MM division, Delhi Transco Limited, Room No.-105, 1st Floor, Rajghat Power House, Pre-fabricated RPH Building, New Delhi-110002 (India). In the event of any discrepancy between original and copy of the hard bid, the original shall govern. Also in the event of any discrepancy between online bidding documents and the hard copy of the bid, the online bid shall govern. The Price Bid (Part-II) shall not be submitted in hard copy and shall only be uploaded on e-portal of Delhi Govt. website.

1.7 All bids must be accompanied by Bid Security amount mentioned in the web notification as per
cl. No. 23 of Section ITB, Volume-I of the bidding document. The Scanned copy of Bid Security is to be submitted with online bid; however, the Bid Security in original shall be submitted in the Tender Opening Cell, Delhi Transco Limited, DGM (T) M&S C&MM division, Delhi Transco Limited, Room No.-105, 1st Floor, Rajghat Power House, Prefabricated RPH Building, New Delhi-110002 (India), at least one and half hour before the time of bid opening, failing which the bids shall be rejected.

1.8 The Techno- Commercial Bid (Part-I) so opened shall be evaluated and the date of opening of the Price Bid (Part-II) of the techno-commercially successful bidders shall only be communicated to all techno commercially successful bidders.

1.9 Delhi Transco Limited shall not be responsible for any postal delays in respect of request for issuance of bidding documents and/or dispatch of bidding documents and/or submission of bids.

2.0 Delhi Transco limited reserves the right to cancel/withdraw this invitation to bids without assigning any reason and shall bear no liability whatsoever consequent upon such a decision.

2.1 All correspondence/communication regarding the NIT shall be made to: DGM (T) M&S C&MM division, Delhi Transco Limited, Room No.-105, 1st Floor, Rajghat Power House, Prefabricated RPH Building, New Delhi-110002 (India), Phone: 23251274, Email: dgmms.cmm@dtl.gov.in, dgmms105@gmail.com

2.2 Integrity Pact must be submitted alongwith the bid in physical form at the address given at para 1.7 above.

2.3 Under the Integrity Pact Program (IPP), Shri Umakant Lal shall be the Independent External Monitor for the subject package. Correspondence, if any, to the IEM be addressed to the following:

Shri Umakant Lal  
403, Bhabha Tower,  
Grishapravesh Buildteck,  
Sector-77,  
Noida-(UP)-201304  
E-mail:- umaktantlal@yahoo.co.in

DGM (T) M&S
SECTION-II

INSTRUCTION TO BIDDER
(ITB)
SECTION- II

INSTRUCTION TO BIDDERS (ITB)

A. INTRODUCTION

1.0 GENERAL INFORMATION

1.1 Delhi Transco Limited (hereinafter called ‘DTL’/ ‘Owner’/ ‘Employer’) will receive bids in respect of equipment to be furnished and erected as set-forth in the accompanying Specifications. All bids shall be prepared and submitted in accordance with these instructions.

1.2 Eligibility of bidders

Bids can be submitted by firms:

1.2.1 From within India including company (ies) registered and incorporated in India as per Companies Act, 2013 barring foreign bidders/MNCs not registered and incorporated in India and those bidders with whom business is banned by DTL and

1.2.2 Only 'Class-I local supplier' shall be eligible to bid as per MoP order dt. 16.11.2021 read in conjunction with PPP-MII order dt. 16.09.2020 with latest amendment if any.

1.2.3 Any bidder from a country which shares a land border with India and Any bidder (including an Indian bidder) who has a Specified Transfer of Technology (ToT) arrangement with an entity from a country which shares a land border with India will be eligible to bid only if bidder is registered with a competent authority and the registration should be valid at the time of submission of bid and at the time of acceptance of bid as per Ministry of Finance order no- F.No.7/10/2021-PPD(1) dt 23.02.2023 and their latest amendment thereof.

2.0 QUALIFYING REQUIREMENTS OF BIDDERS

2.1 The Qualifying Requirements for the Bidders are given in Annexure-A (BDS) to this Volume-I of the Bidding Documents.

2.2 The above stated requirements are a minimum and the Owner reserves the right to request for any additional information and also reserves the right to reject the Proposal of any Bidder, if in the opinion of the Owner, the qualification data is incomplete or the Bidder is found not qualified to satisfactorily perform the contract.

3.0 COST OF BIDDING

3.1 The bidder shall bear all costs and expenses associated with preparation and submission of its bid including post-bid discussion, technical and other presentations etc., and the Owner will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

B. THE BIDDING DOCUMENTS

4.0 CONTENTS OF BIDDING DOCUMENT

4.1 The goods and services required, bidding procedures and Contract terms are prescribed in the Bidding Document.
In addition to the Invitation For Bids, the Bidding Document is a compilation of the following sections:

**Volume - I: Conditions of Contract**
- i) Section-I Invitation For Bid (IFB)
- ii) Section-II Instructions to Bidders (ITB)
- iii) Section-III Bid Data Sheets (BDS)
- iv) Section-IV Conditions of Contract (CC)
- v) Section-V Special Conditions of Contract (SCC)
- vi) Section-VI Forms and Procedures (F&P)

**Volume - II: Technical Specification**

**Volume - III: Bid Form, Attachments, GTP & Price Schedules**
- Section I Bid Form
- Section II Attachments
- Section III Guaranteed Technical Particulars (GTP)
- Section IV Price Schedules

5.0 UNDERSTANDING OF BID DOCUMENTS

5.1 A prospective Bidder is expected to examine all instructions, forms, terms, specifications and all other information in the Bid documents and fully inform himself as to all the conditions and matters which may in any way affect the scope of work or the cost thereof. Failure to furnish all information required by the Bid document or submission of a Bid not substantially responsive to the Bid document in every respect will be at the Bidder's risk and may result in the rejection of its bid.

6.0 CLARIFICATIONS ON BID DOCUMENTS

6.1 A prospective Bidder finding discrepancies or omissions, in specifications and document or is in doubt as to the true meaning of any part, they shall at once make a request, in writing or by electronic media (hereinafter, the term cable is deemed to include Electronic Data Interchange (EDI) or telefax) at the Employer's mailing address indicated below interpretation/clarification, to the Owner. The owner, then, will issue interpretation(s) and clarification(s) as he may think fit in writing. After receipt of such interpretation(s) and clarification(s), the Bidder may submit his bid but within the time and date as specified in the invitation for bid. All such interpretations and clarifications shall form a part of the bidding document and shall accompany the Bidder’s proposal. A prospective Bidder requiring any clarification on bidding document may notify the owner in writing. The Employer will respond in writing to any request for clarification or modification of the bidding documents that it receives within 15 days after appearing in the web site. Written copies of the owner’s response (including an explanation of the query but without identifying its source) will be uploaded on the website as the part of bidding documents.

Address of Employer, telephone, facsimile numbers & E-mail address: (Refer BDS)

6.2 Verbal clarification and information given by the owner or his employee(s) or his representative (s) shall not in any way be binding on the owner.

6.3 The Bidder is advised to visit and examine the site, where the facilities are to be installed and its surroundings and obtain for itself on its own responsibility, all information that may be necessary, for preparing the bid and entering into a contract for supply and installation of the facilities. The costs of visiting the site shall be at the Bidder's own expense.
6.4 The Bidder and any of its personnel or designated representative will be granted permission by the facilities incharge to enter upon its premises and lands for the purpose of such inspection, but only upon the express condition that the Bidder, its personnel and designated representative will release and indemnify the facilities incharge and its personnel and designated representative from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of the inspection.

6.5 The Bidder’s designated representative(s) is/are invited to attend pre-bid meeting, which, if convened, will take place at the venue and time stipulated in the BDS.

The purpose of the conference will be to clarify any issues regarding the Bidding Documents in general and the Technical Specifications in particular. The bidder is required to submit questions in writing or by cable to reach the Employer at the address indicated in BDS, two days before the pre-bid conference i.e. … (as per web notification and relevant corrigendum).

Any modifications of the Bidding Documents which may become necessary as a result of the pre-bid conference shall be made by the Employer exclusively through an amendment pursuant to ITB Clause 7.0 and not through the record notes of the pre-bid conference. Non-attendance at the pre-bid conference will not be a cause for disqualification of a bidder.

7.0 AMENDMENT TO BIDDING DOCUMENT

7.1 At any time prior to the deadline for submission of bids, the owner may, for any reason, whether as its own initiative or in response to a clarification requested by a prospective Bidder, modify the bidding document by amendment(s).

7.2 Each Amendment will be posted on owners as well as on Delhi Govt. website. The owner will not be responsible for checking the website by the bidder for the same in time or otherwise. It will be considered that the information contained therein will have been taken into account by the Bidder in its bid.

7.3 In order to afford prospective Bidders reasonable time in which to take the amendment into account in preparing their bids, the owner may, at its discretion, extend the deadline for the submission of bids.

7.4 Such amendments, clarification, etc, shall be binding on the Bidders and will be given due consideration by the Bidders while they submit their bids and invariably enclose such documents as a part of the bid.

C. PREPARATION OF BIDS

8.0 Language of Bid

8.1 The bid prepared by the bidder and all correspondence and documents relating to the bid, exchanged by the owner and the bidder shall be written in the English language, provided that any printed literature furnished by the Bidder may be written in another language so long as accompanied by an English translation of its pertinent passages. Failure to comply with this may disqualify a bid. For purposes of interpretation of the bid, the English translation shall govern.
9.0 LOCAL CONDITIONS

9.1 It will be imperative on each bidder to fully inform himself of all local conditions and factors which may have any effect on the execution of the contract covered under these documents and specification. The owner shall not entertain any request for clarifications from the Bidders, regarding such local conditions.

9.2 It must be understood and agreed that such factors have properly been investigated and considered while submitting the proposals. No claim for financial adjustment to the contract awarded under these specifications and documents will be entertained by the owner. Neither any change in the time schedule of the contract nor any financial adjustments arising thereof shall be permitted by the owner, which are based on the lack of such clear information or its effect on the cost of the Works to the Bidder.

10.0 DOCUMENTS COMPRISING THE BID

10.1 The bidder shall complete the Bid form inclusive of Price Schedules, Technical Data requirements etc. furnished in the Bidding Documents, indicating for the goods to be supplied and services to be rendered, a brief description of goods and services, quantity and prices.

10.2 The bidder shall also submit documentary evidence to establish that the Bidder meets the Qualification Requirements (QR) as detailed in Bid data sheets (BDS).

10.3 The Bid Security shall be furnished in a separate cover in accordance with clause 23.0 of Section ITB. Each Bidder shall submit with its bid the following Attachments:

(a) Attachment 1: Bid Security
   A bid security furnished in accordance with ITB Clause 23.

(b) Attachment 2: Power of Attorney
   A power of attorney, duly authorized by a Notary Public, indicating that the person(s) signing the bid has the authority to sign the bid and thus that the bid is binding upon the Bidder during the full period of its validity in accordance with ITB Clause 24.

(c) Attachment 3: Bidder's Eligibility and Qualifications
   In the absence of prequalification, documentary evidence that the Bidder is eligible to bid in accordance with ITB Cl 1.2, Section BDS and is qualified to perform the contract if its bid is accepted.

   The documentary evidence of the Bidder's qualifications to perform the contract, if its bid is accepted, shall establish to the Employer's satisfaction that the Bidder has the financial, technical, production, procurement, shipping, installation and other capabilities necessary to perform the contract, and, in particular, meets the experience and other criteria outlined in the Qualification Requirement & ITB

   Qualification requirements for bidders are enclosed as Annexure-A, Section BDS.
(d) **Attachment 4: Subcontractors Proposed by the Bidder**

The Bidder shall include in its bid details of all major items of supply or services, that it proposes to purchase and shall give details of the name and nationality of the proposed Subcontractor, including vendors, for each of those items. Bidders are free to list more than one Subcontractor against each item of the facilities. Quoted rates and prices will be deemed to apply to whichever Subcontractor is appointed, and no adjustment of the rates and prices will be permitted.

Vendors hired by the erector or the manufacturer or the lead player, shall be selected on considerations of quality and economy and DTL reserves the right to seek information in relation to any such vendor proposed to be hired by the erector or manufacturer or lead player. Subletting of either whole or part of the contract by the contractor, hired by DTL shall not be permissible.

The Employer reserves the right to delete any proposed Subcontractor from the list prior to award of contract, and after discussion between the Employer and the Contractor, attachment-4 to the form of Contract Agreement shall be completed, listing the approved Subcontractors for each item.

(e) **Attachment 5: Commercial Deviations**

In order to facilitate evaluation of bids, deviations, if any, from the Terms & Conditions Commercial Deviations Specifications shall be listed in Attachment 5 for Techno commercial Bid.

(f) **Attachment 6: Deviation on Important condition.**

In order to facilitate evaluation of bids, deviations on Important Condition shall be listed in Attachment 6 for important condition of Bid.

(g) **Attachment 7: Technical Deviation.**

In order to facilitate evaluation of bids, deviations, if any on technical specifications shall be listed in Attachment 7 for Techno commercial Bid.

(h) **Attachment 8: Additional Information**

In order to facilitate evaluation of bids, if any additional Information on technical/commercial specifications shall be listed in Attachment 8 for Techno commercial Bid.

(i) **Attachment 9: Bought-out & Sub-Contracted Item**

(j) **Attachment 10: Work Completion Attachment**

(k) **Attachment 11: List of Special Tools & Tackles**

(l) **Attachment 12: Information regarding ex-employees of Employer in Bidder’s firm.**

(m) **Attachment 13: Deleted.**

(n) **Attachment 14: Price Adjustment Data**

(o) **Attachment 15: Guarantee Declaration**
Section -II  Instructions To Bidders (ITB)                                                            Page 6 of 26

(p) **Attachment 16: Integrity Pact**

Integrity Pact *(submission of Hard Copy in ‘Original’)*
The Bidder shall complete the accompanying Integrity Pact, which shall be applicable for bidding as well as contract execution, duly signed on each page by the person signing the bid and shall be returned by the Bidder in two (2) originals alongwith the Techno - Commercial Part in a separate envelope, duly superscripted with ‘Integrity Pact’. “The Bidder shall submit the Integrity Pact on a non judicial stamp paper of Rs. 100/-.

The required format for Integrity Pact shall be as per Attachment 16.

If the Bidder is a partnership firm or a consortium, the Integrity Pact shall be signed by all the partners or consortium members.

Integrity Pact must be submitted in physical form at the address given at ITB 25.0 at or before the schedule time and date of opening of Techno-commercial part of the bid.

Bidder’s failure to submit the Integrity Pact duly signed in Original alongwith the Bid or subsequently pursuant to ITB Sub-Clause 27.6 shall lead to outright rejection of the Bid.

(q) **Attachment 17: Deleted**

(r) **Attachment 18: Checklist**
(Bidder shall submit the information regarding documents submitted by them in the offer as per the checklist provided in Attachment)

(s) **Attachment 19: Affidavit of Self certification regarding Local Content in line with PPP-MII order (submission of Hard Copy in ‘Original’), to be submitted on a non-judicial stamp paper of Rs. 100/-.

In line with the MOP order dt. 16.11.2021 read in conjunction with PPP-MII order 16.09.2020 & their latest amendments thereof, 'Class-I local supplier' shall be required to indicate percentage of local content and submit self-certification, in original, certifying that the item offered meets the local content requirement for 'Class-I local supplier' and shall also give details of the location(s) at which the local value addition is made, as prescribed in the PPP-MII Order dt. 16.09.2020 & their latest amendments thereof, on a non-judicial stamp paper of Rs. 100/-.

Any False declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151(iii) of the General Financial Rules along with such other actions as may be permissible under law.

(t) **Attachment 20: Certificate from statutory auditor or cost auditor of the company giving the percentage of Local Content, in line with PPP-MII order and MoP Order, as applicable (submission of Hard Copy in ‘Original’)) to be submitted on the letter head of the auditor/ cost accountant.

In line with the MOP order dt. 16.11.2021 read in conjunction with PPP-MII order dated 16.09.2020 & their latest amendments thereof, the 'Class-I local supplier' shall submit certificate on the letter head of the auditor/cost accountant from the statutory auditor or cost auditor of the company giving the percentage of local content.
Any False declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151(iii) of the General Financial Rules along with such other actions as may be permissible under law.

(u) Attachment 21: Undertaking for not indulging in Corrupt & Fraudulent practice

It shall be the sole responsibility of bidder to provide the information based on the documents submitted by them.

(v) Attachment 22: Certification by the Bidder as per DoE Order no- F.No.7/10/2021-PPD(1) dt 23.02.2023 in line with ITB Clause 1.2.2 (In case of a Joint Venture bid, the declaration shall be given by all partners of the Joint Venture).

Any false certificate given by a bidder whose bid is accepted will let to immediate termination and further legal action in accordance with law.

(w) Attachment 23: Details of Type test Report as per QR and in accordance with latest IEC/NIT.

(x) Attachment 24: Undertaking for Dynamic Short Circuit Test for Transformer.

11.0 SCOPE OF THE PROPOSAL

11.1 The scope of the work covered under this package shall be on the basis of a single Bidder’s responsibility, completely covering all the equipment specified under the section Project, Volume-II. It will include the following: -

a. Complete manufacture including shop testing.
b. Providing Engineering drawing, data, operational manual, etc for the Owner’s approval.
c. Packing and transportation from the manufacturer’s works to the site.
d. Receipt, storage, preservation and conservation of equipment at the site.
e. Pre-assembly, if any, erection, testing and commissioning of all equipment.
f. Reliability tests and performance and guarantee tests on completion of commissioning and
g. Furnishing of spares, if applicable.

The above scope of work is indicative and the complete scope of work is defined in section project, Volume-II of this tender document.

11.2 Bids containing deviations from critical provisions relating to (i) to (xi) below will be considered as non responsive:

(i) Governing Laws, Clause 5, CC
(ii) Settlement of Disputes, Clause 6, CC
(iii) Taxes and Duties, Clause 14, CC
(iv) Appendix 2 to the Form of Contract Agreement (Price Adjustment): Clause No. 15 ITB
(v) Bid Security: Clause 23.0, Section ITB Volume-I, conditions of contract
(vi) Contract Performance Guarantee: Clause 43.0, Section ITB, Volume-I, Conditions of Contract.
(vii) Liquidated Damages & (Functional Guarantee): Clause 28 & 28.5 CC
(viii) Defect Liability: Clause No. 27 CC
(ix) Price Basis and Payment: Clause No.12 CC and Clause 14 Section ITB
(x) Completion Time : Section F&P Appendix-4
(xi) Patent Indemnity, Clause No.29, CC

However, the Bidders, wishing to propose deviations to any of the above provisions, must provide in the Commercial Deviations Attachment of Bid Form in their bid alongwith the cost of withdrawal of such deviations. If the deviation to any of these provisions is not priced, the bid will be rejected. The evaluated cost of the bid shall include, in addition to the cost described in Price schedule, the cost of withdrawal of the deviations from the above provisions to make the bid fully compliant with these provisions.

Bidders are also required to quote the price for Commercial, contractual and Technical obligations outlined in the bidding document. If a Bidder wishes to make a deviation, such deviation shall be listed in deviation Attachment of Volume-III. The Bidder shall also provide additional price, if any, for withdrawal of the deviations. If the deviation to any of these provisions is not priced, the bid will be rejected.

At the time of Award of Contract, if so desired by the owner, the Bidder shall withdraw these deviations listed in commercial deviation Attachment of Bid Form in their Bid at the cost of withdrawal stated by him in the bid. In case the Bidder does not withdraw the deviations proposed by him, if any, at the cost of withdrawal stated by him in the bid, his bid will be rejected and his bid security forfeited.

The owner’s determination of a bid’s responsiveness is to be based on the contents of the bid itself without recourse to extrinsic evidence.

11.3 Bids not covering the above entire scope of works may be treated as incomplete and hence rejected.

12.0 BID PRICE

12.1 The Bidder shall quote in the appropriate Attachment of Bid form lump-sum price for the entire scope of works (covered under the Bidding document) and also the unit rates of the goods and services

12.2 The Bid price under the contract shall be on a firm price basis, unless otherwise specified in the conditions of contract.

12.3 The Bidder shall also furnish the price break-up in the appropriate Attachments of bid form to indicate the following:

i. Ex-works price of the equipment/materials (including tools and tackles etc.)
ii. Charges for transportation and insurance for delivery of the equipment/ materials up to their final destinations.
iii. Lump-sum charges towards unloading, storage, insurance, erection, testing & commissioning, exclusive of taxes and duties as per GST.
iv. Price break-up for spares, if applicable, in line with clause 17.0 of this section.
v. Taxes and duties and any other levies legally payable on the transactions between the owner and the Bidder.
vi. Any other charges as per the requirement of conditions of contract/Technical specifications.

12.4 Bidder can effect reductions in the prices already filled up in Price Schedules by way of discounts. Bidder can offer the discount either on lump sum basis or percent basis, which can be made applicable either on the total price or one or more of the price schedule(s).

The Bidder may note that in case they choose to offer multiple discounts, all discounts shall be applicable simultaneously on the base prices of respective items on which the bidder has offered the discount(s) i.e., all the discounts shall be considered together on the Quoted Prices of such items (as quoted by the bidder without discount).

12.5 Examination of the bid shall be in accordance to Clause 34 of Section ITB.

13.0 ALTERNATE PROPOSALS

13.1 Based on their experience, capabilities, patented research, and development works etc., the bidder may, in addition to a base proposal, offer alternate proposal(s), for reasons of economy or better performance. But in all such cases, the base proposal shall be strictly in line with the requirements as stipulated in the bidding documents and only such base proposal shall be considered for the purposes of evaluation of the proposals. Should the bid by the successful bidder contain such alternate proposal then the owner at its discretion may accept the same at the time of award of contract.

14.0 PRICE BASIS AND PAYMENTS

14.1 The bidders shall quote in their proposals lump-sum price for the entire scope of works covered under section Project, Volume-II as required in the Bid Forms on a firm price basis unless otherwise specified in the Conditions of Contract. Bidders quoting a system of pricing other than that specified run the risk of rejection.

14.2 Bidder shall indicate bid prices in Indian Rupees only.

15.0 PRICE ADJUSTMENT: Refer BDS

16.0 TIME SCHEDULE

16.1 The basic consideration and the essence of the contract shall be strict adherence to the time schedule for performing the specified works.

16.2 The Owner’s requirements of completion schedule for the works are mentioned in the accompanying conditions of contract.

16.3 The completion schedule as stated in the Conditions of Contract shall be one of the major factors in consideration of the bids.

16.4 The Owner reserves the right to request for a change in the work schedule during pre-award discussions with successful Bidder.

16.5 The Successful Bidder will be required to prepare detailed PERT network and finalize the same with the Owner as per the requirement of Clause 18.0, Section CC, Vol-I.
17.0 SPARE PARTS

17.1 In case where it is mandatory for the bidders to quote for certain identified spare parts, the same are included in the accompanying Technical Specifications. In such cases the item wise price breakdown of such spares on an Ex-works basis shall be indicated in the bid. The Bidder shall further indicate item wise price break-up on FOR site basis. In respect of Taxes, the provisions of Clause 14.0 CC shall be applicable. The above prices shall not be included in the lump-sum price but indicated separately in the Attachments and shall not be subject to escalation. The prices quoted for these spares will be taken into account for evaluation. The owner, however, reserves the right to vary the quantity of any of the spare and/or to delete any items of spares altogether or add new items of spares during award/detailed engineering stage limited to a period of six (6) months from date of contract unless such period is specified otherwise in conditions of contract at the unit rate agreed to in the contract or to be agreed mutually in case unit rates are not identified in the Bid/Contract.

17.2 In addition, the Bidder shall provide in the form of Attachment given in Bid Forms, the complete list of recommended spare parts for three (3) years operation of the equipment covered under the Proposal. In the list of recommended spare parts, the bidder shall identify the unit-wise population of each of the items recommended and anticipated normal life of the spare. Such list will also indicate the prices on FOR destination site basis for each item. No other basis of prices will be quoted. The prices of these spare parts shall be on firm price basis and shall remain valid till 120 days after the date on which the validity of the main bid expires. The prices of the spare parts thus quoted shall not be taken into consideration for the purpose of evaluation. Other relevant terms and conditions of these documents shall also be applicable to such spare parts.

17.3 Spare parts list will be used by the owner to decide about the spares to be procured against his spares requirement for equipment quoted. The quantities of the spares to be procured shall be decided by the owner and the Bidder shall furnish all those spares ordered.

17.4 In case where no mandatory spares are indicated, the Bidder shall comply with the requirement indicated in Clause 17.2 through 17.3 above.

18.0 CONTRACT QUALITY ASSURANCE

18.1 The Bidder shall include in his Proposal the Quality Assurance Programme containing the overall quality management and procedures, which he proposes to follow in the performance of the works during various phases as detailed in relevant clause of the General Technical Conditions.

18.2 At the time of Award of Contract, the detailed Quality Assurance Programme to be followed for the execution of the contract will be mutually discussed and agreed to and such agreed Programme shall form a part of the Contract.

19.0 INSURANCE

19.1 The Bidder’s insurance liabilities pertaining to the scope of works are detailed out in Clauses titled ‘Insurance’ in Conditions of Contract (CC) of this Volume- I. Bidder’s attention is specifically invited to these clauses. Bid price shall include all the cost in pursuance of fulfilling all the insurance liabilities under the Contract.
20.0 MAINTENANCE TOOLS AND TACKLES

The Proposal shall include all special tools and tackles required for the operation and maintenance of the equipment in each equipment package. The Bidder shall indicate all the above items in the Proposal sheets in the form of an Attachment given there in and the description and the quantity of each item. The lump sum price to be quoted by the Bidder shall include prices of these tools and tackles. These tools and tackles shall be delivered at site along with the last consignment of equipment and in no case earlier than this, unless otherwise specified in the Conditions of Contract and/or Technical Specifications, Volume-II.

21.0 ERECTION TOOLS & TACKLES

The Bidder, under a separate Attachment, in his Proposal shall include a list of all special equipment, tools & tackles etc. which he proposes to bring to site for the purpose of erection, handling, testing and commissioning including performance & guarantee tests of the equipment. If any such equipment is listed anywhere else in the Proposal and not specially mentioned in the above Attachment, it shall be deemed to have been included in the Bidder’s proposed scope of supply.

22.0 BRAND NAMES

22.1 The specific reference in these specifications and documents to any Material / Equipment by brand name, make or catalogue number shall be construed as establishing standards of quality and performance and not as limiting competition. However, Bidders may offer other similar material/equipment provided they meet the specified standard, design and performance requirements. The Bidder shall furnish adequate technical information about such alternative material/equipment to enable the owner to determine its acceptability. The Owner shall be the sole judge on the acceptability or otherwise of such alternative material/equipment.

22.2 The Bidder shall note that standards for workmanship, material and equipment and reference to brand names or catalogue numbers designated by the Owner in its Technical Specifications are intended to be descriptive only and not restrictive. The Bidder may substitute alternative standards, brand name and/or catalogue numbers in its bid, provided that it demonstrates to the Owner’s satisfaction that the substitutions are substantially equivalent or superior to those designed in the Technical Specifications.

23.0 BID SECURITY

23.1 The Bidder shall furnish, as part of its bid, Bid Security for an amount as specified in the BDS Bid security shall be valid for 60 days beyond validity of the bid.

23.2 The Bid Security is required to protect the Owner against the risk of Bidder’s conduct, which would warrant the guarantee forfeiture, pursuant to Clause 23.7. The Bid Security shall be made payable to the Owner without any condition whatsoever.

23.3 The Bid Security shall be denominated in Indian Rupees only and shall be in one of the following forms:

(a) DD/Pay Order/FD/Insurance Surety Bonds receipt in favour of Delhi Transco Limited New Delhi, payable at New Delhi, from a Scheduled Commercial Bank.
(b) E-payment from the account of the bidder. The detail of DTL’s Bank account is as under:

<table>
<thead>
<tr>
<th>Name</th>
<th>Delhi Transco Ltd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Bank with Address</td>
<td>SBI, Chandni Chowk Delhi.</td>
</tr>
<tr>
<td>Current Account No.</td>
<td>10820056547</td>
</tr>
<tr>
<td>Codes</td>
<td>RTGS/IFSC No : SBIN0000631</td>
</tr>
<tr>
<td></td>
<td>MICR No : 110002018</td>
</tr>
</tbody>
</table>

(c) An irrevocable Bank Guarantee (including e-Bank Guarantee) issued by a Scheduled Commercial Bank in favour of Delhi Transco Limited, New Delhi & BG (Bank Guarantee) should be valid for minimum 240 days from date of opening of tender. Performa for the Bank Guarantee is enclosed as Annexure-I, Section Forms & Procedure to this Volume-I.

23.4 Any bid not secured in accordance with paras 23.1 and 23.3 above will be rejected by the Owner as non-responsive.

23.5 EMD/Bid Security may be returned to bidders (except L-1 bidder), after opening of price bids and recommendation of L-1 bidder for award/negotiation.

23.6 The successful Bidder’s Bid Security will be discharged/returned upon the Bidder’s executing the Contract and furnishing the Performance Security/ Guarantee pursuant to Clause 43.0 of ITB. The amount of Bid Security in whole or any part thereof is liable to be forfeited due to its non submission of performance security/guarantee or non-execution of contract.

23.7 The Bid Security may be forfeited:

a) If a Bidder withdraws/ modifies his bid after opening during the period of bid validity specified by the Bidder on the Bid Form;
   or
   In case the Bidder does not withdraw the deviations proposed by him, if any, even after considering the cost of withdrawal stated by him in the bid;
   or
   If a Bidder does not accept the corrections to its bid price pursuant to Clause 35.0, A and B, Section-ITB;
   or
   If, as per the Qualifying Requirements the Bidder has to submit a Deed of Joint Undertaking (if any) and bidder fails to submit the same, duly attested by Notary Public of the place(s) of the respective executant(s) or registered with the Indian Embassy/ High Commission in that country, within ten days from the date of intimation of pre-award discussion.

b) In case of a successful Bidder, if the Bidder fails within the specified time limit,
   (i) to sign the Contract, in accordance with NIT.
      or
   (ii) to furnish the Performance Security/ Guarantee, in accordance with NIT.

23.8 The Scanned copy of Bid Security is to be submitted with online bid, however, the Bid Security shall be submitted in separate sealed envelope in one original and two copies in the Tender Opening Cell (Refer BDS) / at least one and half hour before the time of bid opening.
Any bid not accompanied by the required bid security in accordance with provisions of this clause will be rejected by the Owner and bid shall not be opened.

23.9 No interest shall be payable by the Owner on the above Bid Security.

23.10 Bid security is required from all the bidders except Startups, Micro and Small Enterprises (MSEs)/NSIC registered firms as notified by Department of Micro, Small and Medium Enterprises (MSME) and OEM/OES from Govt. organization/PSU.

23.11 Unsuccessful Bidder’s Bid Security will be discharged /returned as promptly as possible after a decision with regard to finalization of the tender or after the expiry of the period of bid validity prescribed by the Owner.

24.0 PERIOD OF VALIDITY OF BIDS

24.1 Bids shall remain valid for 180 days after the date of bid opening prescribed by the Owner unless otherwise specified in the accompanying Conditions of Contract. A bid valid for a shorter period will be rejected by the Owner as non-responsive.

24.2 In exceptional circumstances e.g. expiry of bid validity, the Owner may solicit the Bidder’s consent to an extension of the period of validity of the bid on same terms and conditions otherwise their bid shall not be considered. The request and the response thereto shall be made in writing (including cable or telex). The bid security provided under Clause 23.0 shall also be extended by the same period as the extension in the validity of the Bid. A bidder may refuse the request without forfeiting his bid security. A Bidder granting the request will not be required or permitted to modify its bid.

D. FORMAT OF BID

25.0 The on line offer complete in all respects will be submitted at e-procurement portal of Delhi Govt. website i.e. [http://govtprocurement.delhi.gov.in](http://govtprocurement.delhi.gov.in). In addition to submission of scanned copies of mandatory documents through e-procurement portal, the bidder shall also submit (02) Two copies of the bid in Book Bound form, clearly marking each “Original Bid” and “Copy of bid” including, the signed hard copies of all relevant pre-qualification documents being submitted in support of Bid (all Forms, Annexures etc. Experience certificate and supporting documents copies, type test reports, Guaranteed Technical Particulars, any other documents required as per the bidding document, etc.) and un priced schedule at least one and half hour before the time of bid opening in the Tender Opening Cell (Refer BDS). In the event of any discrepancy between original and copy of the hard bid, the original shall govern. Also in the event of any discrepancy between online bidding documents and the hard copy of the bid, the online bid shall govern. The Price Bid (Part-II) shall not be submitted in hard copy and shall only be uploaded on e-portal of Delhi Govt. website.

25.1 The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to bind the Bidder to the Contract. The letter of authorization shall be indicated by written Power-of-Attorney accompanying the bid. All pages of the bid, except for un-amended printed literature, shall be initialed by the person or persons signing the bid. All pages of the bid shall be numbered.

16.11.2021 & their latest amendments thereof, Certificate from statutory auditor/cost auditor/cost accountant/chartered accountant, giving the percentage of Local Content, under PPP-MII orders and MoP Orders, if applicable shall be submitted in separate envelop.

25.2 The Bidders must submit the qualifying data in (2) two copies, as required in this Instruction to Bidders in a separate envelop sealed and enclosed in the envelope submitting Proposals, super scribed as under:

**QUALIFYING DATA FOR : BID TITLE (Refer BDS)**

25.3 The bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the persons or persons signing the bid.

25.4 Documents to be uploaded on e-procurement portal of Delhi Government while bidding:

The following scanned copies of documents are required to be uploaded:

a) Bid Security
b) GST Registration No.
c) PAN No.
d) EPF Registration No.
e) Registration Certificate of the Company issued from the Competent Authority.
f) Details of technical experience along with performance certificates as per NIT.
g) Financial details as per NIT
h) Bid form, attachments and annexure’s as per NIT
i) Price bid (Only Online)
j) Other documents as per NIT

26.0 SIGNATURE OF BIDS

26.1 The bid must contain the name, residence and place of business of the person or persons making the bid and must be signed and sealed by the Bidder with his usual signature. The names of all persons signing should also be typed or printed below the signature.

26.2 Bid by a partnership must be furnished with full names of all partners and be signed with the partnership name, followed by the signature(s) and designation(s) of the authorized partner(s) or other authorized representative(s).

26.3 Bids by Corporation/Company must be signed with the legal name of the Corporation/company by the President, Managing Director or by the Secretary or other person or persons authorized to bid on behalf of such Corporation/Company in the matter.

26.4 A bid by a person who affixes to his signature the word ‘President’ Managing Director’, ‘Secretary’, ‘Agent’ or other designation without disclosing his principal will be rejected.

26.5 Satisfactory evidence of authority of the person signing on behalf of the Bidder shall be furnished with the bid.

26.6 The Bidder’s name stated on the Proposal shall be exact legal name of the firm.

26.7 Bids not conforming to the above requirements of signing may be disqualified.
27.0 SEALING AND MARKING OF BIDS

27.1 The Bidders shall seal the original and each copy of the bid in an inner and an outer envelope, duly marking the envelopes as “Original” and “Copy”.

27.2 The inner and outer envelopes shall be:

a). Addressed to the Owner at the following address:
Address of Employer, telephone, facsimile numbers & E-mail address: (Refer BDS)

b). bear the name of package, the specification number, Details of Bid Guarantee, Validity of Bid, Name of the Bidder with address and the words “DO NOT OPEN BEFORE date and time of opening as mentioned in web notification”, to be completed with the time and date specified in the Invitation for Bid, pursuant to ITB Sub-Clause 27.2. Other Annexure’s/Performa’s/Attachments shall be enclosed in envelope on which above contents shall be super scribed. The Price Bid (Part-II) shall not be submitted in hard copy, and shall be submitted online only however un priced schedules shall be submitted along with techno commercial bid Part I.

27.3 The inner envelope shall indicate the name and address of the Bidder to enable the bid to be returned unopened in case it is declared “late” or “rejected”.

27.4 If the outer envelope is not sealed and marked as required by para 27.2 above, the Owner will assume no responsibility for the bid’s misplacement or premature opening or its secrecy, but this disclosure will not constitute grounds for bid rejection.

27.5 The Bid Security must be submitted in a separate sealed envelope on which the contents shall be super scribed.

27.6 The Bidder shall submit the sealed bids in Two Part System i.e. PART-I (TECHNO-COMMERCIAL BID- ONLINE AND IN HARD COPY) and PART-II (PRICE BID-ONLINE ONLY). The Integrity Pact shall be submitted in two (2) originals in separate sealed envelope along with bid having marking as “Integrity Pact”. The separate envelopes containing original & copies of PART-I (TECHNO-COMMERCIAL BID)”, and BID SECURITY and Integrity Pact shall then be sealed in an outer envelope.

PART-I (TECHNO-COMMERCIAL BID) - All supporting documents, Attachments, Annexures, Performa, Un-priced Schedules, Bid Form (un-priced) and Bid document except price bid.

PART-II (PRICE BID) - Price Schedules & Bid Form only. (ONLINE ONLY)

28.0 DEADLINE FOR SUBMISSION OF BIDS

28.1 The Bidders are required to submit the bid through e-procurement portal of Delhi Govt. website i.e. http://govtprocurement.delhi.gov.in not later than the time & date mentioned in the Invitation for Bid. In addition to submission of scanned copies of mandatory documents through e-procurement portal, the bidder shall also submit (02) Two copies of the bid in Book Bound form, clearly marking each “Original Bid” and “Copy of bid” including, the signed hard copies of all relevant pre-qualification documents being submitted in support of Bid (all Forms, Annexures etc. Experience certificate, supporting documents copies, type test reports, Guaranteeed Technical Particulars and any other documents required as per the bidding
document, etc.) at least one and half hour before the time of bid opening in the Tender Opening Cell (Refer BDS)./ In the event of any discrepancy between original and copy of the hard bid, the original shall govern. Also in the event of any discrepancy between online bidding documents and the hard copy of the bid, the online bid shall govern. The Price Bid (Part-II) shall not be submitted in hard copy and shall only be uploaded on e-portal of Delhi Govt. website. Bidders have the option of sending the hard copy of the bid by registered post or submitting the bid in person. Bids submitted by telex/telegram will not be accepted. No request from any Bidder to the Owner to collect the Proposals from airlines, cargo agents etc. shall be entertained by the Owner.

28.2 Hard Copy of the bids must be received by the Owner at the address specified under para 27.2, not later than the time & date mentioned in the Invitation for Bid. In the event of the specified date for submission of Bids, being declared a holiday for the Owner, the Bid will be received upto the appointed time on the next working day.

28.3 The Owner may, at its discretion, extend this deadline for the submission of bids by amending the Bidding Documents, in which case all rights and obligations of the Owner and Bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

29.0 LATE BIDS

29.1 Any bid received by the Owner after the time & date fixed or extended for submission of bids prescribed by the Owner, will be rejected and/or returned unopened to the Bidder.

30.0 MODIFICATION AND WITHDRAWAL OF BIDS

30.1 The Bidder may modify or withdraw its bid after the bid’s submission provided that written notice of the modification or withdrawal is received by the Owner prior to the deadline prescribed for submission of bids.

30.2 The Bidder’s modification or withdrawal notice shall be sent by fax/e-mail but it should be followed by a signed confirmation copy by post and such signed confirmation should reach the owner/purchaser not later than the bid submission date and the modified bid prepared, sealed, marked and dispatched in accordance with the provisions of Clause 27.0 clearly identified as such, in two inner envelopes duly marked "Bid Modifications-Original" and "Bid Modifications-Copies." The inner envelopes shall be sealed in an outer envelope, which shall be duly marked "Bid Modifications." The Bidder shall submit one (1) no. original and two (2) no. copies of the same.

Other provisions concerning the marking and dispatch of bid modifications shall be in accordance with ITB Sub-Clauses 27.2, 27.3 and 27.4.

30.3 No bid may be modified or withdrawn after the deadline for submission of bids. Withdrawal of a bid after the deadline for submission of bids will result in forfeiture of bidder’s bid security.

30.4 Notice of withdrawal shall

a) be addressed to the Owner named in Clause. No. 27.2(a) of ITB.

b) bear the name of the package, tender/ specification number, and the words “Bid Withdrawal Notice”
Bid withdrawal notices received after the bid submission deadline will be ignored, and the submitted bid will be deemed to be a validly submitted bid.

31.0 INFORMATION REQUIRED WITH THE PROPOSAL

31.1 The bids must clearly indicate the name of the manufacturer, the type of model of each principal item of equipment proposed to be furnished and erected. The bid should also contain drawings and descriptive materials indicating general dimensions, materials from which the parts are manufactured, principles of operation, the extent of pre-assembly involved, major construction equipment proposed to be deployed, method of erection and the proposed erection organizational structure.

31.2 The above information shall be provided by the Bidder in the form of separate sheets, drawings, catalogues, etc. in (02) two copies.

31.3 Any bid not containing sufficient descriptive material to describe accurately the equipment proposed may be treated as incomplete and hence rejected. Such descriptive materials and drawings submitted by the Bidder will be retained by the Owner. Any major departure from these drawings and descriptive material submitted will not be permitted during the execution of the Contract without specific written permission of the Owner.

31.4 Oral statements made by the Bidder at any time regarding quality, quantity or arrangement of the equipment or any other matter will not be considered.

31.5 Standard catalogue pages and other documents of the Bidder may be used in the bid to provide additional information and data as deemed necessary by the Bidder.

31.6 The Bidder, along with his Proposal, shall submit a list of recommended erection equipment and materials which will be required for the purpose of erection of equipment and materials supplied under the Contract.

31.7 In case the ‘Proposal’ information contradicts specification requirements, the specification requirements will govern, unless otherwise brought out clearly in the Technical Commercial Deviations Attachment.

E. BID OPENING AND EVALUATION

32.0 OPENING OF BIDS BY OWNER

32.1 Two part bids submitted by the bidders shall be opened in two phases. In the first phase, the techno commercial bid (Part-I) shall be opened and the bids of the bidders found techno commercially successful after detailed evaluation shall be opened in the second phase.

In first stage, the Owner will open the Part-I (Techno Commercial Bid) bids in the presence of Bidders’ representatives (up to 2 persons) who choose to attend at the date and time for opening of bids in the Invitation to Bid or in case any extension has been given thereto, on the extended bid opening date and time notified to all the Bidders. The Bidders’ representatives who are present shall sign in a register as well as proforma evidencing their attendance.

Bid Security will be checked and in case Bid Security is not found of required amount or not in acceptable mode, the offer of that particular bidder shall be considered invalid.

On the due date of opening as notified, Bidders, whose Bid Security will be found in order only their Techno Commercial offer will be opened on the date of opening.
32.2 Envelopes marked “WITHDRAWAL” shall be opened first and the name of the Bidder shall be read out. Bids for which an acceptable notice of withdrawal has been submitted pursuant to ITB clause 30.0 shall not be opened.

32.3 The Bidders’ names, bid prices, modifications, bid withdrawals and the presence or absence of the requisite Bid Security and such other details as the Owner, at its discretion, may consider appropriate will be announced at the opening. Subsequently, all envelopes marked “MODIFICATION” shall be opened and the submissions therein read out in appropriate detail. No bid shall be rejected at bid opening except for late bids pursuant to ITB Clause 30.0.

Any bid not accompanied by an acceptable Bid Security shall be rejected by the Owner as being non responsive, pursuant to ITB clause 34.4. The bid guarantee of a Joint Venture must be in the name of all partners in the Joint Venture submitting the bid.

32.4 No electronic recording devices will be permitted during bid opening.

32.5 Bids not opened and read out at bid opening shall not be considered for further evaluation, irrespective of the circumstances.

32.6 After Tenders/Bids have been opened no alterations shall be permitted either in the Tendered/Bid amount or in the specifications or schedule or any altering offer entertained unless and until specifically asked for.

33.0 CLARIFICATION OF BIDS

To assist in the examination, evaluation and comparison of bids the Owner may, at its discretion, ask the Bidder for a clarification of its bid. The request for clarification and the response shall be in writing and no change in the price or substance of the bid shall be sought, offered or permitted.

34.0 PRELIMINARY EXAMINATION

34.1 The Owner will examine the bids to determine whether they are complete, whether required sureties have been furnished, whether the documents have been properly signed and whether the bids are generally in order.

34.2 Prior to the detailed evaluation of PART-I (TECHNO-COMMERCIAL BID), the Owner/Employer will determine whether each bid is of acceptable quality, is generally complete and is substantially responsive to the bidding documents. For purpose of this Clause, a substantially responsive bid is one, which conforms to all the terms and conditions of the Bidding Document without material deviations, objections, conditions or reservations. A material deviation, objection, conditionality or reservation is one (i) that affects in any substantial way the scope, quality or performance of the contract; (ii) that limits in any substantial way, inconsistent with the bidding documents, the Owner's rights or the successful Bidder's obligations under the contract; or (iii) whose rectification would unfairly affect the competitive position of other Bidders who are presenting substantially responsive bids.

The qualified bidders, whose bids are techno-commercially responsive and, who are considered to have the capacity and capability to perform the Contract based on the assessment, if carried out, price bids shall be opened.

The PART-II (PRICE BID) of only those bidders whose TECHNO-COMMERCIAL BID are of acceptable quality shall be opened ONLINE ONLY, thereafter. However technically acceptable party shall be informed for the opening of the Price Bid (Part-II).
34.3 A bid determined as not substantially responsive will be rejected by the Owner and may not subsequently be made responsive by the Bidder by correction of the non-conformity. The Owner’s determination of a bid’s responsiveness is to be based on the contents & compliance of the complete provisions of Techno-Commercial bid itself without recourse to extrinsic evidence.

34.4 The Owner may waive any minor informality or non-conformity or irregularity in a bid, which does not constitute a material deviation, provided such waiver does not prejudice or affect the relative ranking of any Bidder.

35A Detailed Technical & Commercial Evaluation (Part-I)

35A.1 The Owner will carry out a detailed evaluation of the Techno-Commercial (Part-I) of offer to determine whether the Technical/Commercial aspects are in accordance with the requirements set forth in the bidding documents. In order to reach such a determination, the Owner will examine and compare the technical/commercial aspects of the bids on the basis of the information supplied by the bidders, taking into account the following factors:

(a) Overall completeness and compliance with the Techno-Commercial Specifications and Drawings; deviations from the Technical Specifications as identified in Attachment-7 to the bid; suitability of the facilities offered in relation to the environmental and climatic conditions prevailing at the site; and quality, function and operation of any process control concept included in the bid. The bid that does not meet minimum acceptable standards of completeness, consistency and detail will be rejected for non-responsiveness.

(b) Achievement of specified performance criteria by the facilities & Qualifying Requirements as provided in Annexure-A of BDS. The evaluation will also take into account the Bidder's financial, technical and production capabilities.

(c) Type, quantity and long term availability of mandatory and recommended spare parts and maintenance services.

(d) Any other relevant factors, if any, listed in the Bid, or that the Owner deems necessary or prudent to take into consideration.

(e) The bidder has to quote the complete scope of work for the subject package covered under the specifications as stated in the bid document. Bids covering partial scope of work will be treated incomplete and shall be rejected.

(f) Conditional discount(s)/ rebate(s), if any, offered by the bidder shall not be taken into consideration for evaluation. It shall however, be considered in case of award.

(g) The cost of withdrawal of deviations shall also be considered for the purpose of evaluation of Bid.

35A.2 When alternative technical proposal have been permitted and offered in Section-ITB to the bid, the Owner will make similar evaluation of the alternatives, which will be treated in the technical and commercial evaluations as if they were base bids. Where alternatives are not permitted, but have been offered in any event, they shall be ignored.

35B Evaluation of Price Bids (Part-II)

35B.1 The Owner will carry out a detailed evaluation of the Price Bids Part (Part-II) of the bidders found techno-commercially successful. The comparison will be in line with the bidding documents and on the basis of Lump sum price for the entire scope of work under the package. Based on such evaluation, L1 bidder would be decided on the basis of least evaluated cost to the Employer.
The lump sum price shall include:

i) F.O.R. destination (site) price of equipment/materials, including mandatory spares and special tools & tackles (if any) under the package.

ii) Charges for erection, which shall include unloading, handling, storage, insurance, erection, testing & commissioning of the complete equipment/materials under the package and all associated civil works.

The Owner's comparison will also include the costs resulting from application of the evaluation procedures described in ITB Sub-Clause 35B.3.

DTL’s evaluation of a bid, in addition to the lump sum price as above will take into account the applicable taxes, duties & levies payable/reimbursable by the Employer as per provisions of Clause 14.0 of CC, Volume I.

Discount(s)/ rebate(s) offered by the bidder shall be indicated either on lumpsum basis or percent basis. Bidder shall also indicate in his bid, the price component on which the percentage discount is to be applied. In case the price component(s) on which the percentage discount is applicable is not indicated in the bid, then the discount will be adjusted in the total bid price [i.e. proportionately on each price component], for arriving the price of L1 bidder. However, if lumpsum discount is offered, the same shall be adjusted in full from the ex-works price component (by proportionately reducing ex-works price of individual items), for arriving the price of L1 bidder.

35B.2 The Owner's evaluation of a bid will take into account, in addition to the bid prices indicated in Price Schedules, the following costs and factors that will be added to each Bidder's bid price in the evaluation using pricing information available to the Owner, in the manner and to the extent indicated in ITB Sub-Clause 35.B.3 and in the Technical Specifications:

(a) the cost of all quantifiable deviations and omissions from the contractual and commercial conditions and the Technical Specifications as identified in Attachment-5 to 7 to the bid.

(b) compliance with the time Attachment called for in Attachment -10 of Bid price Attachment and evidenced as needed in a milestone Attachment provided in the bid.

(c) Performance and Productivity of the equipments offered

Bidder shall state the guaranteed performance or efficiency in response to Technical Specifications. Equipment offered shall have minimum performance specified in Technical Specifications to be considered responsive. Bids offering Equipments with a performance less that of specified may be rejected.

35B.3 Pursuant to ITB Sub-Clause 35.B.2, the following evaluation methods will be followed:

(a) Contractual and commercial deviations

The evaluation shall be based on the evaluated cost of fulfilling the contract in compliance with all commercial, contractual and technical obligations under this bidding document. In arriving at the evaluated cost, the price of withdrawal of deviations shown in relevant Attachment of the bid, price and other Attachments, will be used. If the deviation to any of the provisions is not priced, the bid will be rejected.
At the time of award of contract, if so desired by the Owner, the bidder will withdraw the deviations listed in relevant deviation Attachments of bid in their bid at the cost of withdrawal stated by him in the bid. In case the bidder does not withdraw the deviations proposed by him in the bid, his bid will be rejected and his Bid Security will be forfeited.

(b) Time Attachment (Program of Performance)

The plant and equipment covered by this bidding are required to be shipped and installed, and the facilities shall have the pre-commissioning completed within the period named in the Bid after the effective date specified in the Contract Agreement. Bidders are required to base their prices on the Time Attachment given in Attachment -10 of Bid Form to the form of Contract Agreement (Time Attachment) or, where no time Attachment is given, on the completion date(s) given in the Bid. No credit will be given for earlier completion. Bid offering completion beyond the named period is liable to be rejected.

(c) If the vendor has quoted higher than the scheduled delivery period the bids will be treated as non-responsive.

Any adjustments in price that result from the above procedures shall be added, for purposes of comparative evaluation only, to arrive at an "Evaluated Bid Price." Bid prices quoted by Bidders shall remain unaltered.

a) Arithmetical/computational errors will be rectified on the following basis.

(i) If there is a discrepancy between the unit price and the total price, which is obtained by multiplying the unit price and quantity of item, or between sub-total and the total price, the unit or sub-total price shall prevail, and the total price shall be corrected.

(ii) Further, if there is a discrepancy between the quantity specified by DTL in the bidding document and the indicated by the bidder in his bid, the former shall be taken to arrive at the computed price.

(iii) In case the unit rate of an item is not quoted but the total price of the item is indicated, the same shall be taken to arrive at the computed price.

(iv) If there is a discrepancy between words and figures (of unit price or sub-total price if total price is not quoted), the amount in words will prevail (Not applicable in case of total quoted price, in that case arithmetically corrected computed price shall prevail).

b) Wherever, as per the bidding documents, any shortfall in the rating and performance requirement of equipment/material/systems attracts consideration of differential price factor and the value of differential loss for evaluation, the same shall be worked out as per the methodology given in the bidding documents, for adding the same to the computed price of the bidders.

c) The value of the differential loss will be added to the computed price of each bidder and the price quoted by the bidder for extra scope of work will be deducted, as discussed above, to arrive at the computed bid price.

d) The computed price arrived at, as above, shall be considered for the purpose of further evaluation as well as award.
If the bidder does not accept the methodology of correction as mentioned above, its bid will be rejected and the bid security will be forfeited in accordance with ITB Clause 23.7.

36.0 DEFINITIONS AND MEANINGS

36.1 For the purpose of evaluation and comparison of bids, the following meanings and definitions will apply.

a) ‘Bid Price’ shall mean the base price quoted by each Bidder in his Proposal for the completed scope of works.

b) ‘Differential Price’ shall mean the summation of the equalizing elements of price for parameter differential or deficiencies in the equipment and services determined from the Bidder’s Proposal.

c) ‘Cost Compensation for Deviations’ shall mean the Rupee value of deviations, which shall be provided by the Bidder with proper justification in his Bid.


36.2 Calculation of Differential Price & Cost Compensation for Deviations, if applicable:

36.2.1 The Differential Price (if applicable) to be added to the Bid Price of each during evaluation and comparison shall be derived as under:

Differential price is not applicable as per technical specification.

37.0 COMPARISON OF BIDS

37.1 Lump-sum price includes all taxes and levies covering both supply of material as well as erection, installation and commissioning. However, while submitting the invoices/bills/running bills, for making payments, bifurcation between taxable amount and applicable taxes should be enumerated on each and every invoices/bills/running bills.

37.2 For comparison purposes all the evaluated bid prices shall be in Indian Rupees as under:

\[ W = M + DP + D \]

Where,

\[ W = \text{Total Comparison Price} \]
\[ M = \text{Bid price in Indian Rupees (Ex-works value of equipment + Components of erection cost + mandatory spares, taxes and duties and other Components, if any).} \]
\[ DP = \text{Differential price in Indian Rupees calculated according to para 36.2.1. (Not Applicable)} \]
\[ D = \text{Cost compensation for deviations.} \]

37.3 All evaluated bid prices of all the Bidders shall be compared among themselves to determine the lowest evaluated bid and, as a result of this comparison; the lowest bid will be term as L1 bidder.
38.0 Purchase preference, Contacting the employer & Award of Contract

38.1 Deleted.

38.1 Purchase Preference:

38.1.1 Deleted.

38.1.2 Deleted.

38.1.3 Verification of local content:

a. The 'Class-I local supplier' at the time of tender, bidding or solicitation in his bid in the given format, shall be required to indicate percentage of local content and provide self-certification that the item offered meets the local content requirement for 'Class-I local supplier' as the case may be. They shall also give details of the location(s) at which the local value addition is made. Further,

b. the 'Class-I local supplier' shall also be required to provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.

38.1.4 Any False declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151(iii) of the General Financial Rules along with such other actions as may be permissible under law.

38.1.5 A supplier who has been debarred by any procuring entity for violation of PPP-MII Order, dt 15.06.2017, 28.05.2018, 29.05.2019, 04.06.2020 & 16.09.2020 & there latest amendments thereof, read in conjunction with MoP Order dt. 20.12.2018, 04.04.2020, 28.07.2020 & 16.11.2021 & their latest amendments thereof (mentioned above) for procurement by any other procuring entity for the duration of the debarment. The debarment for such other procuring entities shall take effect prospectively from the date on which it comes to the notice of other procurement entities.

38.2 CONTACTING THE OWNER

Bid shall be deemed to be under consideration immediately after they are opened and until such time official intimation of award/rejection is made by the Owner to the Bidders. While the bids are under consideration, Bidders and/or their representatives or other interested parties are advised to refrain from contacting by any means, the Owner and/or his employees/representatives on matters related to the bids under consideration. The owner, if necessary, will obtain clarifications on the bids by requesting for such information from any or all the Bidders, either in writing or through personal contacts as may be necessary. Bidders will not be permitted to change the substance of the bids after the bids have been opened.

38.3 Award of Contract

38.3.1 Post-Qualification

38.3.1 The Employer will determine to its satisfaction whether the Bidder selected as Techno-Commercially qualified & lowest bidders considered for award is qualified to satisfactorily perform the contract in terms of the qualifying requirements stipulated in the INB 1.2 and 2.0
38.3.2 The determination will take into account the Bidder's financial, technical and production capabilities, in particular its contract, work in hand, future commitments and current litigation. It will be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder in Attachment 3 to the bid, as well as such other information as the Employer deems necessary and appropriate.

38.3.3 An affirmative determination will be a prerequisite for award of the contract to the Bidder. A negative determination will result in rejection of the Bidder's bid, in which event the Employer will proceed to the next bidder to make a similar determination of that Bidder's capabilities to perform satisfactorily.

39.0 AWARD CRITERIA

39.1 The Owner will award the Contract to the successful Bidders whose bids have been determined to be substantially responsive and lowest bidder considered for award provided further that the Bidders are determined to be qualified to perform the Contract satisfactorily. The owner shall be the sole judge in this regard.

39.2 The Employer may request the Bidder to withdraw any of the deviations listed in Attachment 05 to 07 of the winning bid, at the price shown for the deviation in Attachment 05 to 07 to the bid. Bidder would be required to comply with all other requirements of the Bidding Documents except for those deviations which are accepted by the Employer.

39.3 The Employer reserves the right to vary the quantity of any of the spares and/or delete any items of spares altogether at the time of Award of Contract.

39.4 The mode of contracting with the successful bidder will be as briefly indicated below:
In the case of successful Bidder, the award shall be made as follows:

(i) First Contract: Supply of equipment and materials on the ex-works basis.

(ii) Second Contract: Transportation, storage, insurance, erection, testing and commissioning etc. of equipment/ materials in respect of all the equipments supplied under the "First Contract" and any other services specified in the Contract Documents.
Both contracts will contain a cross fall breach clause specifying that breach of one will constitute breach of the other.

40.0 OWNER’S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS

40.1 The Owner reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to award of contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Owner’s action. DELHI TRANSCO LIMITED reserves the right to waive minor deviations if they do not materially affect the capability of the Bidder to perform the contract.

41.0 NOTIFICATION OF AWARD

41.1 Prior to the expiration of the period of bid validity and extended validity period, if any, the Owner will notify the successful Bidder in writing by registered letter or by cable or telex or
fax or e-mail, that its bid has been accepted which shall be confirmed in writing by bidder. However if confirmation is not received from the bidder the notification shall be deemed to have been accepted by the bidder after expiry of the period mentioned in the notification.

41.2 The notification of award will constitute the formation of the Contract.

41.3 Upon the successful Bidder’s furnishing of Contract performance Guarantee (CPG) pursuant to Clause 43.0 the Owner will promptly notify each unsuccessful Bidder and will discharge its bid security, pursuant to Clause 23.0.

42.0 SIGNING OF CONTRACT

42.1 At the same time as the Owner notifies the successful Bidder that its bid has been accepted, the Owner will send the Bidder the detailed Letter of Award, incorporating all agreements between the parties.

42.2 Within seven (07) days of receipt of the detailed Letter of Award, the successful bidder shall sign and date the same and return it to the Owner, failing which all the terms & conditions of the Letter of Award shall be binding upon the successful bidder and it shall be treated as a binding Contract between Delhi Transco Limited and the successful bidder.

42.3 The Bidder will prepare the Contract Agreement as per the Performa enclosed in Section- Forms & Procedure to this Volume-I and the same will be signed within 30 (thirty) days from the date of Notification of Award.

43.0 CONTRACT PERFORMANCE GUARANTEE

43.1 Within Twenty-Eight (28) days after receipt of the notification of award, the successful Bidder, to whom the work is awarded, shall be required to furnish a Performance Guarantee deposited in the form of Insurance Surety Bonds, Account Payee Demand Draft, Fixed Deposit Receipt from a Commercial bank, Bank Guarantee (including e-Bank Guarantee) from a scheduled Commercial bank or any foreign Bank or subsidiary of a foreign Bank having its branch in India with overall international corporate rating or rating of long term debt not less than A- (A minus) or equivalent by reputed rating agency, in the form attached in Section- Forms & Procedure to this Volume-I in favour of the Owner or online payment in an acceptable form.

The guarantee amount shall be equal to ten percent (10%) of the total Contract Price and it shall guarantee the faithful performance of the Contract in accordance with the terms and conditions specified in these documents and specifications.

Performance Security shall be valid upto defect liability period but initially for 12 months from the date of taking over/operational acceptance. This Performance guarantee shall be renewed periodically every year upto the end of defect liability period. Every renewal of the Performance guarantee shall be done by the contractor one month prior to the expiry date.

Non submission of performance security within the stipulated period will constitute a sufficient ground for the annulment of the award and forfeiture of the bid security.

44.0 Corrupt or Fraudulent Practices

44.1 DTL requires that Bidders/Suppliers/Contractors, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, the DTL:
(a) defines, for the purposes of this provision, the terms set forth below as follows:

(i) "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution; and

(ii) "fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Employer/Owner, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition;

(b) will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

(c) will declare a firm ineligible, either indefinitely or for a stated period of time, if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing this contract.

44.2 Furthermore, Bidders shall be aware of the provision stated in sub-clause 42.2 of the Conditions of Contract.

44.3 Bidder shall furnish undertaking for not indulging in corrupt & fraudulent practice as per Attachment 21.

45 GOODS AND SERVICE TAX

45.1 The bidder shall comply with the provision of section 171 of the GST Act, 2017 and all the benefits accrued to him on account of any reduction in rate of tax on any supply of goods or services will be supplied to DTL under this Tender No. Refer BDS will be passed on to Delhi Transco Limited by way of commensurate reduction in the prices. In future, if anything found contrary, the bidder will be accountable for any contravention of the law and shall indemnify Delhi Transco Limited for the loss suffered on account of not passing the aforesaid benefit.
SECTION-III

BID DATA SHEETS (BDS)
SECTION-III

BID DATA SHEETS (BDS)

The following bid specific data for the Plant and Equipment to be procured shall amend and/or supplement the provisions in the Instruction to Bidders (ITB)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>ITB Clause Ref. No.</th>
<th>Bid Data Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ITB 10.3 (w)</td>
<td>Attachment 23:- Deleted</td>
</tr>
<tr>
<td>2.</td>
<td>ITB 10.3 (x)</td>
<td>Attachment 24: Deleted</td>
</tr>
<tr>
<td>3.</td>
<td>ITB 23.8, ITB 25.0, ITB 28.1</td>
<td>Address for submission of Bid Documents and Bid Opening; Address in Person or by Post: Tender Opening Cell, Delhi Transco Limited, DGM (T) M&amp;S C&amp;MM division, Delhi Transco Limited, Room No.-105, 1st Floor, Rajghat Power House, Pre-fabricated RPH Building, New Delhi-110002 (India), Email: <a href="mailto:dgmms.cmm@dtl.gov.in">dgmms.cmm@dtl.gov.in</a>, <a href="mailto:dgmms105@gmail.com">dgmms105@gmail.com</a></td>
</tr>
<tr>
<td>4.</td>
<td>ITB 6.1, ITB 27.2</td>
<td>Address of the Employer: DGM (T) M&amp;S C&amp;MM division, Delhi Transco Limited, Room No.-105, 1st Floor, Rajghat Power House, Pre-fabricated RPH Building, New Delhi-110002 (India), Email: <a href="mailto:dgmms.cmm@dtl.gov.in">dgmms.cmm@dtl.gov.in</a>, <a href="mailto:dgmms105@gmail.com">dgmms105@gmail.com</a></td>
</tr>
<tr>
<td>5.</td>
<td>ITB 6.1</td>
<td>Clause 6.1 of ITB stands modified as under: A prospective Bidder finding discrepancies or omissions, in specifications and document or is in doubt as to the true meaning of any part; they shall at once make a request, in writing or by electronic media (hereinafter, the term cable is deemed to include Electronic Data Interchange (EDI) or telefax) at the Employer's mailing address within ten (10) days after floating of tender. In case of any changes/modification in the bidding documents due to the above, the same shall be uploaded on the website as part of bidding document.</td>
</tr>
<tr>
<td>6.</td>
<td>ITB 6.5</td>
<td>ITB Clause 6.5- in the office of Delhi Transco Limited, Conference Room, 4th Floor, Shakti Sadan Building, Kotla Road, New Delhi-110002 (India), Email: <a href="mailto:dgmms.cmm@dtl.gov.in">dgmms.cmm@dtl.gov.in</a>, <a href="mailto:dgmms105@gmail.com">dgmms105@gmail.com</a></td>
</tr>
<tr>
<td>S. No.</td>
<td>ITB Clause Ref. No.</td>
<td>Bid Data Details</td>
</tr>
<tr>
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</table>
| 7.     | ITB 15.0            | **For a Completion Period greater than 18 Months Cl. 15 to be followed as under:**  
**Fixed Price:** Prices quoted by the bidder shall be fixed during the Bidder’s Performance of the Contract and not subject to variation on any account except for Power Transformer. A bid submitted with an adjustable price quotation will be treated as non-responsive and rejected, except for Power Transformer.  
**Variable Prices:** 500 MVA Power Transformer shall be governed by latest IEEMA (Indian Electrical & Electronics Manufacturers Association) formula as per Appendix 2 of Form of Contract Agreement, Section Forms & Procedures, Volume-I, Attachment 14 of Section-2, Volume-III. |
| 8.     | ITB 23.1            | **Amount of Bid Security:**  
**In Figures:** 44404840/-  
**In Words:** (Rs. Four Crore forty four Lacs four Thousand eight Hundred and forty Only) |
| 9.     | ITB 25.2            | **BID TITLE:**  
Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis |
| 10.    | ITB 33.1            | **Clause no. 33.1 of ITB:**  
“To assist in the examination, evaluation and comparison of bids the Owner may, at its discretion, ask the Bidder for a clarification of its bid. The request for clarification and the response shall be in writing and no change in the price or substance of the bid shall be sought, offered or permitted.”  
**Shall be read as :**  
“To assist in the examination, evaluation and comparison of bids the Owner may, at its discretion, ask the Bidder for a clarification of its bid. The request for clarification and the response shall be in writing and no change in the price or substance of the bid shall be sought, offered or permitted.  
The bidder shall ensure that its original bid will be complete in all respect before submission.” |
| 11.    | ITB 36, 37          | **Differential price is not applicable as per technical specification.** |
| 12.    | ITB 45.1            | **Tender No. T23P111611** |
Qualifying Requirement of Bidders for Design, Manufacture, Supply, Erection, Testing and Commissioning of 400/220/33 kV Auto Transformer of 500 MVA and/or 315 MVA Capacity.

Qualification of bidder will be based on meeting the minimum pass/fail criteria specified below regarding the Bidder's technical experience and financial position as demonstrated by the Bidder's responses in the corresponding Bid Schedules.

The Employer may assess the capacity and capability of the bidder, to successfully execute the scope of work covered under the package within stipulated completion period. This assessment shall inter-alia include (i) document verification; (ii) bidders work/ manufacturing facilities visit; (iii) manufacturing capacity, details of works executed, works in hand, anticipated in future & the balance capacity available for the present scope of work; (iv) details of plant and machinery, manufacturing and testing facilities, manpower and financial resources; (v) details of quality systems in place; (vi) past experience and performance; (vii) customer feedback; (viii) banker's feedback etc.

Further DTL reserves the right to waive off minor deviation if they do not affect the capability of the bidder to perform the contract. However it does not allow the bidder for any deviation in technical experience & financial capability.

1.0 Technical Experience

1.1 The bidder, should have designed, manufactured, type tested 400kV or above voltage class transformers of at least 500 MVA/ 315 MVA capacity or equivalent capacity in banks of 3 single phase units (capacity of 500MVA or 315MVA shall be applicable as per scope of tender). The bidder should have supplied and commissioned at least 01 (one) number of such transformers during the last seven (07) years as on ending last day of month previous to the one in which the tender is invited and the same should have been in satisfactory operation* for at least two (2) years.

Note:

1. $: For the purpose of qualifying requirement, during the last seven years means that the commissioning date is to be within a period of seven years ending last day of month previous to the one in which the tender is invited.
2. *: Satisfactory Operation means Certificate issued by the Employer certifying the operation without any adverse remark.

1.2 The 400kV or above voltage class Transformer manufacturer(s) who have established production line in India for these equipment(s) based on technological support of parent/ another entity of the same parent/ group/ subsidiary/ sister concern## or collaborator for the respective equipment(s) shall also be considered provided;
(i) Such manufacturer has designed, manufactured, type tested, supplied, installed and commissioned 400 kV or above voltage class transformer and,

(ii) The parent / another entity of the same parent/ group/ subsidiary/ sister concern## or collaborator meets qualifying requirements stipulated at para 1.1 above; and

(iii) The 400kV or above voltage class Transformer manufacturer(s) furnishes:

   a. A legally enforceable undertaking (jointly with the parent / another entity of the same parent/ group/ subsidiary/ sister concern## company or collaborator) to guarantee quality, timely supply, performance and warranty obligations as specified for the equipment(s); and

   b. a confirmation letter from the parent / another entity of the same parent/ group/ subsidiary/ sister concern## or collaborator along with the bid stating that parent / another entity of the same parent/ group/ subsidiary/ sister concern## or collaborator shall furnish performance guarantee for an amount of 10 % of the cost of such equipment(s). This performance guarantee shall be in addition to Contract Performance Guarantee to be submitted by the Bidder.

   **Note**: Sister concern## of bidder means the company which has same parent as that of the bidder.

2.0 Financial Position

The bidder should have adequate financial capability to meet the following minimum criteria:

a) Net Worth requirement of QR

Net Worth for last three financial years should be positive. (Total Assets less Total liabilities shall be positive)

b) Minimum Average Annual Turnover (MAAT) requirement for the last three years of the bidder should not be less than;

(Cost Estimate x 1.5/Completion period in years).

MAAT:- Rs. 1998217786 (Rs. One Hundred ninety nine Crores eighty two Lacs seventeen Thousand seven Hundred eighty six Only)
(For the purpose of arriving at MAAT, total income, except non-recurring income e.g. Sale of fixed assets shall be considered). Further the completion period for calculating MAAT shall be considered as 1 year even if the Contractual Completion period is less than 1 year.

c) Liquid Asset (LA) requirement of
(Cost Estimate x 3/Completion period in months).

LA:- Rs. 333036298/- (Rs. Thirty three Crore thirty Lacs Thirty six Thousand two hundred ninety eight Only)

(For the purpose of arriving at LA, Current Assets less Inventories and prepaid expenses shall be considered i.e. LA=Current Asset-Inventories-Prepaid Expenses) Further, the Completion Period for calculating LA shall be considered as 12 months even if the Contractual Completion period is less than 12 months.

The cost Estimate referred above shall include GST and other taxes & duties.

(d) Relaxation for Start-Ups^/ MSEs

Start-Ups^/ MSEs, meeting the specified requirements at Para 2.0 (a) above in Financial Position shall also be considered qualified if they meet Eighty (80) % of the requirement specified at Para 2.0 (b) & 2.0 (c) above in Financial Position.

^Start-Ups as defined by DIPP, applicable as on ending last day of month previous to the one in which tender is invited.

Note:
In case bidder is a holding company, the financial position criteria referred to in clause 2.0 above shall be of that holding company only (i.e. excluding its subsidiary/ group companies). In case bidder is a subsidiary of a holding company, the financial position criteria referred to in clause 2.0 above shall be of that subsidiary company only (i.e. excluding its holding company)

In case completion period is less than one (1) year the denominator to calculate MAAT and LA shall be considered as one (1) and twelve (12) respectively. The bidders are required to submit Annual Financial Report (Balance Sheet and Profit & Loss A/C) of last three
financial years (ending last day of month previous to the one in which the tender is invited). Annual financial statement should be duly certified by a Chartered Accountant for last three financial years and counter signed by bidders/Authorized signatory.

--End of Section-III (BDS) ---
SECTION-IV

CONDITIONS OF CONTRACT
(CC)
**SECTION-IV**

**Condition of Contract (CC)**

A. **Contract and Interpretation:**

1.0 **Definitions:**

1.1 The following words and expressions shall have the meanings hereby assigned to them:

"**Contract**" means the Contract Agreement entered into between the Employer and the Contractor, together with the Contract Documents referred to therein; they shall constitute the Contract, and the term "the Contract" shall in all such documents be construed accordingly.


"**CC**" means the Conditions of Contract hereof.

"**Day**" means calendar day of the Gregorian Calendar.

"**Month**" means calendar month of the Gregorian Calendar.

"**Employer/Owner**" means the person named as below and includes the legal successors or permitted assigns of the Employer/Owner.

Delhi Transco Ltd.
Shakti Sadan
New Delhi-110002
Fax No. – 011-23232721,
Tel. No. -011-23230026

"**Project Manager**" means the person appointed by the Employer in the manner provided in CC Sub-Clause 17.1 (Project Manager) hereof and named as such in the CC to perform the duties delegated by the Employer.

The Project Manager is: [Name, address, telephone, cable, email-id and facsimile numbers]

"**Contractor**" means the person(s) whose bid to perform the Contract has been accepted by the Employer and is named as such in the Contract Agreement, and includes the legal successors or permitted assigns of the Contractor.

The Contractor is: [Name, address, telephone, cable and facsimile numbers ]

"**Contractor’s Representative**" means any person nominated by the Contractor and named as such in the CC and approved by the Employer in the manner provided in CC Sub-Clause 17.2 (Contractor's Representative and Construction Manager) hereof to perform the duties delegated by the Contractor.

The Contractor’s Representative is: [Name, address, telephone, cable and facsimile numbers]

"**Subcontractor,**" including vendors, means any person to whom execution of any part of the Facilities, including preparation of any design or supply of any Plant and Equipment, is sub-contracted directly or indirectly by the Contractor, and includes its legal successors or permitted assigns.

"**Arbitrator**" means the person or persons appointed by agreement between the Employer and the Contractor to make a decision on or to settle any dispute or difference between the Employer and the Contractor referred to him or her by the parties pursuant to CC Sub-Clause 6.2 (Arbitrator) hereof.

"**Contract Price**" means the sum specified in Article 2.1 (Contract Price) of the Contract Agreement, subject to such additions and adjustments thereto or deductions therefrom, as may be made pursuant to the Contract.
"Facilities" means the Plant and Equipment to be supplied and installed, as well as all the Installation Services to be carried out by the Contractor under the Contract.

"Plant and Equipment" means permanent plant, equipment, machinery, apparatus, articles and things of all kinds to be provided and incorporated in the Facilities by the Contractor under the Contract (including the spare parts to be supplied by the Contractor under CC Sub-Clause 7.3 hereof), but does not include Contractor's Equipment.

"Installation Services" means all those services ancillary to the supply of the Plant and Equipment for the Facilities, to be provided by the Contractor under the Contract; e.g., transportation and provision of marine or other similar insurance, inspection, expediting, Site preparation works (including the provision and use of Contractor's Equipment and the supply of all construction materials required), installation, testing, Pre-commissioning, commissioning, operations, maintenance, the provision of operations and maintenance manuals, training, etc.

"Contractor's Equipment" means all plant, facilities, equipment, machinery, tools, apparatus, appliances or things of every kind required in or for installation, completion and maintenance of Facilities that are to be provided by the Contractor, but does not include Plant and Equipment, or other things intended to form or forming part of the Facilities.

"Site" means the land and other places upon which the Facilities are to be installed, and such other land or places as may be specified in the Contract as forming part of the Site.

"Effective Date" means the date from which the Time for Completion shall be determined as stated in Article 3 (Effective Date for Determining Time for Completion) of the form of Contract Agreement.

"Taking Over" means the Employer's written acceptance of the Facilities under the Contract, after successful Trial – Operation for the specified period in accordance with the Contract.

"Time of completion" means the time within which completion of the Facilities as whole (or of a part of the Facilities where a separate Time for completion of such part has been prescribed) and Taking Over by the employer is to be attained in accordance with the stipulations in the SCC and the relevant provisions of the Contract.

The successful Bidder shall be required to prepare detailed Network(s) and project implementation plans & programmes and finalize the same with the Employer as per requirement specified in Technical Specifications, which shall form a part of the Contract.

Note: No credit will be given for the earlier delivery/ completion and offers with delivery/completion beyond the completion period will be treated as unresponsive.

"Completion" means that the Facilities (or a specific part thereof where specific parts are specified in the CC) have been completed operationally and structurally and put in a tight and clean condition, and that all work in respect of Pre-commissioning of the Facilities or such specific part thereof has been completed and Commissioning has been attained as per Technical Specifications followed by successful Trial – Operation, as provided in CC Clause 24.0 (Completion of Facilities) & 25.0 (Commissioning and Operational Acceptance) hereof.

"Pre-commissioning" means the testing, checking and other requirements specified in the Technical Specifications that are to be carried out by the Contractor in preparation for Commissioning as provided in CC Clause 24 (Completion) hereof.

"Commissioning" means operations of the facilities or any part thereof to be carried out by the Contractor as provided in CC Sub-Clause 25.1 (commissioning) hereof, for the purpose of carrying out Guarantee Test(s).

"Guarantee Test(s)" means the test(s) specified in the Technical Specifications to be carried out to
ascertain whether the Facilities or a specified part thereof is able to attain the Functional Guarantees specified in the Technical Specifications in accordance with the provisions of CC Sub-Clause 25.2 (Guarantee Test) hereof.

"Operational Acceptance" means the acceptance by the Employer of the Facilities (or any part of the Facilities where the Contract provides for acceptance of the Facilities in parts), which certifies the Contractor's fulfillment of the Contract in respect of Functional Guarantees of the Facilities (or the relevant part thereof) in accordance with the provisions of CC Clause 28 (Functional Guarantees) hereof and shall include deemed acceptance in accordance with CC Clause 25 (Commissioning and Operational Acceptance) hereof.

"Defect Liability Period" means the period of validity of the warranties given by the Contractor commencing at Completion of the Facilities or a part thereof, during which the Contractor is responsible for defects with respect to the Facilities (or the relevant part thereof) as provided in CC Clause 27 (Defect Liability) hereof.

'Local content' means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value, in percent.

'Class-I local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-I local supplier' as defined under PPP-MII Order No.P-45021/2/2017-PP (BE-II) dated 16.09.2020.

'Class-II local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-II local supplier' but less than that prescribed for 'Class-I local supplier' as defined under PPP-MII Order No.P-45021/2/2017-PP (BE-II) dated 16.09.2020.

'Non - Local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, has local content less than or equal to 20%, as defined above or as defined under PPP-MII Order No. P-45021/2/2017-PP (BE-II) dated 16.09.2020.

'Minimum local content:' The 'local content' requirement to categorize a supplier as 'Class-I local supplier' is minimum 50%. For 'Class-II local supplier', the 'local content' requirement is minimum 20%. Nodal Ministry/ Department may prescribe only a higher percentage of minimum local content requirement to categorize a supplier as 'Class-I local supplier' / 'Class-II local supplier'. For the items, for which Nodal Ministry Department has not prescribed higher minimum local content notification under the Order, it shall be 50% and 20% for 'Class-I local supplier' / 'Class-II local supplier' respectively.

'L1' means the lowest tender or lowest bid or the lowest quotation received in a tender, bidding process or other procurement solicitation as adjudged in the evaluation process as per the tender or other procurement solicitation.

'Margin of purchase preference' means the maximum extent to which the price quoted by a "Class-I local supplier" may be above the L1 for the purpose of purchase preference.

'Procuring entity' means a Ministry or department or attached or subordinate office of, or autonomous body controlled by, the Government of India and includes Government companies as defined in the Companies Act.

2. Contract Documents

2.1 Subject to Article 1.2 (Order of Precedence) of the Contract Agreement, all documents forming part of the Contract (and all parts thereof) are intended to be correlative, complementary and mutually explanatory. The Contract shall be read as a whole.

3. Interpretation

3.1 Language

3.1.1 All Contract Documents, all correspondence and communications to be given, and all other documentation to be prepared and supplied under the Contract shall be written in English, and the Contract shall be
construed and interpreted in accordance with that language.

3.1.2 If any of the Contract Documents, correspondence or communications are prepared in any language other than the governing language under CC Sub Clause 3.1.1 above, the English translation of such documents, correspondence or communications shall prevail in matters of interpretation.

3.2 **Singular and Plural**
The singular shall include the plural and the plural the singular, except where the context otherwise requires.

3.3 **Headings**
The headings in the CC are included for ease of reference, and shall neither constitute a part of the Contract nor affect its interpretation.

3.4 **Persons**
Words importing persons or parties shall include firms, corporations and government entities.

3.5 **Incoterms**
Unless inconsistent with any provision of the Contract, the meaning of any trade term and the rights and obligations of parties there under shall be as prescribed by Incoterms.

Incoterms means international rules for interpreting trade terms published by the International Chamber of Commerce (latest edition), 38 Cours Albert 1er, 75008 Paris, France.

3.6 **Entire Agreement**
Subject to CC Sub-Clause 16.4 hereof, the Contract constitutes the entire agreement between the Employer and Contractor with respect to the subject matter of Contract and supersedes all communications, negotiations and agreements (whether written or oral) of parties with respect thereto made prior to the date of Contract.

3.7 **Amendment**
No amendment or other variation of the Contract shall be effective unless it is in writing, is dated, expressly refers to the Contract, and is signed by a duly authorized representative of each party hereto.

3.8 **Independent Contractor**
The Contractor shall be an independent contractor performing the Contract. The Contract does not create any agency, partnership, joint venture or other joint relationship between the parties hereto.

Subject to the provisions of the Contract, the Contractor shall be solely responsible for the manner in which the Contract is performed. All employees, representatives or Subcontractors engaged by the Contractor in connection with the performance of the Contract shall be under the complete control of the Contractor and shall not be deemed to be employees of the Employer, and nothing contained in the Contract or in any subcontract awarded by the Contractor shall be construed to create any contractual relationship between any such employees, representatives or Subcontractors and the Employer.

3.9 **Joint Venture or Consortium**
If the Contractor is a joint venture or consortium of two or more firms, all such firms shall be jointly and severally bound to the employer for the fulfillment of the provisions of the Contract and shall designate one of such firms to act as a leader with authority to bind the joint venture or consortium. The composition or the constitution of the joint venture or consortium shall not be altered without the prior consent of the Employer.

3.10 **Non-Waiver**

3.10.1 Subject to CC Sub-Clause 3.10.2 below, no relaxation, forbearance, delay or indulgence by either party in enforcing any of the terms and conditions of the Contract or the granting of time by either party to the other shall prejudice, affect or restrict the rights of that party under the Contract, nor shall any waiver by either party of any breach of Contract operate as waiver of any subsequent or continuing breach of Contract.

3.10.2 Any waiver of a party's rights, powers or remedies under the Contract must be in writing, must be dated and signed by an authorized representative of the party granting such waiver, and must specify the right and the extent to which it is being waived.
3.11 Severability
If any provision or condition of the Contract is prohibited or rendered invalid or unenforceable, such prohibition, invalidity or unenforceability shall not affect the validity or enforceability of any other provisions and conditions of the Contract.

3.12 Country of Origin
"Origin" means the place where the materials, equipment and other supplies for the Facilities are mined, grown, produced or manufactured, and from which the services are provided.

4. Notices
4.1 Unless otherwise stated in the Contract, all notices to be given under the Contract shall be in writing, and shall be sent by personal delivery, airmail post, special courier, cable, telegraph, telex, facsimile, email id or Electronic Data Interchange (EDI) to the address of the relevant party set out in the Special Conditions of Contract, with the following provisions.

Employer’s address for notice purposes: [Name, address and telephone, cable, email-id and facsimile numbers]

Contractor’s address for notice purposes: [Name, address and telephone, cable, email-id and facsimile numbers]

4.1.1 Any notice sent by cable, telegraph, telex, facsimile, email id or EDI shall be confirmed within two (2) days after despatch by notice sent by airmail post or special courier, except as otherwise specified in the Contract.

4.1.2 Any notice sent by airmail post or special courier shall be deemed (in the absence of evidence of earlier receipt) to have been delivered ten (10) days after dispatch. In proving the fact of despatch, it shall be sufficient to show that the envelope containing such notice was properly addressed, stamped and conveyed to the postal authorities or courier service for transmission by airmail or special courier.

4.1.3 Any notice delivered personally or sent by cable, telegraph, telex, facsimile, email id or EDI shall be deemed to have been delivered on date of its despatch.

4.1.4 Either party may change its postal, cable, telex, facsimile or EDI address or addressee for receipt of such notices by ten (10) days' notice to the other party in writing.

4.2 Notices shall be deemed to include any approvals, consents, instructions, orders and certificates to be given under the Contract.

5. Governing Law
5.1 The courts at Delhi shall have the exclusive jurisdiction on all matters. The contract shall be governed and interpreted in accordance with the laws of the employer’s country, i.e. India.

6. Settlement of Disputes

6.1. Adjudicator
Not applicable.

6.2 Arbitration

6.2.1 If at any time any question, dispute or difference shall arise between the Employer and the Contractor in connection with or arising out of the Contract or the carrying out of the Works either party shall be entitled to refer the matter to be finally settled by arbitration in accordance with the following provisions:

6.2.2 The arbitration shall be conducted by three arbitrators. One each to be nominated by the Contractor and the Employer and the third to be appointed as an umpire by both the arbitrators in accordance with the Indian Arbitration Act. If either of the parties fails to appoint its arbitrator within sixty (60) days after receipt of a notice from the other party invoking the Arbitration clause, the arbitrator appointed by the party invoking the arbitration clause shall become the sole arbitrator to conduct the arbitration.
6.2.3 The arbitration shall be conducted in accordance with the provisions of the Indian Arbitration &
Conciliation Act, 1996 or any statutory modification thereof. The venue of arbitration shall be New Delhi,
India.

6.2.4 The arbitration shall be conducted at New Delhi, India. The language of arbitration shall be English.

6.2.5 The Arbitrator(s) shall have full power to open up review and revise:

   a) Any decision of the Employer referred to arbitration, and
   b) Any certificate of the Employer related to the dispute.

6.2.6 The award given by the Arbitrator(s) under the Sub-clauses 6.2.1 & 6.2.3 shall be a speaking award.

6.2.7 Works to Continue

Performance of the Contract shall continue during arbitration proceedings unless the Employer shall
order suspension. If any such suspension is ordered the reasonable costs incurred by the Contractor and
occasioned thereby shall be added to the Contract Price. No payments due or payable by the Employer
shall be withheld on account of pending reference to arbitration.

6.2.8 Time Limit for Arbitration

Formal notice of arbitration must be given to the other party, and where required to the appropriate
arbitration body no later than 90 days after the issue of the Final Certificate of Payment.

6.2.9 Law and Procedure

6.2.9.1 Applicable Law

The law, which is to apply to the Contract and under which the Contract is to be construed, shall be
Indian law.

6.2.9.2 Procedural Law

The law governing the procedure and administration of any arbitration instituted pursuant to Clause 6.0
shall be Indian law.

B. Subject Matter of Contract

7. Scope of Facilities

7.1. Unless otherwise expressly limited in the Technical Specifications, the Contractor’s obligation cover the
provision of all Plant and Equipment and the performance of all Installation Services required for the
design, the manufacture (including procurement, quality assurance, construction, installation, associated
civil works, Pre-commissioning and delivery) of the Plant and Equipment and the installation, completion,
commissioning and performance testing of the facilities in accordance with the plans, procedures,
specifications drawings, codes and any other documents as specified in the Technical specifications. Such
specifications include, but are not limited to, the provision of supervision and engineering services the
supply of labour, materials, equipment, spare parts (as specified in CC sub-clause 7.3 below) and
accessories, Contractor’s Equipment; construction utilities and supplies, temporary materials, structures
and facilities, transportation (including without limitation, unloading and hauling to, from and at the Site);
and storage except for those supplies, works and services that will be provided or performed by the
Employer, as set forth in Appendix-6 (Scope of Works and Supply by the Employer) to the Contract
Agreement.

7.2 The Contractor shall, unless specifically excluded in the Contract, perform all such work and/or supply all
such items and materials not specifically mentioned in the Contract but that can be reasonably inferred
from the Contract as being required for attaining Completion of the Facilities as if such work and/or items
and materials were expressly mentioned in the Contract.

7.3 In addition to the supply of Mandatory Spare Parts included in the Contract, the Contractor agrees to
supply spare parts required for the operation and maintenance of the Facilities for the period specified in
the CC. However, the identity, specifications and quantities of such spare parts and the terms and
conditions relating to the supply thereof are to be agreed between the Employer and the Contractor, and the price of such spare parts shall be that given in Price Schedules, which shall be added to the Contract Price. The price of such spare parts shall include the purchase price thereof and other costs and expenses (including the Contractor's fees) relating to the supply of spare parts.

The Contractor shall ensure the availability of spare parts for the supplied items for a minimum period of fifteen (15) years from operational acceptance by the Employer.

7.4 The Contractor shall carry sufficient inventories to ensure an ex-stock supply of consumable spares for the plant and equipment. Other spare parts and components shall be supplied as promptly as possible, but at the most within six (6) months of placing the order and opening the letter of credit.

7.5 In the event of termination of production of spare parts:

(i) The Contractor shall send advance notification to the Employer of the pending termination, with 2 (two) years time to permit the Employer to procure needed requirements, and

(ii) Following such termination, the contractor shall furnish at no cost to the Employer the blueprints, drawings and specifications of the spare parts, if requested.

8. Time for Commencement and Completion

8.1 The Contractor shall commence work on the Facilities within the period specified in the CC and without prejudice to CC Sub-Clause 26.2 hereof, the Contractor shall thereafter proceed with the Facilities in accordance with the time schedule specified in Appendix 4 (Time Schedule) to the Contract Agreement.

The contractor shall commence work on the facilities from the Effective Date of Contract for determining Time for completion as specified in the contract.

8.2. The Contractor shall attain Completion of the Facilities (or of a part where a separate time for Completion of such part is specified in the Contract) within the time stated in the CC or within such extended time to which the Contractor shall be entitled under CC Clause 40 (Extension of Time for Completion) hereof.

9. Contractor's Responsibilities

9.1 The Contractor shall design, manufacture (including associated purchases and/or subcontracting), install and complete the Facilities with due care and diligence in accordance with the Contract.

9.2 The Contractor confirms that it has entered into this Contract on the basis of a proper examination of the data relating to the Facilities (including any data as to boring tests) provided by the Employer, and on the basis of information that the Contractor could have obtained from a visual inspection of the Site (if access thereto was available) and of other data readily available to it relating to the Facilities as at the date twenty-eight (28) days prior to bid submission. The Contractor acknowledges that any failure to acquaint itself with all such data and information shall not relieve its responsibility for properly estimating the difficulty or cost of successfully performing the Facilities.

9.3 The Contractor shall acquire in its name all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located that are necessary for the performance of the Contract, including, without limitation, visas for the Contractor's and Subcontractor's personnel and entry permits for all imported Contractor's Equipment. The Contractor shall acquire all other permits, approvals and/or licenses that are not the responsibility of the Employer under CC Sub-Clause 10.3 hereof and that are necessary for the performance of the Contract.

9.4 The Contractor shall comply with all laws in force in the country where the Facilities are installed and where the Installation Services are carried out. The laws will include all national, provincial, municipal or other laws that affect the performance of the Contract and bind upon the Contractor. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, damages, claims, fines, penalties and expenses of whatever nature arising or resulting from the violation of such laws by the Contractor or its personnel, including the Subcontractors and their personnel, but without prejudice to CC Sub-Clause 10.1 hereof.

9.5 Any Plant, Material and Services that will be incorporated in or be required for the Facilities and other
supplies shall have their origin as specified under CC Sub-Clause 3.12 (Country of Origin).

9.6 The Contractor shall permit the Employer to inspect the Contractor’s accounts and records relating to the performance of the Contractor.

10. **Employer’s Responsibilities**

10.1 The Employer shall ensure the accuracy of all information and/or data to be supplied by the Employer as described in Appendix 6 (Scope of Works and Supply by the Employer) to the Contract, except when otherwise expressly stated in the Contract.

10.2 The Employer shall be responsible for acquiring and providing legal and physical possession of the Site and access thereto, and for providing possession of and access to all other areas reasonably required for the proper execution of the Contract, including all requisite rights of way, as specified in Appendix 6 (Scope of Works and Supply by the Employer) to the Contract Agreement. The Employer shall give full possession of and accord all rights of access thereto on or before the date(s) specified in Appendix 6.

10.3 The Employer shall acquire and pay for all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the site is located which such authorities or undertakings require the Employer to obtain them in the Employer’s name, are necessary for the execution of the Contract (they include those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract), including those specified in Appendix 6 (Scope of works and supply by the Employer) to the Contract Agreement.

10.4 If requested by the Contractor, the Employer shall use its best endeavors to assist the Contractor in obtaining in a timely and expeditious manner all permits, approvals and/or licenses necessary for the execution of the Contract from all local, state or national government authorities or public service undertakings that such authorities or undertakings require the Contractor or Subcontractors or the personnel of the Contractor or Subcontractors, as the case may be, to obtain.

10.5 Unless otherwise specified in the Contract or agreed upon by the Employer and the Contractor, the Employer shall provide sufficient, properly qualified operating and maintenance personnel, shall supply and make available all raw materials utilities, lubricants, chemicals, catalysts, other materials and facilities, and shall perform all works and services of whatsoever nature, to enable the Contractor to properly carry out Pre-commissioning, Commissioning and Guarantee Tests, all in accordance with the provisions of Appendix 6 (Scope of works and supply by the Employer) to the Contract Agreement at or before the time specified in the program furnished by the Contractor under CC Sub-Clause 18.2 (Program of Performance) hereof and in the manner thereupon specified or as otherwise agreed upon by the Employer and the Contractor.

10.6 The Employer shall be responsible for the continued operation of the facilities after Operational Acceptance, in accordance with CC 25.3

10.7 All costs and expenses involved in the performance of the obligations under this CC Clause 10 shall be the responsibility of the Employer, save those to be incurred by the Contractor with respect to the performance of Guarantee Tests, in accordance with CC Sub-Clause 25.2.

C. **Payment**

11. **Contract Price**

11.1 The Contract Price shall be as specified in Article 2 (Contract Price and Terms of Payment) of the Form of Contract Agreement.

11.2 The Contract Price shall be on lump sum basis. The Contract price shall be adjusted on account of variation in quantity in accordance with clause 39 CC. Further the CIF/Ex-works price component and installation price component shall also be subject to price adjustment in line with the provisions of Appendix 2 to Form of Contract Agreement

11.3 Subject to CC Sub-Clauses 9.2, 10.1 and 35 (Unforeseen Conditions) hereof, the Contractor shall be deemed to have satisfied itself as to the correctness and sufficiency of the Contract Price, which shall, except as otherwise provided for in the Contract, cover all its obligations under the Contract.

12. **Terms of Payment**
12.1 The Contract Price shall be paid as specified in Appendix 1 (Terms and Procedures of Payment) to the Contract Agreement. The procedures to be followed in making application for and processing payments shall be those outlined in the same Appendix 1.

12.2 No payment made by the Employer herein shall be deemed to constitute acceptance by the Employer of the Facilities or any part(s) thereof.

12.3 The currency or currencies in which payments are made to the Contractor under this Contract shall be specified in Appendix 1 (Terms and Procedures of Payment) to the Contract Agreement, subject to the general principle that payments will be made in the currency or currencies in which the Contract Price has been stated in the Contractor's bid.

12.4 All payments shall be made in currency or currencies specified in the corresponding Appendix 1 (Terms and Procedures of Payment) to the Contract Agreement, pursuant to CC 12.3.

13. Securities

13.1 Issuance of Securities
The Contractor shall provide the securities specified below in favor of the Employer at the times, and in the amount, manner and form specified below.

13.2 Advance Payment Security

13.2.1 The Contractor shall, within twenty-eight (28) days of the notification of contract award, provide a security in an amount equal to the advance payment calculated in accordance with Appendix 1 (Terms and Procedures of Payment) to the Contract Agreement, and in the same currency or currencies with a validity of up to the date of completion of Facilities in accordance with CC clause 24.0 and it shall be kept alive till the recovery of the full amount of the advance with interest portion.

13.2.2 The Security shall be in the form provided in the bidding documents or in another form acceptable to the Employer. The security shall be discharged after completion of the facilities or relevant party thereof.

Procedure for effective reduction in the Advance Payment Security:

Recovery of the advance amount shall be made from each running bill proportionately. It should be clearly understood that reduction in the value of security for advance shall not in any way dilute the Contractor’s responsibility and liabilities under the Contract including in respect of the Facilities for which reduction in the value of security is allowed.

13.3 Performance Security

13.3.1 The Bidder shall submit performance security @ 10% of the total contract price for the performance of contact within twenty eight days (28 days) from the issuance of notifications of award. The Material shall not be accepted without depositing performance security.

The performance security is to be deposited in the form of Insurance Surety Bonds, Account Payee Demand Draft, Fixed Deposit Receipt from a commercial Bank, Bank Guarantee (including e-Bank Guarantee) from a commercial Bank or online payment in an acceptable form safeguarding the purchaser’s interest in all respect. Performance security shall be valid up to defect liability period but initially for 12 Months from the date of taking over/operational acceptance. This performance guarantee shall be renewed periodically every year up to the end of defect liability period. Every renewal of performance guarantee shall be done by the contractor one month prior to the expiry date.

The bidder will submit an undertaking to the owner with a copy to the banker issuing the performance bank guarantee that the bidder will renew and submit the bank guarantee within thirty days before the expiry of bank guarantee failing which it shall be encashed and credited in favour of DTL automatically by the banker without waiting for any instructions from DTL.

13.3.2 The performance security shall be in the form of unconditional Bank Guarantee attached hereto in the
Section IV - Sample Forms and Procedures.

13.3.3 Reduction in the security pro rata to the Contract Price of any part of the Facilities is not admissible since separate time for Completion of part of the facilities is not applicable. However, if the Defects Liability Period has been extended on any part of the Facilities pursuant to CC sub-clause 27.8 hereof, the Contractor shall issue an additional security in an amount proportionate to the Contract Price of that part. The Security shall be returned to the Contractor immediately after its expiration, provided, however, that if the Contractor pursuant to CC Sub-Clause 27.10, is liable for an extended warranty obligation, the performance security shall be extended for the period and up to the amount specified in the CC clause 27.

13.3.4 In case of award of the contract to a Joint Venture, the performance security and the Bank Guarantee for advance payment shall be submitted in the name of the Joint Venture and not in the name of the Lead Partner or any Partner(s) of the Joint Venture alone.

13.3.5 No interest on Performance Security Deposit will be payable to the depositors.

13.3.6 Exemption from performance security deposit will not be permitted under any circumstance.

13.4 Issuing Banks
The Advance Payment Security and Performance Security are to be provided by the Contractor in the form of ‘Bank Guarantee’ which should be issued either:

(a) by a reputed bank located in the country of Employer and acceptable to the Employer, or
(b) by a foreign bank confirmed by either its correspondence bank located in the country of Employer which should be reputed and acceptable to the Employer, or
(c) by a Public Sector Bank in the country of Employer.

All banks shall be nationalized and scheduled banks operating in India.

14. Taxes and Duties
14.1 Prices are to be quoted exclusive of GST and GST rate may also be indicated in the price bid and BOQ/un-priced schedule.

14.2 The Contractor shall be entirely responsible for payment of all taxes, duties, license fees and other such levies legally payable/incurred until delivery of the contracted supplies to the Employer. If it is statutory requirement to make deductions towards such taxes and duties or any other applicable taxes and duties, the same shall be made by the owner and a certificate for the same shall be issued to the Contractor.

14.3 The Contractor shall be solely responsible for its Income Tax liabilities and for taxes that may be levied on the Contractor's persons or on earnings of any of his employees and shall hold the owner indemnified and harmless against any claims that may be made against the Employer. The Employer does not take any responsibility whatsoever regarding taxes under Income Tax Act, for the Contractor or his personnel. If it is obligatory under the provisions of the Income Tax Act, deduction of Income Tax at source shall be made by the Employer.

14.4 In respect of transactions between the Employer and the Contractor, the Base Price is inclusive of all cost as well as duties and tax (custom duties & levies, Taxes and duties as per GST Rules) paid or payable on components, raw materials and any other items used /incorporated or to be incorporated in the Plants & Equipments and other final goods & services to be supplied by the contractor under the proposed contract. No separate claim shall be paid by the Employer for taxes and duties included in respect of these items stated herein.

14.5 Taxes, duties and levies as per GST Rules for the goods & Services under ‘transactions’ between contractor & Employer for destination site/state shall not be included in the base price. These amounts will be payable (along with subsequent statutory variation if any) on the supplies made by the Contractor, subject to submission of the documentary evidence indicating the said taxes paid by the contractor and GST credit is transferred to the Employer. But the amount of said taxes shall be limited to the tax liability on the transaction between the employer and the Contractor only. However, Employer will not bear any upward variation in GST rate due to change/disputes in classification relating to HSN/SAC code as quoted by the bidder at a later stage. Employer shall, however, deduct such taxes at source as per the rules and issue Tax Deduction at Source (TDS) Certificate to the Contractor as per the said rules. The Input Tax Credit (ITC) available, if any, under GST as per the relevant Government laws wherever applicable has been taken into account by the Contractor. Reimbursement of GST by the Employer shall be at the rate applicable on the HSN/SAC of the goods/ services supplied by the Contractor to the Employer as
14.6 The Contractor shall comply with all tax laws in force in India. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, interest, damages, claims, fines, penalties and expenses of whatever nature arising or resulting from the violation of such tax laws by the Contractor or its personnel, including the Subcontractors and their personnel.

14.8 For payment in respect of dispatches made directly from Contractor's works, Tax invoices raised by the Contractor shall be accepted as documentary evidence and for payment of GST. The amount of GST as stated in Tax invoice will be paid only after the GST credit is transferred to the Employer. However, the employer from time to time may also verify the payment / deposit of various taxes by the contractor, which the later has already claimed and charged in the previous invoices from the employer against the aforesaid transactions between employer and the contractor.

14.9 In Case the Taxes, Duties and Levies as per GST Rules on transaction between Employer and the Contractor is covered under the Reverse Charge provision full Tax has to be stated / mentioned in the quoted prices/ bid. However, where the Reverse Charge Mechanism Provisions are applicable, DTL shall not pay the applicable tax amount to the contractor and will deposit directly to the Government treasury. To facilitate the bidders, Employer has indicated HSN/SAC code and rate of GST against each item in the price schedule. It shall entirely be the responsibility of the bidder to check the HSN/SAC code and rate of GST given against each item. The bidder may either confirm the HSN and rate of GST or if the bidder opts to classify the item in question under a different HSN/ SAC code or opts to indicate a different rate of GST, bidder may indicate the same in the columns provided. The bidder shall solely be responsible for HSN/SAC classification and the rate of GST of each item. Employer’s liability for the reimbursement of GST shall be GST applicable at the rate as confirmed/ deemed confirmed in the bid and as accepted by the Employer. The Input Tax Credit (ITC) available, if any, under the GST law as per the relevant Govt. policies wherever applicable shall be taken into account by the bidder while quoting bid price.

14.10 For the purpose of the Contract, it is agreed that the Contract Price specified in Article-2 (Contract Price and Terms of Payment) of the Contract Agreement is based on the taxes inclusive of duties, levies and charges prevailing at the date seven (07) days prior to the last date of bid submission. If any rates of Tax including service tax are increased or decreased or, a new Tax is introduced, or/an existing Tax is abolished in the course of the performance of the Contract, which was or will be assessed on the Contractor in connection with performance of the Contract, an equitable adjustment of the Contract price shall be made to take into account any such change by addition to the Contract price or deduction therefrom, as the case may be (changes in law & regulations hereof. However, these adjustments would be applicable to all transactions between the employer and the Contractor for which the taxes and duties are reimbursable by the Employer as per the Contract. These adjustments shall not be applicable on procurement of raw materials, intermediary components etc by the Contractor.

14.11 In respect of raw materials, intermediary components etc forming part of base price of goods & services supplied under the contract, neither the employer nor the Contractor shall be entitled to any claim arising due to increase or decrease in the rate of Tax, introduction of a new Tax or abolition of an existing Tax in the course of the performance of the Contract. However, Employer will not bear any upward variation in GST rate due to change/disputes in classification relating to HSN/SAC code as quoted by the bidder at a later stage.

D. Intellectual Property

15. Copyright

15.1 The copy right in all drawings, documents and other materials containing data and information furnished to the Employer by the Contractor herein shall remain vested in the Contractor or, if they are furnished to the Employer directly or through the Contactor by any third party, including supplies of materials, the copyright in such materials shall remain vested in such third party.

The Employer shall however be free to reproduce all drawings, document and other material furnished to the Employer for all purpose of the Contract including, if required, for operation and maintenance.
16. Confidential Information

16.1 The Employer and the Contractor shall keep confidential and shall not, without the written consent of the other party hereto, divulge to any third party any documents, data or other information furnished directly or indirectly by the other party hereto in connection with the Contract, whether such information has been furnished prior to, during or following termination of the Contract. Notwithstanding the above, the Contractor may furnish to its Subcontractor(s) such documents, data and other information it receives from the Employer to the extent required for the Subcontractor(s) to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor(s) an undertaking of confidentiality similar to that imposed on the Contractor under this CC Clause.

16.2 The Employer shall not use such documents, data and other information received from the Contractor for any purpose other than the operation and maintenance of the Facilities. Similarly, the Contractor shall not use such documents, data and other information received from the Employer for any purpose other than the design, procurement of Plant and Equipment, construction or such other work and services as are required for the performance of the Contract.

16.3 The obligation of a party under CC Sub-Clauses 16.1 and 16.2 above, however, shall not apply to that information which:

(a) now or hereafter enters the public domain through no fault of that party
(b) can be proven to have been possessed by that party at the time of disclosure and which was not previously obtained, directly or indirectly, from the other party hereto
(c) otherwise lawfully becomes available to that party from a third party that has no obligation of confidentiality

16.4 The above provisions of this CC Clause 16 shall not in any way modify any undertaking of confidentiality given by either of the parties hereto prior to the date of the Contract in respect of the Facilities or any part thereof.

16.5 The provisions of this CC Clause 16 shall survive termination, for whatever reason, of the Contract.

E. Execution of the Facilities

17. Representatives

17.1 If the Project Manager is not named in the Contract, then within fourteen (14 days) of the Effective Date, the Employer shall appoint and notify the Contractor in writing of the name of Project manager. The Employer may from time to time appoint some other person as the Project manager in place of the person previously so appointed, and shall give a notice of the name of such other person to the Contractor without delay. The Employer shall take all reasonable care to see that no such appointment is made at such a time or in such a manner as to impede the progress of work on the Facilities. The Project Manager shall represent and act for the employer at all times during the currency of the Contract. All notices, instructions, orders, certificates, approvals and all other communications under the Contract shall be given by the Project Manager, except as herein otherwise provided.

All notices, instructions, information and other communications given by the Contractor to the employer under the Contract shall be given to the Project Manager, except as herein otherwise provided.

17.2 Contractor's Representative & Construction Manager

17.2.1 If the Contractor's Representative is not named in the Contract, then within fourteen (14) days of the Effective Date, the Contractor shall appoint the Contractor's Representative and shall request the Employer in writing to approve the person so appointed. If the Employer makes no objection to the appointment within fourteen (14) days, the Contractor's Representative shall be deemed to have been approved. If the Employer objects to the appointment within fourteen (14) days giving the reason therefor, then the Contractor shall appoint a replacement within fourteen (14) days of such objection, and the foregoing provisions of this CC Sub-Clause 17.2.1 shall apply thereto.

17.2.2 The Contractor's Representative shall represent and act for the Contractor at all times during the currency of the Contract and shall give to the Project Manager all the Contractor's notices, instructions, information and all other communications under the Contract.

All notices, instructions, information and all other communications given by the Employer or the Project Manager to the Contractor under the Contract shall be given to the Contractor's Representative or, in its absence, its deputy, except as herein otherwise provided.
The Contractor shall not revoke the appointment of the Contractor's Representative without the Employer's prior written consent, which shall not be unreasonably withheld. If the Employer consents thereto, the Contractor shall appoint some other person as the Contractor's Representative, pursuant to the procedure set out in CC Sub-Clause 17.2.1.

17.2.3 The Contractor's Representative may, subject to the approval of the Employer (which shall not be unreasonably withheld), at any time delegate to any person any of the powers, functions and authorities vested in him or her. Any such delegation may be revoked at any time. Any such delegation or revocation shall be subject to a prior notice signed by the Contractor's Representative, and shall specify the powers, functions and authorities thereby delegated or revoked. No such delegation or revocation shall take effect unless and until a copy thereof has been delivered to the Employer and the Project Manager.

Any act or exercise by any person of powers, functions and authorities so delegated to him or her in accordance with this CC Sub-Clause 17.2.3 shall be deemed to be an act or exercise by the Contractor's Representative.

17.2.3.1 Notwithstanding anything stated in CC sub-Clause 17.1 and 17.2.1 above, for the purpose of execution of Contract, the Employer and the Contractor shall finalize and agree to a Contract Co-ordination Procedure and all the communication under the Contract shall be in accordance with such Contract Coordination Procedure.

17.2.4 From the commencement of installation of the Facilities at the site until Operational Acceptance, the Contractor's Representative shall appoint a suitable person as the construction manager, (hereinafter referred to as “the Construction Manager”). The Construction Manager shall supervise all work done at the site by the Contractor and shall be present at the site throughout normal working hours, except when on leave, sick or absent for reasons connected with the proper performance of the Contract. Whenever the Construction Manager is absent from the Site, a suitable person shall be appointed to act as his or her deputy.

17.2.5 The Employer may by notice to the Contractor object to any representative or person employed by the Contractor in the execution of the Contract who, in the reasonable opinion of the Employer, may behave inappropriately, may be incompetent or negligent, or may commit a serious breach of the Site regulations provided under CC Sub-Clause 22.3. The Employer shall provide evidence of the same, whereupon the Contractor shall remove such person from the Facilities.

17.2.6 If any representative or person employed by the Contractor is removed in accordance with CC Sub-Clause 17.2.5, the Contractor shall, where required, promptly appoint a replacement.

18. Work Program

18.1 Contractor's Organization

The Contractor shall supply to the Employer and the Project Manager a chart showing the proposed organization to be established by the Contractor for carrying out work on the Facilities. The chart shall include the identities of the key personnel together with the curricula vitae of such key personnel to be employed within twenty-one (21) days of the Effective Date. The Contractor shall promptly inform the Employer and the Project Manager in writing of any revision or alteration of such an organization chart.

18.2 Program of Performance

The form of the program of performance of the Contract shall be in the form of the Critical Path Method (CPM), the PERT network, or other internationally used programs.

Within twenty-eight (28) days after the date of Notification of Award, the Contractor shall prepare and submit to the Project Manager a detailed program of performance of the Contract, made in the form specified in the CC and showing the sequence in which it proposes to design, manufacture, transport, assemble, install and pre-commission the Facilities, as well as the date by which the Contractor reasonably requires that the Employer shall have fulfilled its obligations under the Contract so as to enable the Contractor to execute the Contract in accordance with the program and to achieve completion, commissioning and Acceptance of the Facilities in accordance with the Contract. The program so submitted by the Contractor shall accord with the Time Schedule included in appendix-4 (Time Schedule) to the Contract Agreement and any other dates and periods specified in the Contract. The Contractor shall update and revise the program as and when appropriate or when required by the Project Manager, but
without modification in the Times for Completion given in the CC and any extension granted in accordance with CC Clause 40, and shall submit all such revisions to the Project Manager.

18.3 Progress Report

The Contractor shall monitor progress of all the activities specified in the program referred to in CC Sub-Clause 18.2 (Program of Performance) above, and supply a progress report to the Project Manager every month.

The progress report shall be in a form acceptable to the Project Manager and shall indicate: (a) percentage completion achieved compared with the planned percentage completion for each activity; and (b) where any activity is behind the program, giving comments and likely consequences and stating the corrective action being taken.

18.4 Progress of Performance

If at any time the Contractor's actual progress falls behind the program referred to in CC Sub-Clause 18.2 (Program of Performance), or it becomes apparent that it will so fall behind, the Contractor shall, at the request of the Employer or the Project Manager, prepare and submit to the Project Manager a revised program, taking into account the prevailing circumstances, and shall notify the Project Manager of the steps being taken to expedite progress so as to attain Completion of the Facilities within the Time for Completion under CC Sub Clause 8.2 (Time for Commencement and Completion), any extension thereof entitled under CC Sub-Clause 40.1 (Extension of Time for Completion), or any extended period as may otherwise be agreed upon between the Employer and the Contractor.

18.5 Work Procedures

The Contract shall be executed in accordance with the Contract Documents and the procedures given in the section on Sample Forms and Procedures of the Contract Documents.

The Contractor may execute the Contract in accordance with its own standard project execution plans and procedures to the extent that they do not conflict with the provisions contained in the Contract.

19. Subcontracting

19.1 Appendix 5 (List of Approved Subcontractors) to the Contract Agreement specifies major items of supply or services and a list of approved Subcontractors against each item, including vendors. Insofar as no Subcontractors are listed against any such item, the Contractor shall prepare a list of Subcontractors for such item for inclusion in such list. The Contractor may from time to time propose any addition to or deletion from any such list. The Contractor shall submit any such list or any modification thereto to the Employer for its approval in sufficient time so as not to impede the progress of work on the Facilities. Such approval by the Employer for any of the Subcontractors shall not relieve the Contractor from any of its obligations, duties or responsibilities under the Contract.

19.2 The Contractor shall select and employ its Subcontractors for such major items from those listed in the lists referred to in CC Sub-Clause 19.1.

19.3 For items or parts of the Facilities not specified in Appendix 5 (List of Approved Subcontractors) to the Contract Agreement, the Contractor may employ such Subcontractors as it may select, at its discretion.

20. Design and Engineering

20.1 Specifications and Drawings

20.1.1 The Contractor shall execute the basic and detailed design and the engineering work in compliance with the provisions of the Contract, or where not so specified, in accordance with good engineering practice.

The Contractor shall be responsible for any discrepancies, errors or omissions in the specifications, drawings and other technical documents that it has prepared, whether such specifications, drawings and other documents have been approved by the Project Manager or not, provided that such discrepancies, errors or omissions are not because of inaccurate information furnished in writing to the Contractor by or on behalf of the Employer.
20.1.2 The Contractor shall be entitled to disclaim responsibility for any design, data, drawing, specification or other document, or any modification thereof provided or designated by or on behalf of the Employer, by giving a notice of such disclaimer to the Project Manager.

20.2 Codes and Standards
Wherever references are made in the Contract to codes and standards in accordance with which the Contract shall be executed, the edition or the revised version of such codes and standards current at the date twenty-eight (28) days prior to date of bid submission shall apply unless otherwise specified. During Contract execution, any changes in such codes and standards shall be applied after approval by the Employer and shall be treated in accordance with CC Clause 39.3 (Changes Originating from Contractor).

20.3 Approval/Review of Technical Documents by Project Manager

20.3.1 The Contractor shall prepare (or cause its subcontractors to prepare) and furnish to the Project Manager the documents listed in Appendix-7(List of Documents for Approval or Review) to the Contract Agreement for its approval or review as specified and as in accordance with the requirements of CC sub-Claus 18.2 (Program of Performance).

Any part of the Facilities covered by or related to the documents to be approved by the Project Manager shall be executed only after the Project Manager’s approval thereof.

CC sub-Clause 20.3.2 through 20.3.7 shall apply to those documents requiring the Project Manager’s approval, but not to those furnished to the Project Manager for its review only.

20.3.2 Within twenty one (21) days after receipt by the Project Manager of any document requiring the Project Manager’s approval in accordance with CC Sub-Clause 20.3.1, the Project Manager shall either return one copy thereof to the Contractor with its approval endorsed thereon or shall notify the Contractor in writing of its disapproval thereof and the reasons therefore and the modifications that the Project Manager proposes.

20.3.3 The Project Manager shall not disapprove any document, except on the grounds that the document does not comply with some specified provision of the Contract or that it is contrary to good engineering practice.

20.3.4 If the Project Manager disapproves the document, the Contractor shall modify the document and resubmit it for the Project Manager’s approval in accordance with CC sub-Claus 20.3.2. If the Project Manager approves the documents subject to modification(s), the Contractor shall make the required modifications and the document shall be deemed to have been approved.

The procedure, for submission of the documents by the Contractor and their approval by the Project Manager shall be discussed and finalized with the Contractor.

20.3.5 If any dispute or difference occurs between the Employer and the Contractor in connection with or arising out of the disapproval by the Project Manager of any document and/or any modification(s) thereto that cannot be settled between the parties within a reasonable period, then such dispute or difference may be referred to an Arbitration for determination in accordance with CC Sub Clause 6.2 (Arbitration) hereof. If such dispute or difference is referred to Arbitration, the Project Manager shall give instructions as to whether and if so, how, performance of the Contract is to proceed. The Contractor shall proceed with the Contract in accordance with the Project Manager's instructions, provided that if the Arbitration upholds the Contractor's view on the dispute and if the Employer has not given notice under CC Sub Clause 6.2 (arbitration), then the Contractor shall be reimbursed by the Employer for any additional costs incurred by reason of such instructions and shall be relieved of such responsibility or liability in connection with the dispute and the execution of the instructions as the Arbitration shall decide, and the Time for Completion shall be extended accordingly.

20.3.6 The Project Manager's approval, with or without modification of the document furnished by the Contractor, shall not relieve the Contractor of any responsibility or liability imposed upon it by any provisions of the Contract except to the extent that any subsequent failure results from modifications required by the Project Manager.

20.3.7 The Contractor shall not depart from any approved document unless the Contractor has first submitted to the Project Manager an amended document and obtained the Project Manager's approval thereof, pursuant to the provisions of this CC Sub-Clause 20.3. If the Project Manager requests any change in any already approved document and/or in any document based thereon, the provisions of CC Clause 39 (Change in the
21. **Procurement**

21.1 **Plant and Equipment**

Subject to CC Sub-Clause 18.2, the Contractor shall manufacture or procure and transport all the Plant and Equipment in an expeditious and orderly manner to the Site.

21.2 **Employer-Supplied Plant, Equipment, and Materials**

If Appendix 6 (Scope of Works and Supply by the Employer) to the Contract Agreement provides that the Employer shall furnish any specific items of machinery, equipment or materials to the Contractor, the following provisions shall apply:

21.2.1 The Employer shall, at its own risk and expense, transport each item to the place on or near the Site as agreed upon by the parties and make such item available to the Contractor at the time specified in the program furnished by the Contractor, pursuant to CC Sub-Clause 18.2 (Program of Performance), unless otherwise mutually agreed.

21.2.2 Upon receipt of such item, the Contractor shall inspect the same visually and notify the Project Manager of any detected shortage, defect or default. The Employer shall immediately remedy any shortage, defect or default, or the Contractor shall, if practicable and possible, at the request of the Employer, remedy such shortage, defect or default at the Employer's cost and expense. After inspection, such item shall fall under the care, custody and control of the Contractor. The provision of this CC Sub-21.2.2 shall apply to any item supplied to remedy any such shortage or default or to substitute for any defective item, or shall apply to defective items that have been repaired.

21.2.3 The foregoing responsibilities of the Contractor and its obligations of care, custody and control shall not relieve the Employer of liability for any undetected shortage, defect or default, nor place the Contractor under any liability for any such shortage, defect or default whether under CC Clause 27 (Defect Liability) or under any other provision of Contract.

21.3 **Transportation**

21.3.1 The Contractor shall at its own risk and expense transport all the Plant and Equipment and the Contractor's Equipment to the Site by the mode of transport that the Contractor judges most suitable under all the circumstances.

21.3.2 Unless otherwise provided in the Contract, the Contractor shall be entitled to select any safe mode of transport operated by any person to carry the Plant and Equipment and the Contractor's Equipment.

21.3.3 Upon despatch of each shipment of the Plant and Equipment and the Contractor's Equipment, the Contractor shall notify the Employer by telex, cable, facsimile or Electronic Data Interchange (EDI) of the description of the Plant and Equipment and of the Contractor's Equipment, the point and means of despatch, and the estimated time and point of arrival in the country where the Site is located, if applicable, and at the Site. The Contractor shall furnish the Employer with relevant shipping documents to be agreed upon between the parties.

21.3.4 The Contractor shall be responsible for obtaining, if necessary, approvals from the authorities for transportation of the Plant and Equipment and the Contractor's Equipment to the Site. The Employer shall use its best endeavors in a timely and expeditious manner to assist the Contractor in obtaining such approvals, if requested by the Contractor. The Contractor shall indemnify and hold harmless the Employer from and against any claim for damage to roads, bridges or any other traffic facilities that may be caused by the transport of the Plant and Equipment and the Contractor's Equipment to the Site.

21.4 **Customs Clearance**

The Contractor shall, at its own expense, handle all imported Plant and Equipment and Contractor’s Equipment at the point(s) of import and shall handle any formalities for customs clearance including liabilities for port charges if any, subject to the Employer’s obligations under CC sub-Clause 14.4, provided that if applicable laws or regulations require any application or act to be made by or in the name
of the employer, the employer shall take all necessary steps to comply with such laws or regulations. In
the event of delays in customs clearance due to the fault of the employer, the Contractor shall be entitled
to an extension in the Time for Completion, pursuant to CC Clause 40.

21.5 Delivery and Documents

21.5.1 For Imported Goods

Upon shipment, the Contractor shall notify the Employer and the Insurance company by cable or telex of
the full details of the shipment including Contract number, description of goods, quantity, the vessel, the
bill of lading/Airway Bill number and date, port of loading, date of shipment, port of discharge, etc. The
Contractor shall mail the following documents to the Employer, with a copy to the Insurance Company:

1) Copies of the Contractor’s invoice showing Contract Agreement reference, goods description,
   quantity, unit price, total amount;
2) Original (3/3) and six copies of the negotiable, clean on-board bill of lading/Air way Bill marked
   freight prepaid and six copies of non negotiable bill of lading / Airway Bill;
3) Copies of packing list identifying contents of each package(6 copies);
4) Original insurance policy certification (3 copies);
5) Manufacturer’s / Contractor’s guarantee certificate of Quality;
6) Material Inspection & Clearance Certificate (MICC) for dispatch, issued by the Employer’s
   representative and the Contractor’s factory inspection report, test certificates( 3 copies); and
7) Certificate of origin.

The above documents shall be air mailed/faxed by the Contractor to reach the Employer within one week
from date of shipment to enable the Employer to make progressive payment to the Contractor and also
make necessary arrangement for payment of custom duties etc. The Contractor will be responsible for any
consequent expenses due to delay in furnishing the above documentation.

21.5.2 For Domestic Goods

Upon shipment, the Contractor shall notify the employer and the Insurance Company by cable or telex of
the full details of the dispatch including Contract number, description of goods, quantity, R/R or L/R
number and date, place of loading, date of dispatch etc. The Contractor shall mail the following
documents to the Employer, with a copy to Insurance Company:

1) Copies of the Contractor’s invoice showing Contract Agreement reference, goods description,
   quantity, unit price, total amount(6 copies);
2) Copies of packing list identifying contents of each package(6 Copies);
3) Railway receipt / Receipted LR ;
4) Manufacturer’s / Contractor’s guarantee certificate of Quality.
5) Material Inspection & Clearance Certificate (MICC) for dispatch issued by the Employer’s
   representative and the Contractor’s factory inspection report & test certificate (3 copies) and
   insurance certificate (3 copies); and
6) Certificate of origin.

21.6 Packing

21.6.1 The Contractor shall provide such packing of the Goods as it is required to prevent their damage or
deterioration during transit to their final destination as indicated in the Contract. The packing shall be
sufficient to withstand, without limitation, rough handling during transit and exposure to extreme
temperatures, salt and precipitation during transit and open storage. Packing case size and weights shall
take into consideration, where appropriate, the remoteness of the goods final destination and the absence of
heavy handling facilities at all points in transit.
21.6.2 The packing, marking and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the Contract and, subject to any subsequent instruction ordered by the Employer consistent with the requirements of the Contract.

21.7 Indemnity Bond

For the equipment/material to be provided by the Contractor, it will be the responsibility of the Contractor to take delivery, unload and store the material at Site and execute an Indemnity Bond in favour of the Employer against loss, damage and any risks involved for the full value of the material and obtain authorization letter from Employer as per proforma given at Section-IV. This Indemnity Bond shall be furnished by the Contractor before commencement of the supplies and shall be valid till the scheduled date of Operational Acceptance of the equipment by the Employer.

22. Installation

22.1 Setting Out/Supervision/Labour

22.1.1 Bench Mark: The Contractor shall be responsible for the true and proper setting-out of the Facilities in relation to bench marks, reference marks and lines provided to it in writing by or on behalf of the Employer.

If, at any time during the progress of installation of the Facilities, any error shall appear in the position, level or alignment of the Facilities, the Contractor shall forthwith notify the Project Manager of such error and, at its own expense, immediately rectify such error to the reasonable satisfaction of the Project Manager. If such error is based on incorrect data provided in writing by or on behalf of the Employer, the expense of rectifying the same shall be borne by the Employer.

22.1.2 Contractor's Supervision:

The Contractor shall give or provide all necessary superintendence during the installation of the Facilities, and the Construction Manager or its deputy shall be constantly on the Site to provide full-time superintendence of the installation. The Contractor shall provide and employ only technical personnel who are skilled and experienced in their respective callings and supervisory staff who are competent to adequately supervise the work at hand.

22.1.3 Labour:

(a) The Contractor shall provide and employ on the Site in the installation of the Facilities such skilled, semi-skilled and unskilled labour as is necessary for the proper and timely execution of the Contract. The Contractor is encouraged to use local labour that has the necessary skills.

(b) Unless otherwise provided in the Contract, the Contractor shall be responsible for the recruitment, transportation, accommodation and catering of all labour, local or expatriate, required for the execution of the Contract and for all payments in connection therewith.

(c) The Contractor shall be responsible for obtaining all necessary permit(s) and/or visa(s) from the appropriate authorities for the entry of all labour and personnel to be employed on the Site into the country where the Site is located.

(d) The Contractor shall at its own expense provide the means of repatriation to all of its and its Subcontractor's personnel employed on the Contract at the Site to their various home countries. It shall also provide suitable temporary maintenance of all such persons from the cessation of their employment on the Contract to the date programmed for their departure. In the event that the Contractor defaults in providing such means of transportation and temporary maintenance, the Employer may provide the same to such personnel and recover the cost of doing so from the Contractor.

(e) The Contractor shall at all times during the progress of the Contract use its best endeavors to prevent any unlawful, riotous or disorderly conduct or behavior by or amongst its employees and the labour of its Subcontractors.

(f) The Contractor shall, in all dealings with its labour and the labour of its Subcontractors currently employed on or connected with the Contract, pay due regard to all recognized festivals, official holidays, religious or other customs and all local laws and regulations pertaining to the employment of labour.

22.2 Contractor's Equipment
22.2.1 All Contractors’ Equipment brought by the Contractor onto the Site shall be deemed to be intended to be used exclusively for the execution of the Contract. The Contractor shall not remove the same from the Site without the Project Manager's consent that such Contractor's Equipment is no longer required for the execution of the Contract.

22.2.2 Unless otherwise specified in the Contract, upon completion of the Facilities, the Contractor shall remove from the Site all Equipment brought by the Contractor onto the Site and any surplus materials remaining thereon.

22.2.3 The Employer will, if requested, use its best endeavors to assist the Contractor in obtaining any local, state or national government permission required by the Contractor for the export of the Contractor's Equipment imported by the Contractor for use in the execution of the Contract that is no longer required for the execution of the Contract.

22.3 Site Regulations and Safety

The Employer and the Contractor shall establish Site regulations setting out the rules to be observed in the execution of the Contract at the Site and shall comply therewith. The Contractor shall prepare and submit to the Employer, with a copy to the Project Manager, proposed Site regulations for the Employer's approval, which approval shall not be unreasonably withheld.

Such Site regulations shall include, but shall not be limited to, rules in respect of security, safety of the Facilities, gate control, sanitation, medical care, and fire prevention.

22.3.1 Compliance with Labour Regulations

22.3.1.1 During continuance of the contract, the Contractor and his sub-contractors shall abide at all times by all applicable existing labour enactments and rules made there under, regulations notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. The employees of the Contractor and the Sub-contractor in no case shall be treated as the employees of the Employer at any point of time.

22.3.1.2 The Contractor shall keep the employer indemnified against any action by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments.

22.3.1.3 If the Employer is caused to pay under any law as principal employer such amounts as may be necessary to cause or as observe, or for non observance of the provisions stipulated in the notifications / byelaws / Acts / Rules / regulations including amendments, if any, on the part of the Contractor, the Employer shall have the right to deduct any money due to the Contractor under this contract or any other contract with employer including his amount of performance security for adjusting the aforesaid payment. The Employer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

22.3.1.4 Some major laws along with their latest amendments applicable to establishments engaged in building and other construction works:

a) Workmen Compensation Act 1923: The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

b) Payment of Gratuity Act 1972: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years service or more or on death the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

c) Employee P.F. and Miscellaneous Provision Act 1952: The Act provides for monthly contribution by the employer plus workers @ 10% or 8.33%. The benefits under the Act are:

1) Pension or family pension on retirement or death, as the case may be.
2) Deposit linked insurance on death in harness of the worker.
3) Payment of P.F. accumulation on retirement/death etc.
d) Maternity Benefit Act 1951: The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

e) Contract Labour (Regulation & Abolition) Act 1970: The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by law. The Principal Employer is required to take Certification of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more labour contract labour.

f) Minimum Wages Act 1948: The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provision of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.

g) Payment of Wages Act 1936: It lays down as to by what date the wages are to paid, when it will be paid and what deductions can be made from the wages of the workers.

h) Equal Remuneration Act 1979: The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.

i) Payment of Bonus Act 1965: The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing Rs.3500/- per month or less. The bonus is to be paid to employees getting Rs.2500/- per month or above upto Rs.3500/- per month shall be worked out by taking wages as Rs.2500/-per month only. The Act does not apply to certain establishments. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.

j) Industrial Dispute Act 1947: The Act lays down the machinery the procedure for resolution of Industrial disputes, in what situations a strike or lock out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

k) Industrial Employment (Standing Orders) Act 1946: It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority.

l) Trade Unions Act 1926: The Act lays down the procedure for registration of trade unions of workmen and employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.


n) Inter-State Migrant workmen’s (Regulation of Employment & Conditions of Service) Act 1979: The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home upto the establishment and back, etc.

o) The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996: All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the Building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the government.
Factories Act 1948: The Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

22.3.2 Protection of Environment

The Contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution noise or other causes arising as consequence of his methods of operation.

During continuance of the Contract, the Contractor and his Sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or Notification that may be issued in this respect in future by the State or Central Government or the local authority.

Salient features of some of the major laws that are applicable are given below:

The Water (Prevention and Control of Pollution) Act, 1974, This provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. ‘Pollution’ means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.

The Air (Prevention and Control of Pollution) Act, 1981, This provides for prevention, control and abatement of air pollution. ‘Air Pollution’ means the presence in the atmosphere of any ‘air pollutant’, which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

The Environment (Protection) Act, 1986, This provides for the protection and improvement of environment and for matters connected therewith and the prevention of hazards to human beings, other living creatures, plants and property. ‘Environment’ includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

The Public Liability Insurance Act, 1991: This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and or matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under Environment (Protection) Act, 1986, and exceeding such quantity as be specified by notification by the Central Government.

22.4 Opportunities for Other Contractors

22.4.1 The Contractor shall, upon written request from the Employer or the Project Manager, give all reasonable opportunities for carrying out the work to any other contractors employed by the Employer on or near the Site.

22.4.2 If the Contractor, upon written request from the Employer or the Project Manager, makes available to other contractors any roads or ways the maintenance for which the Contractor is responsible, permits the use by such other contractors of the Contractor's Equipment, or provides any other service of whatsoever nature for such other contractors, the Employer shall fully compensate the Contractor for any loss or damage caused or occasioned by such other contractors in respect of any such use or service, and shall pay to the Contractor reasonable remuneration for the use of such equipment or the provision of such services.

22.4.3 The Contractor shall also so arrange to perform its work as to minimize, to the extent possible, interference with the work of other contractors. The Project Manager shall determine the resolution of any difference or conflict that may arise between the Contractor and other contractors and the workers of the Employer in regard to their work.
22.4.4 The Contractor shall notify the Project Manager promptly of any defects in the other contractors' work that come to its notice, and that could affect the Contractor's work. The Project Manager shall determine the corrective measures, if any, required to rectify the situation after inspection of the Facilities. Decisions made by the Project Manager shall be binding on the Contractor.

22.5 **Emergency Work**
If, by reason of an emergency arising in connection with and during the execution of the Contract, any protective or remedial work is necessary as a matter of urgency to prevent damage to the Facilities, the Contractor shall immediately carry out such work.

If the Contractor is unable or unwilling to do such work immediately, the Employer may do or cause such work to be done as the Employer may determine is necessary in order to prevent damage to the Facilities. In such event the Employer shall, as soon as practicable after the occurrence of any such emergency, notify the Contractor in writing of such emergency, the work done and the reasons therefore. If the work done or caused to be done by the Employer is work that the Contractor was liable to do at its own expense under the Contract, the reasonable costs incurred by the Employer in connection therewith shall be paid by the Contractor to the Employer. Otherwise, the cost of such remedial work shall be borne by the Employer.

22.6 **Site Clearance**

22.6.1 **Site Clearance in Course of Performance:** In the course of carrying out the Contract, the Contractor shall keep the Site reasonably free from all unnecessary obstruction, store or remove any surplus materials, clear away any wreckage, rubbish or temporary works from the Site, and remove any Contractor's Equipment no longer required for execution of the Contract.

22.6.2 **Clearance of Site after Completion:** After Completion of all parts of the Facilities, the Contractor shall clear away and remove all wreckage, rubbish and debris of any kind from the Site, and shall leave the Site and Facilities clean and safe.

22.7 **Watching and Lighting**
The Contractor shall provide and maintain at its own expense all lighting, fencing, and watching when and where necessary for the proper execution and the protection of the Facilities, or for the safety of the owners and occupiers of adjacent property and for the safety of the public.

22.8 **Work at Night and on Holidays**

22.8.1 Unless otherwise provided in the Contract, no work shall be carried out during the night and on public holidays of the country where the Site is located without prior written consent of the Employer, except where work is necessary or required to ensure safety of the Facilities or for the protection of life, or to prevent loss or damage to property, when the Contractor shall immediately advise the Project Manager, provided that provisions of this CC Sub-Clause 22.8.1 shall not apply to any work which is customarily carried out by rotary or double-shifts.

22.8.2 Notwithstanding CC Sub-Claus 22.8.1 or 22.1.3, if and when the Contractor considers it necessary to carry out work at night or on public holidays so as to meet the Time for Completion and requests the Employer's consent thereto, the Employer shall not unreasonably withhold such consent.

23. **Test and Inspection**

23.1 The Contractor shall at its own expense carry out at the place of manufacture and/or on the Site all such tests and/or inspections of the Plant and Equipment and any part of the Facilities as are specified in the Contract.

23.2 The Employer and the Project Manager or their designated representatives shall be entitled to attend the aforesaid test and/or inspection, provided that the Employer shall bear all costs and expenses incurred in connection with such attendance including, but not limited to, all traveling and board and lodging expenses.

23.3 Whenever the Contractor is ready to carry out any such test and/or inspection, the Contractor shall give a reasonable advance notice of such test and/or inspection and of the place and time thereof to the Project Manager. The Contractor shall obtain from any relevant third party or manufacturer any necessary permission or consent to enable the Employer and the Project Manager (or their designated...
representatives) to attend the test and/or inspection. For notification of testing, four weeks shall be deemed as reasonable advance notice.

23.4 The Contractor shall provide the Project Manager with a certified report of the results of any such test and/or inspection.

If the Employer or Project Manager (or their designated representatives) fails to attend the test and/or inspection, or if it is agreed between the parties that such persons shall not do so, then the Contractor may proceed with the test and/or inspection in the absence of such persons, and may provide the Project Manager with a certified report of the results thereof.

23.5 The Project Manager may require the Contractor to carry out any test and/or inspection not required by the Contract, provided that the Contractor's reasonable costs and expenses incurred in the carrying out of such test and/or inspection shall be added to the Contract Price. Further, if such test and/or inspection impedes the progress of work on the Facilities and/or the Contractor's performance of its other obligations under the Contract, due allowance will be made in respect of the Time for Completion and the other obligations so affected.

23.6 If any Plant and Equipment or any part of the Facilities fails to pass any test and/or inspection, the Contractor shall either rectify or replace such Plant and Equipment or part of the Facilities and shall repeat the test and/or inspection upon giving a notice under CC Sub-Clause 23.3. If the inspection is not materialized due to the reasons attributable to contractor then all the expenses including to & fro airfare and TA, DA shall be to the account of the contractor.

23.7 If any dispute or difference of opinion shall arise between the parties in connection with or arising out of the test and/or inspection of the Plant and Equipment or part of the Facilities that cannot be settled between the parties within a reasonable period of time, it may be referred to an Arbitration for determination in accordance with CC Sub-Clause 6.2.

23.8 The Contractor shall afford the Employer and the Project Manager, at the Employer's expense, access at any reasonable time to any place where the Plant and Equipment are being manufactured or the Facilities are being installed, in order to inspect the progress and the manner of manufacture or installation, provided that the Project Manager shall give the Contractor a reasonable prior notice.

23.9 The Contractor agrees that neither the execution of a test and/or inspection of Plant and Equipment or any part of the Facilities, nor the attendance by the Employer or the Project Manager, nor the issue of any test certificate pursuant to CC Sub-Clause 23.4, shall release the Contractor from any other responsibilities under the Contract.

23.10 No part of the Facilities or foundations shall be covered up on the Site without the Contractor carrying out any test and/or inspection required under the Contract. The Contractor shall give a reasonable notice to the Project Manager whenever any such part of the Facilities or foundations are ready or about to be ready for test and/or inspection; such test and/or inspection and notice thereof shall be subject to the requirements of the Contract.

23.11 The Contractor shall uncover any part of the Facilities or foundations, or shall make openings in or through the same as the Project Manager may from time to time require at the Site, and shall reinstate and make good such part or parts.

If any part of the Facilities or foundations have been covered up at the Site after compliance with the requirement of CC Sub-Clause 23.10 and are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating, and making good the same shall be borne by the Employer, and the Time for Completion shall be reasonably adjusted to the extent that the Contractor has thereby been delayed or impeded in the performance of any of its obligations under the Contract.

24. Completion of the Facilities

24.1 As soon as the Facilities or any part thereof has, in the opinion of the Contractor, been completed operationally and structurally and put in a tight and clean condition as specified in the Technical Specifications, excluding minor items not materially affecting the operation or safety of the Facilities, the Contractor shall so notify the Employer in writing.
24.2 Within seven (7) days after receipt of the notice from the Contractor under CC Sub-Clause 24.1, the Employer shall supply the operating and maintenance personnel specified in Appendix 6 (Scope of Works and Supply by the Employer) to the Contract Agreement for Pre-commissioning of the Facilities or any part thereof.

Pursuant to Appendix 6 (Scope of Works and Supply by the Employer) to the Contract Agreement, the Employer shall also provide, within the said seven (7) day period, the raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters required for Pre-commissioning of the Facilities or any part thereof.

24.3 As soon as reasonably practicable after the operating and maintenance personnel have been supplied by the Employer and the raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters if so specified in Appendix-6 (scope of works and supply by the Employer) have been provided by the Employer in accordance with CC Sub-Clause 24.2, the Contractor shall commence Pre-commissioning of the Facilities or the relevant part thereof in preparation for Commissioning.

24.4 As soon as all works in respect of Pre-commissioning are completed and in the opinion of the Contractor, the facilities or any part thereof is ready for commissioning, the contractor shall commence Commissioning as per procedures stipulated in Technical Specification and as soon as Commissioning is satisfactorily completed, the Contractor shall so notify the Project Manager in writing. (Also refer CC 25.2.3)

24.5 The Project Manager shall, within fourteen (14) days after receipt of the Contractor's notice under CC Sub-Clause 24.4, either issue a Completion Certificate in the form specified in the Forms and Procedures section in the bidding documents, stating that the Facilities or that part thereof have reached Completion as at the date of the Contractor's notice under CC Sub-Clause 24.4, or notify the Contractor in writing of any defects and/or deficiencies.

If the Project Manager notifies the Contractor of any defects and/or deficiencies, the Contractor shall then correct such defects and/or deficiencies, and shall repeat the procedure described in CC Sub-Clause 24.4.

If the Project Manager is satisfied that the Facilities or that part thereof have reached Completion, the Project Manager shall, within seven (7) days after receipt of the Contractor's repeated notice, issue a Completion Certificate stating that the Facilities or that part thereof have reached Completion as at the date of the Contractor's repeated notice.

If the Project Manager is not so satisfied, then it shall notify the Contractor in writing of any defects and/or deficiencies within seven (7) days after receipt of the Contractor's repeated notice, and the above procedure shall be repeated.

24.6 If the Project Manager fails to issue the Completion Certificate and fails to inform the Contractor of any defects and/or deficiencies within fourteen (14) days after receipt of the Contractor's notice under CC Sub-Clause 24.4 or within seven (7) days after receipt of the Contractor's repeated notice under CC Sub-Clause 24.5, or if the Employer makes use of the Facilities or part thereof, then the Facilities or that part thereof shall be deemed to have reached Completion as of the date of the Contractor's notice or repeated notice, or as of the Employer's use of the Facilities, as the case may be.

24.7 As soon as possible after Completion, the Contractor shall complete all outstanding minor items so that the Facilities are fully in accordance with the requirements of the Contract, failing which the Employer will undertake such completion and deduct the costs thereof from any monies owing to the Contractor.

25. Commissioning and Operational Acceptance

25.1 Commissioning

25.1.1 Commissioning of the Facilities or any part thereof shall be completed by the Contractor as per procedures detailed in Technical Specifications.

If any Plant and Equipment or any part of the Facilities fails during Commissioning, the Contractor shall either rectify (if fault is minor) or replace such Plant and Equipment or part of the Facilities.
25.1.2 The Employer shall unless otherwise specified in Technical Specifications supply the operating and maintenance personnel and all raw material, utilities, lubricants, chemicals, catalysts, facilities, service and other matters required for Commissioning.

25.1.3 Trial – Operation

25.1.3.1 Trial – Operation of the Facilities or any part thereof shall be commenced by the Contractor immediately after the Commissioning is completed pursuant to CC Sub-Clause 25.1.1

25.1.3.2 Trial – Operation of the Facilities or any part thereof shall be completed by the Contractor for the period specified in Technical Specification (or for a continuous period of 24 hours where such period in not specified in Technical Specification) and as per procedures detailed in Technical Specifications.

25.1.3.3 At any time after the events set out in CC Sub-Clause 25.1.3.2 have occurred, the Contractor may give a notice to the Project Manager requesting the issue of an Taking Over Certificate in the form provided in the Bidding Documents or in another form acceptable to the Employer in respect of the Facilities or the part thereof specified in such notice as on the date of such notice.

25.1.3.4 The Project Manager shall within twenty-one (21) days after receipt of the Contractor's notice, issue an Taking Over Certificate.

25.1.4 Taking Over

25.1.4.1 Upon successful Trial – Operation of the Facilities or any part thereof, pursuant to CC Sub-Clause 25.1.3, the Project Manager shall issue to the Contractor a Taking Over Certificate as a proof of the acceptance of the Facilities or any part thereof. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of Contract after issue of such certificate.

25.1.4.2 If within twenty one (21) days after receipt of the Contractor's notice, the Project Manager fails to issue the Taking Over Certificate or fails to inform the Contractor in writing of the justifiable reasons why the Project Manager has not issued the Taking Over Certificate, the Facilities or the relevant part thereof shall be deemed to have been Taken Over as at the date of the Contractor's said notice.

25.1.4.3 Upon Taking Over of the Facilities or any part thereof, the Employer shall be responsible for the care and custody of the Facilities or the relevant part thereof, together with the risk of loss or damage thereto, and shall thereafter take over the Facilities or the relevant part thereof.

25.2 Guarantee Test

25.2.1 The Guarantee Test (and repeats thereof) shall be conducted by the Contractor after successful trial-operation of the Facilities or the relevant part thereof to ascertain whether the Facilities or the relevant part can attain the Functional Guarantees specified in the Contract Documents. The Contractor’s and Project Manager’s advisory personnel shall attend the Guarantee Test. The Employer shall promptly provide the Contractor with such information as the Contractor may reasonably require in relation to the conduct and results of the Guarantee Test (and any repeats thereof).

25.2.2 If for reasons not attributable to the Contractor, the Guarantee Test of the Facilities or the relevant part thereof cannot be successfully completed within the period from the date of Completion specified in the CC or any other period agreed upon by the Employer and the Contractor, the Contractor shall be deemed to have fulfilled its obligations with respect to the Functional Guarantees, and CC Sub-Clauses 28.2 and 28.3 shall not apply.

The Guarantee Test of the Facilities shall be successfully completed within twenty-six weeks from the date of Completion.

25.2.3 Completion- Guarantee test- acceptance

In the event that the Contractor is unable to proceed with the Pre-commissioning of the Facilities pursuant to Sub-Clause 24.3, or with the Guarantee Test pursuant to Sub-Clause 25.2, for reasons attributable to the Employer either on account of non-availability of other facilities under the responsibilities of other contractor(s), or for reasons beyond the Employer’s control, the provisions leading to “deemed” completion of activities such as Completion of the Facilities, pursuant to CC Sub-Clause 24.6, Operational Acceptance, pursuant to CC Sub-Clause 25.3.4, Contractor’s obligations regarding Defect Liability Period, pursuant to CC Sub Clause 27.2, Functional Guarantee, pursuant to CC Clause 28, Care of
Facilities, pursuant to CC Clause 32, and Suspension, pursuant to CC Sub-Clause 41.1, shall not apply. In this case, the following provisions shall apply.

**25.2.3.1** When the Contractor is notified by the Project Manager that he will be unable to proceed with the activities and obligations pursuant to above Sub-Clause CC 25.2.3, the Contractor shall be entitled to the following:

a) the Time of Completion shall be extended for the period of suspension without imposition of liquidated damages pursuant to CC Sub-Clause 26.2.

b) payments due to the Contractor in accordance with the provisions specified in Appendix I (terms and Procedures of Payment) to the Contract Agreement, which would have not been payable in normal circumstances due to non-completion of the subject activities, shall be released to the Contractor against submission of a security in the form of a bank guarantee of equivalent amount acceptable to the Employer, and which shall become null and void when the Contractor will have complied with its obligations regarding these payments, subject to the provisions of Sub-Clause CC 25.2.3.2 below.

c) the expenses toward the above security and extension of other securities under the Contract, of which validity need to be extended, shall be reimbursed to the Contractor by the Employer.

d) the additional charges toward the care of the Facilities pursuant to CC Sub-Clause 32.1 shall be reimbursed to the Contractor by the Employer for the period between the notification mentioned above and the notification mentioned in Sub-Clause CC 25.2.3.3 below. The provisions of CC sub-Clause 33.2 shall apply to the Facilities during the same period.

**25.2.3.2** In the event that the period of suspension under Sub-Clause CC 25.2.3 actually exceeds one hundred eighty (180) days, the Employer and the Contractor shall mutually agree to any additional compensation payable to the Contractor.

**25.2.3.3** When the Contractor is notified by the Project Manager that the Facilities are ready for Pre-commissioning, the Contractor shall proceed without delay in performing all activities and obligations under the Contract.

**25.3 Operational Acceptance**

**25.3.1** Subject to CC Sub-Clause 25.4 (Partial Acceptance) below, Operational Acceptance shall occur in respect of the Facilities or any part thereof when

(a) the Guarantee Test has been successfully completed and the Functional Guarantees are met; or

(b) the Guarantee Test has not been successfully completed or has not been carried out for reasons not attributable to the Contractor within the period from the date of Completion specified in the CC or any other agreed upon period as specified in CC Sub-Clause 25.2.2 above but successful completion of the facilities has been achieved; or

(c) the Contractor has paid the liquidated damages specified in CC Sub Clause 28.3 hereof; and

(c) any minor items mentioned in CC Sub-Clause 24.7 hereof relevant to the Facilities or that part thereof have been completed.

(e) as built drawings, and operating and maintenance manuals and CD’s etc. as per Technical Specifications of the Bidding Documents are furnished.

**25.3.2** At any time after any of the events set out in CC Sub-Clause 25.3.1 have occurred, the Contractor may give a notice to the Project Manager requesting the issue of an Operational Acceptance Certificate in the form provided in the Bidding Documents or in another form acceptable to the Employer in respect of the Facilities or the part thereof specified in such notice as at the date of such notice.

**25.3.3** The Project Manager shall, after consultation with the Employer, and within twenty-one (21) days after receipt of the Contractor’s notice, issue an Operational Acceptance Certificate.

**25.3.4** If within twenty one (21) days after receipt of the Contractor’s notice, the Project Manager fails to issue the Operational Acceptance Certificate or fails to inform the Contractor in writing of the justifiable
reasons why the Project Manager has not issued the Operational Acceptance Certificate, the Facilities or
the relevant part thereof shall be deemed to have been accepted as at the date of the Contractor’s said
notice.

25.4 Partial Acceptance

25.4.1 If the Contract specifies that Completion and Commissioning shall be carried out in respect of parts of the
Facilities, the provisions relating to Completion and Commissioning including the Guarantee Test shall
apply to each such part of the Facilities individually, and the Operational Acceptance Certificate shall be
issued accordingly for each such part of the Facilities.

25.4.2 If a part of the Facilities comprises facilities such as buildings, for which no Commissioning or Guarantee
Test is required, then the Project Manager shall issue the Operational Acceptance Certificate for such
facility when it attains Completion, provided that the Contractor shall thereafter complete any outstanding
minor items that are listed in the Operational Acceptance Certificate.

F. Guarantees and Liabilities

26. Completion Time Guarantee

26.1 The Contractor guarantees that it shall attain Completion of the Facilities (or a part for which a separate
time for completion is specified in the CC) within the Time for Completion specified in the CC pursuant to
CC Sub-Clause 8.2, or within such extended time to which the Contractor shall be entitled under CC
Clause 40 (Extension of Time for Completion) hereof.

26.2 If the Contractor fails to comply with the Time for Completion in accordance with Clause CC 26 for the
whole of the facilities, (or a part for which a separate time for completion is agreed) then the Contractor
shall pay to the Employer a sum equivalent to half percent (0.5%) of the Contract Price as liquidated
damages for such default and not as a penalty, without prejudice to the Employer's other remedies under
the Contract, for each week or part thereof which shall elapse between the relevant Time for Completio
pursuant to Clause 26.1 above and the date stated in Taking Over Certificate of the whole of the Works
(or a part for which a separate time for completion is agreed) subject to the limit of five percent (5%) of
Contract Price. The Employer may, without prejudice to any other method of recovery, deduct the amount
of such damages from any monies due or to become due to the Contractor. The payment or deduction of
such damages shall not relieve the Contractor from his obligation to complete the Works, or from any
other of his obligations and liabilities under the Contract.

For the application of liquidated damages, the schedule date for Taking Over of the entire system shall be
the basis, and not intermediate schedule milestone.

26.3 No bonus will be given for earlier Completion of the Facilities or part thereof.

27. Defect Liability

27.1 The Contractor warrants that the Facilities or any part thereof shall be free from defects in the design,
ing工程, materials and workmanship of the Plant and Equipment supplied and of the work executed.

27.2 The Defect Liability Period shall be five years from the date of Operational Acceptance of the facilities (or
any part thereof).

If during the Defect Liability Period any defect should be found in the design, engineering, materials and
workmanship of the Plant and Equipment supplied or of the work executed by the Contractor, the
Contractor shall promptly in consultation and agreement with the Employer regarding appropriate
remedying of the defects, and at its cost, repair, replace or otherwise make good (as the Contractor shall, at
its discretion, determine) such defect as well as any damage to the Facilities caused by such defect.

27.3 The Contractor's obligations under this CC Clause 27 shall not apply to

(a) any materials that are supplied by the Employer under CC Sub-Clause 21.2 (Employer-Supplied Plant,
Equipment and Materials), are normally consumed in operation, or have a normal life shorter than the
Defect Liability Period stated herein.

(b) any designs, specifications or other data designed, supplied or specified by or on behalf of the Employer
or any matters for which the Contractor has disclaimed responsibility herein.

(c) any other materials supplied or any other work executed by or on behalf of the Employer, except for the work executed by the Employer under CC Sub-Clause 27.7.

27.4 The Employer shall give the Contractor a notice stating the nature of any such defect together with all available evidence thereof, promptly following the discovery thereof. The Employer shall afford all reasonable opportunity for the Contractor to inspect any such defect.

27.5 The Employer shall afford the Contractor all necessary access to the Facilities and the Site to enable the Contractor to perform its obligations under this CC Clause 27. The Contractor may, with the consent of the Employer, remove from the Site any Plant and Equipment or any part of the Facilities that are defective if the nature of the defect, and/or any damage to the Facilities caused by the defect, is such that repairs cannot be expeditiously carried out at the Site.

27.6 If the repair, replacement or making good is of such a character that it may affect the efficiency of the Facilities or any part thereof, the Employer may give to the Contractor a notice requiring that tests of the defective part of the Facilities shall be made by the Contractor immediately upon completion of such remedial work, whereupon the Contractor shall carry out such tests.

If such part fails the tests, the Contractor shall carry out further repair, replacement or making good (as the case may be) until that part of the Facilities passes such tests.

The tests in character shall in any case be not less than what has already been agreed by the employer and the Contractor for the original equipment/part of the Facilities.

27.7 If the Contractor fails to commence the work necessary to remedy such defect or any damage to the Facilities caused by such defect within a reasonable time (which shall in no event be considered to be less than fifteen (15) days), the Employer may, following notice to the Contractor, proceed to do such work, and the reasonable costs incurred by the Employer in connection therewith shall be paid to the Employer by the Contractor or may be deducted by the Employer from any amount due the Contractor or claimed under the Performance Security.

27.8 If the facilities or any part thereof cannot be used by reason of such defect and/or making good of such defect, the Defect Liability Period of the Facilities or such part, as the case may be, shall be extended by a period equal to the period during which the Facilities or such part cannot be used by the Employer because of any of the aforesaid reasons.

Upon correction of the defects in the Facilities or any part thereof by repair/replacement, such repair/replacement shall have the Defect Liability Period extended by a period of Sixty (60) months from the time such replacement/repair of the facilities or any part thereof.

27.8.1 At the end of Defect Liability Period, the Contractor’s liability ceases except for latent defects. The Contractor’s liability for latent defects warranty shall be limited to period of five (5) years from the end of Defect Liability Period. For the purpose of this clause, the latent defects shall be the defects inherently lying within the material or arising out of design deficiency, which do not manifest themselves during the Defect Liability Period defined in this CC Clause 27, but later.

27.9 Except as provided in CC Clauses 27 and 33 (Loss of or Damage to Property/ Accident or Injury to Workers/Indemnification), the Contractor shall be under no liability whatsoever and howsoever arising, and whether under the Contract or at law, in respect of defects in the Facilities or any part thereof, the Plant and Equipment, design or engineering or work executed that appear after operational acceptance or any part thereof, except where such defects are the result of the gross negligence, fraud, criminal or willful action of the Contractor.

27.10 In addition, the Contractor shall also provide an extended warranty for any such component of the Facilities and during the period of time as may be specified in the CC. Such obligation shall be in addition to the defect liability specified under CC Sub-Clause 27.2.

28. Functional Guarantee

28.1 The Contractor guarantees that during the Guarantee Test, the Facilities and all parts thereof shall attain the Functional Guarantees specified in Appendix 8 (Functional Guarantees) to the Contract Agreement,
subject to and upon the conditions therein specified.

28.2 If, for reasons attributable to the Contractor, the minimum level of the Functional Guarantees specified in Appendix 8 (Functional Guarantees) to the Contract Agreement are not met either in whole or in part, the Contractor shall at its cost and expense make such changes, modifications and/or additions to the Plant or any part thereof as may be necessary to meet at least the minimum level of such Guarantees. The Contractor shall notify the Employer upon completion of the necessary changes, modifications and/or additions, and shall request the Employer to repeat the Guarantee Test until the minimum level of the Guarantees has been met. If the Contractor eventually fails to meet the minimum level of Functional Guarantees, the Employer may consider termination of the Contract pursuant to CC Sub-Clause 42.2 and recover the payments already made to the Contractor.

28.3 If, for reasons attributable to the Contractor, the Functional Guarantees specified in Appendix 8 (Functional Guarantees) to the Contract Agreement are not attained either in whole or in part, but the minimum level of the Functional Guarantees specified in Appendix 8 (Functional Guarantees) to the Contract Agreement is met, the Contractor shall, at the Employer's option, either

(a) make such changes, modifications and/or additions to the Facilities or any part thereof that are necessary to attain the Functional Guarantees at its cost and expense within a mutually agreed time and shall request the Employer to repeat the Guarantee Test, or

(b) pay liquidated damages to the Employer in respect of the failure to meet the Functional Guarantees in accordance with the provisions in Appendix 8 (Functional Guarantees) to the Contract Agreement.

28.4 In case the Employer exercises its option to accept the equipment after levy of liquidated damages, the payment of liquidated damages under CC sub clause 28.3, upto the limitation of liability specified in the Appendix-8 (Functional Guarantees) to the Contract Agreement, shall completely satisfy the Contractor’s guarantees under CC Sub clause 28.3, and the Contractor shall have not further liability whatsoever to the Employer in respect thereof. Upon the payment of such liquidated damages by the Contractor, the Project Manager shall issue the Operational Acceptance Certificate for the Facilities or any part thereof in respect of which the liquidated damages have been so paid.

28.5 Functional Guarantees, Liquidated Damages for Non-Performance

28.5.1 The bidder shall guarantee that the equipment offered shall meet the rating and performance requirements stipulated for various equipment covered in this specification. The bidder shall also furnish a declaration in the manner prescribed and included in the relevant schedule of Bid Form & Price Schedules for guarantees, which shall attract levy of liquidated damages for non-performance.

28.5.2 If the guarantees are not established at factory tests in case of power transformer, shunt reactor & auxiliary transformer as defined in the relevant technical specifications then the Employer at his discretion may reject or accept the equipment in line with relevant technical specifications.

29. Patent Indemnity

29.1 The Contractor shall, subject to the Employer's compliance with CC Sub Clause 29.2, indemnify and hold harmless the Employer and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Employer may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract by reason of: (a) the installation of the Facilities by the Contractor or the use of the Facilities in the country where the Site is located; and (b) the sale of the products produced by the Facilities in any country.

Such indemnity shall not cover any use of the Facilities or any part thereof other than for the purpose
indicated by or to be reasonably inferred from the Contract, any infringement resulting from the use of the Facilities or any part thereof, or any products produced thereby in association or combination with any other equipment, plant or materials not supplied by the Contractor, pursuant to the Contract Agreement.

29.2 If any proceedings are brought or any claim is made against the Employer arising out of the matters referred to in CC Sub-Clause 29.1, the Employer shall promptly give the Contractor a notice thereof, and the Contractor may at its own expense and in the Employer's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.

If the Contractor fails to notify the Employer within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Employer shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Employer within the twenty-eight (28) day period, the Employer shall make no admission that may be prejudicial to the defense of any such proceedings or claim.

The Employer shall, at the Contractor's request, afford all available assistance to the Contractor in conducting such proceedings or claim, and shall be reimbursed by the Contractor for all reasonable expenses incurred in so doing.

29.3 The Employer shall indemnify and hold harmless the Contractor and its employees, officers and Subcontractors from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Contractor may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract arising out of or in connection with any design, data, drawing, specification, or other documents or materials provided or designed by or on behalf of the Employer.

30. Limitation of Liability

30.1 Except in cases of criminal negligence or willful misconduct,

(a) the Contractor shall not be liable to the Employer, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the Contractor to pay liquidated damages to the Employer and

(b) the aggregate liability of the Contractor to the Employer, whether under the Contract, in tort or otherwise, shall not exceed the total Contract Price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment, or to any obligation of the Contractor to indemnify the Employer with respect to patent infringement.

G. Risk Distribution

31. Transfer of Ownership

31.1 Ownership of the plant and equipment (including spare parts) to be imported into the country where the site is located shall be transferred to the Employer upon loading on to the mode of transport to be used to convey the Plant and Equipment from the country of origin to that country and upon endorsement of the dispatch documents in favour of Employer.

31.2 Ownership of the Plant and Equipment (including spare parts) procured in the country where the site is located, shall be transferred to the Employer upon loading on to the mode of transport to be used to carry the Plant and Equipment from the works to the site and upon endorsement of the dispatch documents in favour of Employer.

31.3 Ownership of the Contractor's Equipment used by the Contractor and its Subcontractors in connection with the Contract shall remain with the Contractor or its Subcontractors.

31.4 Ownership of any Plant and Equipment in excess of the requirements for the Facilities shall revert to the Contractor upon Completion of the Facilities or at such earlier time when the Employer and the Contractor agree that the Plant and Equipment in question are no longer required for the Facilities provided quantity
of any Plant and Equipment specifically stipulated in the Contract shall be the property of the Employer whether or not incorporated in the Facilities.

31.5 Notwithstanding the transfer of ownership of the Plant and Equipment, the responsibility for care and custody thereof together with the risk of loss or damage thereto shall remain with the Contractor pursuant to CC Clause 32 (Care of Facilities) hereof until Completion of the Facilities or the part thereof in which such Plant and Equipment are incorporated.

32. Care of Facilities

32.1 The Contractor shall be responsible for the care and custody of the Facilities or any part thereof until the date of Completion of the Facilities pursuant to CC Clause 24 (Completion of the Facilities) or, where the Contract provides for Completion of the Facilities in parts, until the date of Completion of the relevant part, and shall make good at its own cost any loss or damage that may occur to the Facilities or the relevant part thereof from any cause whatsoever during such period. The Contractor shall also be responsible for any loss or damage to the Facilities caused by the Contractor or its Subcontractors in the course of any work carried out, pursuant to CC Clause 27 (Defect Liability). Notwithstanding the foregoing, the Contractor shall not be liable for any loss or damage to the Facilities or that part thereof caused by reason of any of the matters specified or referred to in paragraphs (a), (b) and (c) of CC Sub-Clauses 32.2 and 38.1.

32.2 If any loss or damage occurs to the Facilities or any part thereof or to the Contractor's temporary facilities by reason of

(a) (insofar as they relate to the country where the Site is located) nuclear reaction, nuclear radiation, radioactive contamination, pressure wave caused by aircraft or other aerial objects, or any other occurrences that an experienced contractor could not reasonably foresee, or if reasonably foreseeable could not reasonably make provision for or insure against, insofar as such risks are not normally insurable on the insurance market and are mentioned in the general exclusions of the policy of insurance, including War Risks and Political Risks, taken out under CC Clause 34 (Insurance) hereof

(b) any use or occupation by the Employer or any third party (other than a Subcontractor) authorized by the Employer of any part of the Facilities

(c) any use of or reliance upon any design, data or specification provided or designated by or on behalf of the Employer, or any such matter for which the Contractor has disclaimed responsibility herein, The Employer shall pay to the Contractor all sums payable in respect of the Facilities executed, notwithstanding that the same be lost, destroyed or damaged, and will pay to the Contractor the replacement value of all temporary facilities and all parts thereof lost, destroyed or damaged. If the Employer requests the Contractor in writing to make good any loss or damage to the Facilities thereby occasioned, the Contractor shall make good the same at the cost of the Employer in accordance with CC Clause 39 (Change in the Facilities). If the Employer does not request the Contractor in writing to make good any loss or damage to the Facilities thereby occasioned, the Employer shall either request a change in accordance with CC Clause 39 (Change in the Facilities), excluding the performance of that part of the Facilities thereby lost, destroyed or damaged, or, where the loss or damage affects a substantial part of the Facilities, the Employer shall terminate the Contract pursuant to CC Sub-Clause 42.1 (Termination for Employer's Convenience) hereof, except that the Contractor shall have no entitlement to profit under paragraph (e) of CC Sub Clause 42.1.3 in respect of any unexecuted Facilities as at the date of termination.

32.3 The Contractor shall be liable for any loss of or damage to any Contractor's Equipment, or any other property of the Contractor used or intended to be used for purposes of the Facilities, except (i) as mentioned in CC Sub-Clause 32.2 (with respect to the Contractor's temporary facilities), and (ii) where such loss or damage arises by reason of any of the matters specified in CC Sub-Clauses 32.2 (b) and (c) and 38.1.

32.4 With respect to any loss or damage caused to the Facilities or any part thereof or to the Contractor's Equipment by reason of any of the matters specified in CC Sub-Clause 38.1, the provisions of CC Sub-Clause 38.3 shall apply.

33. Loss of or Damage to Property; Accident or Injury to Workers; Indemnification
33.1 Subject to CC Sub-Clause 33.3, the Contractor shall indemnify and hold harmless the Employer and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, in respect of the death or injury of any person or loss of or damage to any property (other than the Facilities whether accepted or not), arising in connection with the supply and installation of the Facilities and by reason of the negligence of the Contractor or its Subcontractors, or their employees, officers or agents, except any injury, death or property damage caused by the negligence of the Employer, its contractors, employees, officers or agents.

33.2 If any proceedings are brought or any claim is made against the Employer that might subject the Contractor to liability under CC Sub-Clause 33.1, the Employer shall promptly give the Contractor a notice thereof and the Contractor may at its own expense and in the Employer's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.

If the Contractor fails to notify the Employer within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Employer shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Employer within the twenty-eight (28) day period, the Employer shall make no admission that may be prejudicial to the defense of any such proceedings or claim.

The Employer shall, at the Contractor's request, afford all available assistance to the Contractor in conducting such proceedings or claim, and shall be reimbursed by the Contractor for all reasonable expenses incurred in so doing.

33.3 The Employer shall indemnify and hold harmless the Contractor and its employees, officers and Subcontractors from any liability for loss of or damage to property of the Employer, other than the Facilities not yet taken over, that is caused by fire, explosion or any other perils, in excess of the amount recoverable from insurances procured under CC Clause 34 (Insurance), provided that such fire, explosion or other perils were not caused by any act or failure of the Contractor.

33.4 The party entitled to the benefit of an indemnity under this CC Clause 33 shall take all reasonable measures to mitigate any loss or damage which has occurred. If the party fails to take such measures, the other party's liabilities shall be correspondingly reduced.

34. Insurance

34.1 To the extent specified in Appendix 3 (Insurance Requirements) to the Contract Agreement, the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurances set forth below in the sums and with the deductibles and other conditions specified in the said Appendix. The identity of the insurers and the form of the policies shall be subject to the approval of the Employer, who should not unreasonably withhold such approval.

(a) Transit / Marine insurance: During supply of materials for Supply/ Supply portion of Contract

Covering loss or damage occurring while in transit from the manufacturer’s or Contractor's or Subcontractor's works or stores until arrival at the Site, to the Plant and Equipment (including spare parts thereof) and to the Contractor's Equipment. Concerned supplier/Contractor shall take such policy and ensure its validity upto 90days of receipt of Plant and Equipment (including spare parts thereof) at employer’s store or store of the contractor’s as the case may be. Evidence of such policy shall be furnished by contractor alongwith dispatch documents.

(b) Storage Cum Erection (SCE)/Installation Insurance: All Risks Coverage

Covering physical loss or damage to all the equipment, material and facilities being supplied, under the contract, from point of receipt at site including handling, storage, erection, testing etc till Completion of the Facilities, with an extended maintenance coverage for the Contractor's liability in respect of any loss or damage occurring during the Defect Liability Period while the Contractor is on the Site for the purpose of performing its obligations during the Defect Liability Period. Concerned Erector /Contractor shall take such policy.

(c) Materials/Plants/ Equipments supplied By Employer

Covering physical loss or damage to all the equipment, material and facilities being supplied for erection or
use, under the contract, from point of receipt at site including handling, storage, erection, testing etc till Completion of the Facilities.

(d) **Third Party Liability Insurance**  
Covering bodily injury or death suffered by third parties (including the Employer's personnel) and loss of or damage to property occurring in connection with the supply and installation of the Facilities.

(e) **Automobile Liability Insurance**  
Covering use of all vehicles used by the Contractor or its Subcontractors (whether or not owned by them) in connection with the execution of the Contract.

(f) **Workers' Compensation**  
In accordance with the statutory requirements applicable in any country where the Contract or any part thereof is executed.

(g) **Employer's Liability**  
In accordance with the statutory requirements applicable in any country where the Contract or any part thereof is executed.

(h) **Other Insurances**  
Such other insurances as may be specifically agreed upon by the parties hereto as listed in the said Appendix 3.

34.2 All the insurance policies pertaining to Storage Cum Erection /Installation & all Risk Coverage except transit insurance shall be taken in the name of DTL unless otherwise specified. All such policy shall indicate DTL as beneficiary and DTL shall be named as co-insured under all other insurance policies taken out by the Contractor pursuant to CC Sub-Clause 34.1, except for the Third Party Liability, Workers' Compensation and Employer's Liability Insurances, and the Contractor's Subcontractors shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to CC Sub-Clause 34.1 except for the Transit /Marine insurance During Transport, Workers' Compensation and Employer's Liability Insurances. All insurer's rights of subrogation against such co-insured for losses or claims arising out of the performance of the Contract shall be waived under such policies.

34.3 The Contractor shall, in accordance with the provisions of Appendix 3 (Insurance Requirements) to the Contract Agreement, deliver to the Employer certificates of insurance (or copies of the insurance policies) as evidence that the required policies are in full force and effect. The certificates shall provide that no less than twenty-one (21) days' notice shall be given to the Employer by insurers prior to cancellation or material modification of a policy.

34.4 The Contractor shall ensure that, where applicable, its Subcontractor(s) shall take out and maintain in effect adequate insurance policies for their personnel and vehicles and for work executed by them under the Contract, unless such Subcontractors are covered by the policies taken out by the Contractor.

34.5 The Employer shall at its expense take out and maintain in effect during the performance of the Contract those insurances specified in Appendix 3 (Insurance Requirements) to the Contract Agreement, in the sums and with the deductibles and other conditions specified in the said Appendix. The Contractor and the Contractor's Subcontractors shall be named as co-insured under all such policies. All insurers' rights of subrogation against such co-insured for losses or claims arising out of the performance of the Contract shall be waived under such policies. The Employer shall deliver to the Contractor satisfactory evidence that the required insurances are in full force and effect. The policies shall provide that not less than twenty-one (21) days' notice shall be given to the Contractor by all insurers prior to any cancellation or material modification of the policies. If so requested by the Contractor, the Employer shall provide copies of the policies taken out by the Employer under this CC Sub-Clause 34.5.

34.6 If the Contractor fails to take out and/or maintain in effect the insurances referred to in CC Sub-Clause 34.1, the Employer may take out and maintain in effect any such insurances and may from time to time deduct from any amount due to the Contractor under the Contract any premium that the Employer shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Contractor. If the Employer fails to take out and/or maintain in effect the insurances referred to in CC 34.5, the Contractor may take out and maintain in effect any such insurances and may from time to time deduct from any amount due to the Employer under the Contract any premium that the Contractor shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Employer. If the Contractor fails to or is unable to take out and maintain in effect any such insurances, the Contractor shall nevertheless have no liability or
responsibility towards the Employer, and the Contractor shall have full recourse against the Employer for any and all liabilities of the Employer herein.

34.7 Unless otherwise provided in the Contract, the Contractor shall prepare, lodge, pursue and conduct and settle all and any claims made under the policies effected by it pursuant to this CC Clause 34, with the insurance company in case of theft, pilferage, fire etc under information to employer and the monies payable by any insurers under all the insurance except Third Party Liability Insurance, Workers’ Compensation, and Employer’s Liability, shall be paid to the joint account of the Employer and the Contractor and such amounts paid shall be apportioned between the Employer and the Contractor in accordance with the respective responsibilities under the Contract. The Employer shall give to the Contractor all such reasonable assistance as may be required by the Contractor. With respect to insurance claims in which the Employer’s interest is involved, the Contractor shall not give any release or make any compromise with the insurer without the prior written consent of the Employer. With respect to insurance claims in which the Contractor’s interest is involved, the Employer shall not give any release or make any compromise with the insurer without the prior written consent of the Contractor. The Contractor shall replace the lost/ damaged plants/materials/ equipments/ works/ foundations or Employer supplied items promptly irrespective of the settlement of claims by the underwriter.

35. Unforeseen Conditions

35.1 If, during the execution of the Contract, the Contractor shall encounter on the Site any physical conditions (other than climatic conditions) or artificial obstructions that could not have been reasonably foreseen prior to the date of the Contract Agreement by an experienced contractor on the basis of reasonable examination of the data relating to the Facilities (including any data as to boring tests) provided by the Employer, and on the basis of information that it could have obtained from a visual inspection of the Site (if access thereto was available) or other data readily available to it relating to the Facilities, and if the Contractor determines that it will in consequence of such conditions or obstructions incur additional cost and expense or require additional time to perform its obligations under the Contract that would not have been required if such physical conditions or artificial obstructions had not been encountered, the Contractor shall promptly, and before performing additional work or using additional Plant and Equipment or Contractor's Equipment, notify the Project Manager in writing of:

(a) the physical conditions or artificial obstructions on the Site that could not have been reasonably foreseen
(b) the additional work and/or Plant and Equipment and/or Contractor's Equipment required, including the steps which the Contractor will or proposes to take to overcome such conditions or obstructions
(c) the extent of the anticipated delay
(d) the additional cost and expense that the Contractor is likely to incur.

On receiving any notice from the Contractor under this CC Sub-Clause 35.1, the Project Manager shall promptly consult with the Employer and Contractor and decide upon the actions to be taken to overcome the physical conditions or artificial obstructions encountered. Following such consultations, the Project Manager shall instruct the Contractor, with a copy to the Employer, of the actions to be taken.

35.2 Any reasonable additional cost and expense incurred by the Contractor in following the instructions from the Project Manager to overcome such physical conditions or artificial obstructions referred to in CC Sub-Clause 35.1 shall be paid by the Employer to the Contractor as an addition to the Contract Price.

35.3 If the Contractor is delayed or impeded in the performance of the Contract because of any such physical conditions or artificial obstructions referred to in CC Sub-Clause 35.1, the Time for Completion shall be extended in accordance with CC Clause 40 (Extension of Time for Completion).

36. Change in Laws and Regulations

36.1 If, after the date twenty-eight (28) days prior to the date of Bid submission, in the country where the Site is located, any law, regulation, ordinance, order or by-law having the force of law is enacted, promulgated, abrogated or changed (which shall be deemed to include any change in interpretation or application by the competent authorities) that subsequently affects the costs and expenses of the Contractor and/or the Time for Completion, the Contract Price shall be correspondingly increased or decreased, and/or the Time for Completion shall be reasonably adjusted to the extent that the Contractor has thereby been affected in the performance of any of its obligations under the Contract. However, these adjustments would be restricted to direct transactions between the Employer and the Contractor and not on procurement of raw materials, intermediary components etc. by the Contractor. Further, no adjustment of the Contract Price shall be
made on account of variation in deemed export benefits. Notwithstanding the foregoing, such additional or reduced costs shall not be separately paid or credited if the same has already been accounted for in the price adjustment provisions where applicable, in accordance with the Appendix 2 to the Contract Agreement.

37. **Force Majeure**

37.1 "Force Majeure" shall mean any event beyond the reasonable control of the Employer or of the Contractor, as the case may be, and which is unavoidable notwithstanding the reasonable care of the party affected, and shall include, without limitation, the following:

(a) war, hostilities or warlike operations (whether a state of war be declared or not), invasion, act of foreign enemy and civil war

(b) rebellion, revolution, insurrection, mutiny, usurpation of civil or military government, conspiracy, riot, civil commotion and terrorist acts

(c) confiscation, nationalization, mobilization, commandeering or requisition by or under the order of any government or de jure or de facto authority or ruler or any other act or failure to act of any local state or national government authority

(d) strike, sabotage, lockout, embargo, import restriction, port congestion, lack of usual means of public transportation and communication, industrial dispute, shipwreck, shortage or restriction of power supply, epidemics, quarantine and plague

(e) earthquake, landslide, volcanic activity, fire, flood or inundation, tidal wave, typhoon or cyclone, hurricane, storm, lightning, or other inclement weather condition, nuclear and pressure waves or other natural or physical disaster

(f) shortage of labour, materials or utilities where caused by circumstances that are themselves Force Majeure.

37.2 If either party is prevented, hindered or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances thereof within fourteen (14) days after the occurrence of such event.

37.3 The party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such party's performance is prevented, hindered or delayed. The Time for Completion shall be extended in accordance with CC Clause 40 (Extension of Time for Completion).

37.4 The party or parties affected by the event of Force Majeure shall use reasonable efforts to mitigate the effect thereof upon its or their performance of the Contract and to fulfill its or their obligations under the Contract, but without prejudice to either party's right to terminate the Contract under CC Sub Clauses 37.6 and 38.5.

37.5 No delay or nonperformance by either party hereto caused by the occurrence of any event of Force Majeure shall

(a) constitute a default or breach of the Contract

(b)(subject to CC Sub-Clauses 32.2, 38.3 and 38.4) give rise to any claim for damages or additional cost or expense occasioned thereby if and to the extent that such delay or nonperformance is caused by the occurrence of an event of Force Majeure.

37.6 If the performance of the Contract is substantially prevented, hindered or delayed for a single period of more than sixty (60) days or an aggregate period of more than one hundred and twenty (120) days on account of one or more events of Force Majeure during the currency of the Contract, the parties will attempt to develop a mutually satisfactory solution, failing which the dispute will be resolved in accordance with CC Clause 6.

37.7 Notwithstanding CC Sub-Clause 37.5, Force Majeure shall not apply to any obligation of the Employer to make payments to the Contractor herein.
38. **War Risks**

38.1 "War Risks" shall mean any event specified in paragraphs (a) and (b) of CC Sub-Clause 37.1 and any explosion or impact of any mine, bomb, shell, grenade or other projectile, missile, munitions or explosive of war, occurring or existing in or near the country (or countries) where the Site is located.

38.2 Notwithstanding anything contained in the Contract, the Contractor shall have no liability whatsoever for or with respect to

(a) destruction of or damage to Facilities, Plant & Equipment, or any part thereof

(b) destruction of or damage to property of the Employer or any third party

(c) injury or loss of life if such destruction, damage, injury or loss of life is caused by any War Risks, and the Employer shall indemnify and hold the Contractor harmless from and against any and all claims, liabilities, actions, lawsuits, damages, costs, charges or expenses arising in consequence of or in connection with the same.

38.3 If the Facilities or any Plant and Equipment or Contractor's Equipment or any other property of the Contractor used or intended to be used for the purposes of the Facilities shall sustain destruction or damage by reason of any War Risks, the Employer shall pay the Contractor for

(a) any part of the Facilities or the Plant and Equipment so destroyed or damaged (to the extent not already paid for by the Employer)

(b) replacing or making good any Contractor's Equipment or other property of the Contractor so destroyed or damaged,

(c) replacing or making good any such destruction or damage to the Facilities or the Plant and Equipment or any part thereof so far as may be required by the Employer, and as may be necessary for completion of the facilities.

If the Employer does not require the Contractor to replace or make good any such destruction or damage to the Facilities, the Employer shall either request a change in accordance with CC Clause 39 (Change in the Facilities), excluding the performance of that part of the Facilities thereby destroyed or damaged or, where the loss, destruction or damage affects a substantial part of the Facilities, shall terminate the Contract, pursuant to CC Sub-Clause 42.1 (Termination for Employer's Convenience).

38.4 Notwithstanding anything contained in the Contract, the Employer shall pay the Contractor for any increased costs or incidentals to the execution of the Contract that are in any way attributable to, consequent on, resulting from, or in any way connected with any War Risks, provided that the Contractor shall as soon as practicable notify the Employer in writing of any such increased cost.

38.5 If during the performance of the Contract any war risks shall occur that financially or otherwise materially affect the execution of the Contract by the Contractor with due and proper consideration given to the safety of its and its Subcontractors personal engaged in the work on the facilities, provided, however, that if the execution of the work on the facilities becomes impossible or is substantially prevented for a single period of more than sixty (60) days or an aggregate period of more the one hundred and twenty (120) days on account of any war Risks, the parties will attempt to develop a mutually satisfactory solution, failing which the dispatch will be resolved in accordance with CC Clause 6.

38.6 In the event of termination pursuant to CC Sub Clause. 38.3, the rights and obligation of the employer and the Contractor shall be as specified in CC Sub- Clause 42.1.2 and 42.1.3, except that the Contractor shall have no entitlement to profit under paragraph (e) of CC Sub Clause 42.13 in respect of any unexecuted facilities as of the date of termination.

H. **Change in Contract Elements**

39. **Change in the Facilities**

39.1 **Introducing a Change**
39.1.1 Subject to CC Sub-Clauses 39.2.5 and 39.2.7, the Employer shall have the right to propose, and subsequently require, that the Project Manager order the Contractor from time to time during the performance of the Contract to make any change, modification, addition or deletion to, in or from the Facilities (hereinafter called "Change"), provided that such Change falls within the general scope of the Facilities and does not constitute unrelated work and that it is technically practicable, taking into account both the state of advancement of the Facilities and the technical compatibility of the Change envisaged with the nature of the Facilities as specified in the Contract.

39.1.2 The Contractor may from time to time during its performance of the Contract propose to the Employer (with a copy to the Project Manager) any Change that the Contractor considers necessary or desirable to improve the quality, efficiency or safety of the Facilities. The Employer may at its discretion approve or reject any Change proposed by the Contractor, provided that the Employer shall approve any Change proposed by the Contractor to ensure the safety of the Facilities.

39.1.3 Notwithstanding CC Sub-Clauses 39.1.1 and 39.1.2, no change made necessary because of any default of the Contractor in the performance of its obligations under the Contract shall be deemed to be a Change, and such change shall not result in any adjustment of the Contract Price or the Time for Completion.

39.1.4 The procedure on how to proceed with and execute Changes is specified in CC Sub-Clauses 39.2 and 39.3, and further details and sample forms are provided in the Sample Forms and Procedures section in the bidding documents.

39.2 Changes Originating from Employer

39.2.1 If the Employer proposes a Change pursuant to CC Sub-Clause 39.1.1, it shall send to the Contractor a "Request for Change Proposal," requiring the Contractor to prepare and furnish to the Project Manager as soon as reasonably practicable a "Change Proposal," which shall include the following:

(a) brief description of the Change
(b) effect on the Time for Completion
(c) estimated cost of the Change
(d) effect on Functional Guarantees (if any)
(e) effect on any other provisions of the Contract.

39.2.2 Prior to preparing and submitting the "Change Proposal," the Contractor shall submit to the Project Manager an "Estimate for Change Proposal," which shall be an estimate of the cost of preparing and submitting the Change Proposal. Upon receipt of the Contractor's Estimate for Change Proposal, the Employer shall do one of the following:

(a) accept the Contractor's estimate with instructions to the Contractor to proceed with the preparation of the Change Proposal
(b) advise the Contractor of any part of its Estimate for Change Proposal that is unacceptable and request the Contractor to review its estimate
(c) advise the Contractor that the Employer does not intend to proceed with the Change.

39.2.3 Upon receipt of the Employer's instruction to proceed under CC Sub-Clause 39.2.2 (a), the Contractor shall, with proper expedition, proceed with the preparation of the Change Proposal, in accordance with CC Sub-Clause 39.2.1.

39.2.4 The pricing of any Change shall, as far as practicable, be calculated in accordance with the rates and prices included in the Contract. If such rates and prices are inequitable, the parties thereto shall agree on specific rates for the valuation of the Change.

39.2.5 If before or during the preparation of the change proposal it becomes apparent that the aggregate effect of compliance therewith and with all other change orders that have already become binding upon the contractor under this CC Clause 39 would be to increase or decrease the contractor price as originally set forth in Article- 2 (Contract price and Terms of payment) of the contract agreement by more than fifteen (15) percent, the Contractor may give a written notice of objection there to prior to furnish the change
proposal as aforesaid. If the employer accept the contractors objection, the employer and the contractor shall agree on specific rates for valuation of the change.

The Contractor failure to so object shall neither affect its right to object to any subsequent requested change or change orders herein, nor affect its right to taken into account, when making such subsequent objection, the percentage increase or decrease in the contract price that any change not objected to by the contractor represents.

39.2.6 If rates and prices of any change are not available in the contract, the parties thereto shall agree on specific rates for the valuation of the change. Upon receipt of the change proposal, the employer and the contractor shall mutually agree upon all matters therein contained. With in fourteen (14) days after such agreement, the employer shall, if it intends to proceed with change, issue the contractor with a change order.

If the employer is unable to reach a decision with in fourteen (14) days, it shall notify the contractor with details of when the contractor can expect a decision.

If the employer decides not to proceed with the change for whatever reason, it shall, with in the said period of fourteen (14) days, notify the contractor accordingly. Under such circumstances, the contractor shall be entitled to reimbursement of all costs reasonably incurred by it in the preparation of the change proposal, provided that these do not exceed the amount given by the Contractor in its estimate for change proposal submitted in accordance with CC Sub – Clause 39.2.2.

39.2.7 If the Employer and the Contractor cannot reach agreement on the price for the Change, an equitable adjustment to the Time for Completion, or any other matters identified in the Change Proposal, the Employer may nevertheless instruct the Contractor to proceed with the Change by issue of a "Pending Agreement Change Order."

Upon receipt of a Pending Agreement Change Order, the Contractor shall immediately proceed with effecting the Changes covered by such Order. The parties shall thereafter attempt to reach agreement on the outstanding issues under the Change Proposal.

If the parties cannot reach agreement within sixty (60) days from the date of issue of the Pending Agreement Change Order, then the matter may be referred to the Arbitration in accordance with the provisions of CC Sub-Clauses 39.2.6 (Arbitration).

39.3 Changes Originating from Contractor

39.3.1 If the Contractor proposes a Change pursuant to CC Sub-Clause 39.1.2, the Contractor shall submit to the Project Manager a written "Application for Change Proposal," giving reasons for the proposed Change and including the information specified in CC Sub-Clause 39.2.1.

Upon receipt of the Application for Change Proposal, the parties shall follow the procedures outlined in CC Sub-Clauses 39.2.6 and 39.2.7. However, should the Employer choose not to proceed, the Contractor shall not be entitled to recover the costs of preparing the Application for Change Proposal.

39.4 The scope of work under the package(s) shall be as per the Technical Specification, Vol- II of bidding Documents. The quantity variation applicable for the existing scope shall be generally as per the following.

a) The employer reserves the right to increase or decrease the quantity of different items of the specified good and services to the extent of fifteen percent (15%) of the contract prices, by way of suitable amendment to the contract, without any change in unit rate/price and/ or other terms and conditions of the contract. However, the quantities of individual items of goods and services may vary up to any extent.

b) The contract price for (i) items for which quantities have been indicated as lumpsum / lot/ set (ii) items for which quantities were to be estimated by the bidder, including additional items (falling under (i) and /or (ii) considered necessary by the bidder for successful completion of the works as per TS and indicated by him in his bid, shall remain constant unless there is change made in the scope of work by the employer. The quantities and unit prices (a) subsequently arrived while approving the bill of quantities (BOQ)/ billing breakup of lumpsum/lot/set quantities and/ or (b) quantities estimated by the bidder /contractor shall be for on account payment purpose only. In case additional quantities, over and above the quantities in BOQ/billing break up and/or estimated by the bidder/contractor are required for the successful completion of the scope of work as per
technical specification, the contractor shall execute additional quantities of these items for which no additional payments shall be made over and above the lumpsum contract price.

In case quantities of these items supplied at site are in excess of that required for successful completion of scope of work, such additional quantities shall be property of the contractor and contractor shall be allowed to take back the same from the site for which no deduction from the lumpsum contract price shall be made. Further in case actual requirement of quantities for successful completion of scope of work is less than the quantities identified in the approved BOQ/billing break up and/or estimated by the bidder/contractor, the lumpsum contract price shall remain unchanged and no deduction shall be made from the lumpsum price due to such reduction of quantities. It shall be the responsibility of the bidder to pay all 6statutory taxes, duties and levies to the concerned authority’s surplus material which would otherwise have been, lawfully payable. The bidder shall submit an indemnity bond to keep the employer harmless from any liability, before release to such martial to the bidder by the employer.

c) The quantity variation from the existing scope shall be notified to the contractor within the validity of contract.

40. Extension of Time for Completion

40.1 The Time(s) for Completion specified in the CC shall be extended if the Contractor is delayed or impeded in the performance of any of its obligations under the Contract by reason of any of the following:

(a) any Change in the Facilities as provided in CC Clause 39 (Change in the Facilities)

(b) any occurrence of Force Majeure as provided in CC Clause 37 (Force Majeure), unforeseen conditions as provided in CC Clause 35 (Unforeseen Conditions), or other occurrence of any of the matters specified or referred to in paragraphs (a), (b) and (c) of CC Sub-Clause 32.2

(c) any suspension order given by the Employer under CC Clause 41 (Suspension) hereof or reduction in the rate of progress pursuant to CC Sub-Clause 41.2 or

(d) any changes in laws and regulations as provided in CC Clause 36 (Change in Laws and Regulations) or

(e) any default or breach of the Contract by the Employer, specifically including failure to supply the items listed in Appendix 6 (Scope of Works and Supply by the Employer) to the Contract Agreement, or any activity, act or omission of any other contractors employed by the Employer or

(f) any other matter specifically mentioned in the Contract;

by such period as shall be fair and reasonable in all the circumstances and as shall fairly reflect the delay or impediment sustained by the Contractor.

40.2 Except where otherwise specifically provided in the Contract, the Contractor shall submit to the Project Manager a notice of a claim for an extension of the Time for Completion, together with particulars of the event or circumstance justifying such extension as soon as reasonably practicable after the commencement of such event or circumstance. As soon as reasonably practicable after receipt of such notice and supporting particulars of the claim, the Employer and the Contractor shall agree upon the period of such extension. In the event that the Contractor does not accept the Employer's estimate of a fair and reasonable time extension, the Contractor shall be entitled to refer the matter to an Arbitration, pursuant to CC Sub-Clause 6.2 (Arbitration).

40.3 The Contractor shall at all times use its reasonable efforts to minimize any delay in the performance of its obligations under the Contract.

41. Suspension

41.1 The Employer may request the Project Manager, by notice to the Contractor, to order the Contractor to suspend performance of any or all of its obligations under the Contract. Such notice shall specify the obligation of which performance is to be suspended, the effective date of the suspension and the reasons thereof. The Contractor shall thereupon suspend performance of such obligation (except those obligations necessary for the care or preservation of the Facilities) until ordered in writing to resume such performance by the Project Manager.
If, by virtue of a suspension order given by the Project Manager, other than by reason of the Contractor's default or breach of the Contract, the Contractor's performance of any of its obligations is suspended for an aggregate period of more than ninety (90) days, then at any time thereafter and provided that at that time such performance is still suspended, the Contractor may give a notice to the Project Manager requiring that the Employer shall, within twenty-eight (28) days of receipt of the notice, order the resumption of such performance or request and subsequently order a change in accordance with CC Clause 39 (Change in the Facilities), excluding the performance of the suspended obligations from the Contract.

If the Employer fails to do so within such period, the Contractor may, by a further notice to the Project Manager, elect to treat the suspension, where it affects a part only of the Facilities, as a deletion of such part in accordance with CC Clause 39 (Change in the Facilities) or, where it affects the whole of the Facilities, as termination of the Contract under CC Sub-Clause 42.1 (Termination for Employer's Convenience).

41.2 In case,
(a) the Employer has failed to pay the Contractor any sum due under the Contract within the specified period, has failed to approve any invoice or supporting documents without just cause pursuant to Appendix 1 (Terms and Procedures of Payment) to the Contract Agreement, or commits a substantial breach of the Contract, the Contractor may give a notice to the Employer that requires payment of such sum, with interest thereon as stipulated in CC Sub-Clause 12.3, requires approval of such invoice or supporting documents, or specifies the breach and requires the Employer to remedy the same, as the case may be. If the Employer fails to pay such sum together with such interest, fails to approve such invoice or supporting documents or give its reasons for withholding such approval, or fails to remedy the breach or take steps to remedy the breach within fourteen (14) days after receipt of the Contractor's notice or

(b) the Contractor is unable to carry out any of its obligations under the Contract for any reason attributable to the Employer, including but not limited to the Employer's failure to provide possession or access to the Site or other areas in accordance with CC Sub-Clause 10.2, or failure to obtain any governmental permit necessary for the execution and/or completion of the Facilities; then the Contractor may by fourteen (14) days' notice to the Employer suspend performance of all or any of its obligations under the Contract, or reduce the rate of progress.

41.3 If the Contractor's performance of its obligations is suspended or the rate of progress is reduced pursuant to this CC Clause 41, then the Time for Completion shall be extended in accordance with CC Sub-Clause 40.1, and any and all additional costs or expenses incurred by the Contractor as a result of such suspension or reduction shall be paid by the Employer to the Contractor in addition to the Contract Price, except in the case of suspension order or reduction in the rate of progress by reason of the Contractor's default or breach of the Contract.

41.4 During the period of suspension, the Contractor shall not remove from the Site any Plant and Equipment, any part of the Facilities or any Contractor's Equipment, without the prior written consent of the Employer.

42. Termination

42.1 Termination for Employer's Convenience

42.1.1 The Employer may at any time terminate the Contract for any reason by giving the Contractor a notice of termination that refers to this CC Sub-Clause 42.1.

42.1.2 Upon receipt of the notice of termination under CC Sub-Clause 42.1.1, the Contractor shall either immediately or upon the date specified in the notice of termination

(a) cease all further work, except for such work as the Employer may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition

(b) terminate all subcontracts, except those to be assigned to the Employer pursuant to paragraph (d)(ii) below

(c) remove all Contractor's Equipment from the Site, repatriate the Contractor's and its Subcontractors'
personnel from the Site, remove from the Site any wreckage, rubbish and debris of any kind, and leave the whole of the Site in a clean and safe condition.

(d) In addition, the Contractor, subject to the payment specified in CC Sub Clause 42.1.3, shall

(i) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination.

(ii) to the extent legally possible, assign to the Employer all right, title and benefit of the Contractor to the Facilities and to the Plant and Equipment as at the date of termination, and, as may be required by the Employer, in any subcontracts concluded between the Contractor and its Subcontractors.

(iii) deliver to the Employer all non-proprietary drawings, specifications and other documents prepared by the Contractor or its Subcontractors as at the date of termination in connection with the Facilities.

42.1.3 In the event of termination of the Contract under CC Sub-Clause 42.1.1, the Employer shall pay to the Contractor the following amounts:

a. The Contract Price, properly attributable to the parts of the Facilities executed by the Contractor as on the date of termination.

b. The costs reasonably incurred by the Contractor in the removal of the Contractor's Equipment from the Site and in the repatriation of the Contractor's and its Subcontractors' personnel.

c. The amounts to be paid by the Contractor to its Subcontractors in connection with the termination of any subcontracts, including any cancellation charges.

d. Costs incurred by the Contractor in protecting the Facilities and leaving the Site in a clean and safe condition pursuant to paragraph (a) of CC Sub-Clause 42.1.2.

e. The cost of satisfying all other obligations, commitments and claims that the Contractor may in good faith have undertaken with third parties in connection with the Contract and that are not covered by paragraphs (a) through (d) above.

42.2 Termination for Contractor's Default

42.2.1 The Employer, without prejudice to any other rights or remedies it may possess, may terminate the Contract forthwith in the following circumstances by giving a notice of termination and its reasons therefore to the Contractor, referring to this CC Sub-Clause 42.2 and Performance security (CPG) will be forfeited:

(a) if the Contractor becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, if the Contractor is a corporation, a resolution is passed or order is made for its winding up (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), a receiver is appointed over any part of its undertaking or assets, or if the Contractor takes or suffers any other analogous action in consequence of debt.

(b) if the Contractor assigns or transfers the Contract or any right or interest therein in violation of the provision of CC Clause 43 (Assignment).

(c) if the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

For the purpose of this sub-clause:

"corrupt practice" means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in contact execution.

"fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Employer, and includes collusive practice among Bidders.
(prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition”.

42.2.2 If the Contractor

(a) has abandoned or repudiated the Contract

(b) has without valid reason failed to commence work on the Facilities promptly or has suspended (other than pursuant to CC Sub-Clause 41.2) the progress of Contract performance for more than twenty-eight (28) days after receiving a written instruction from the Employer to proceed

(c) persistently fails to execute the Contract in accordance with the Contract or persistently neglects to carry out its obligations under the Contract without just cause

(d) refuses or is unable to provide sufficient materials, services or labour to execute and complete the Facilities in the manner specified in the program furnished under CC Clause 18.2 (Program of Performance) at rates of progress that give reasonable assurance to the Employer that the Contractor can attain Completion of the Facilities by the Time for Completion as extended.

then the Employer may, without prejudice to any other rights it may possess under the Contract, give a notice to the Contractor stating the nature of the default and requiring the Contractor to remedy the same. If the Contractor fails to remedy or to take steps to remedy the same within fourteen (14) days of its receipt of such notice, then the Employer may terminate the Contract forthwith by giving a notice of termination to the Contractor that refers to this CC Sub Clause 42.2

42.2.3 Upon receipt of the notice of termination under CC Sub-Clauses 42.2.1 or 42.2.2, the Contractor shall, either immediately or upon such date as is specified in the notice of termination,

(a) cease all further work, except for such work as the Employer may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition

(b) terminate all subcontracts, except those to be assigned to the Employer pursuant to paragraph (d) below

(c) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination

(d) to the extent legally possible, assign to the Employer all right, title and benefit of the Contractor to the Works and to the Plant and Equipment as at the date of termination, and, as may be required by the Employer, in any subcontracts concluded between the Contractor and its Subcontractors

(e) deliver to the Employer all drawings, specifications and other documents prepared by the Contractor or its Subcontractors as at the date of termination in connection with the Facilities.

42.2.4 The Employer may enter upon the Site, expel the Contractor, and complete the Facilities itself or by employing any third party. The Employer may, to the exclusion of any right of the Contractor over the same, take over and use with the payment of a fair rental rate to the Contractor, with all the maintenance costs to the account of the Employer and with an indemnification by the Employer for all liability including damage or injury to persons arising out of the Employer's use of such equipment, any Contractor's Equipment owned by the Contractor and on the Site in connection with the Facilities for such reasonable period as the Employer considers expedient for the supply and installation of the Facilities.

Upon completion of the Facilities or at such earlier date as the Employer thinks appropriate, the Employer shall give notice to the Contractor that such Contractor's Equipment will be returned to the Contractor at or near the Site and shall return such Contractor's Equipment to the Contractor in accordance with such notice. The Contractor shall thereafter without delay and at its cost remove or arrange removal of the same from the Site.

42.2.5 Subject to CC Sub-Clause 42.2.6, the Contractor shall be entitled to be paid the Contract Price attributable to the Facilities executed as at the date of termination, the value of any unused or partially used Plant and Equipment on the Site, and the costs, if any, incurred in protecting the Facilities and in leaving the Site in a clean and safe condition pursuant to paragraph (a) of CC SubClause 42.2.3. Any sums due to the Employer
from the Contractor accruing prior to the date of termination shall be deducted from the amount to be paid to the Contractor under this Contract.

42.2.6 If the Employer completes the Facilities, the cost of completing the Facilities by the Employer shall be determined. If the sum that the Contractor is entitled to be paid, pursuant to CC SubClause 42.2.5, plus the reasonable costs incurred by the Employer in completing the Facilities, exceeds the Contract Price, the Contractor shall be liable for such excess.

If such excess is greater than the sums due to the Contractor under CC SubClause 42.2.5, the Contractor shall pay the balance to the Employer, and if such excess is less than the sums due to the Contractor under CC Sub-Clause 42.2.5, the Employer shall pay the balance to the Contractor.

The Employer and the Contractor shall agree, in writing, on the computation described above and the manner in which any sums shall be paid.

42.3 Termination by Contractor

42.3.1 If

(a) The Employer has failed to pay the Contractor any sum due under the Contract within the specified period, has failed to approve any invoice or supporting documents without just cause pursuant to Appendix 1 (Terms and Procedures of Payment) of the Contract Agreement, or commits a substantial breach of the Contract, the Contractor may give a notice to the Employer that requires payment of such sum, with interest thereon as stipulated in CC Sub-Clause 12.3, requires approval of such invoice or supporting documents, or specifies the breach and requires the Employer to remedy the same, as the case may be. If the Employer fails to pay such sum together with such interest, fails to approve such invoice or supporting documents or give its reasons for withholding such approval, fails to remedy the breach or take steps to remedy the breach within fourteen (14) days after receipt of the Contractor's notice, or

(b) The Contractor is unable to carry out any of its obligations under the contract for any reason attributable to the employer, including but not limited to the employer’s failure to provide possession of or access to the site or other areas or failure to obtain any governmental permit necessary for the execution and/or completion of the Facilities, which the employer is required to obtain as per provision of the contract as per relevant applicable laws of the country.

then the Contractor may give a notice to the Employer thereof, and if the Employer has failed to pay the outstanding sum, to approve the invoice or supporting documents, to give its reasons for withholding such approval, or to remedy the breach within twenty-eight (28) days of such notice, or if the Contractor is still unable to carry out any of its obligations under the Contract for any reason attributable to the Employer within twenty-eight (28) days of the said notice, the Contractor may by a further notice to the Employer referring to this CC Sub-Clause 42.3.1, forthwith terminate the Contract.

42.3.2 The Contractor may terminate the Contract forthwith by giving a notice to the Employer to that effect, referring to this CC Sub-Clause 42.3.2, if the Employer becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, being a corporation, if a resolution is passed or order is made for its winding up (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), a receiver is appointed over any part of its undertaking or assets, or if the Employer takes or suffers any other analogous action in consequence of debt.

42.3.3 If the Contract is terminated under CC Sub-Clauses 42.3.1 or 42.3.2, then the Contractor shall immediately

(a) cease all further work, except for such work as may be necessary for the purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition

(b) terminate all subcontracts, except those to be assigned to the Employer pursuant to paragraph (d)(ii) below

(c) remove all Contractor's Equipment from the Site and repatriate the Contractor's and its Subcontractor's personnel from the Site

(d) In addition, the Contractor, subject to the payment specified in CC Sub-Clause 42.3.4, shall

(i) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination

(ii) to the extent legally possible, assign to the Employer all right, title and benefit of the Contractor to the
Facilities and to the Plant and Equipment as on the date of termination, and, as may be required by the Employer, in any subcontracts concluded between the Contractor and its Subcontractors.

(iii) deliver to the Employer all drawings, specifications and other documents prepared by the Contractor or its Subcontractors as on the date of termination in connection with the Facilities.

42.3.4 If the Contract is terminated under CC Sub-Clauses 42.3.1 or 42.3.2, the Employer shall pay to the Contractor all payments specified in CC Sub-Clause 42.1.3, and reasonable compensation for all loss or damage sustained by the Contractor arising out of, in connection with or in consequence of such termination.

42.3.5 Termination by the Contractor pursuant to this CC Sub-Clause 42.3 is without prejudice to any other rights or remedies of the Contractor that may be exercised in lieu of or in addition to rights conferred by CC Sub-Clause 42.3.

42.4 In this CC Clause 42, the expression "Facilities executed" shall include all work executed, Installation Services provided, and Plant and Equipment acquired (or subject to a legally binding obligation to purchase) by the Contractor and used or intended to be used for the purpose of the Facilities, up to and including the date of termination.

42.5 In this CC Clause 42, in calculating any monies due from the Employer to the Contractor, account shall be taken of any sum previously paid by the Employer to the Contractor under the Contract, including any advance payment paid pursuant to Appendix 1 (Terms and Procedures of Payment) to the Contract Agreement.

43. Assignment

43.1 Neither the Employer nor the Contractor shall, without the express prior written consent of the other (which consent shall not be unreasonably withheld), assign to any third party the Contract or any part thereof, or any right, benefit, obligation or interest therein or thereunder, except that the Contractor shall be entitled to assign either absolutely or by way of charge any monies due and payable to it or that may become due and payable to it under the Contract.

44 Construction of the contract

44.1 The contracts to be entered into with the successful bidder shall be as under.

For Domestic Bidder:

--- “First contract” for Ex-works supply and CIF supply, if any of all equipment and materials including mandatory spares identifying separately the CIF and Ex-works components of the supply.

---- “Second Contract” for providing all services i.e. inland transportation for delivery at site, unloading, storage handling at site, installation, testing and commissioning including performance testing in respect of all the equipments supplied under “First contract” and any other services specified in the contract documents.

44.2 The award of two (2) separate contracts shall not in any way dilute the responsibility of the contractor for the successful completion if the facility as per specification and breach in one contract shall automatically be construed as a breach of the other contract which will confer a right on the employer to terminate the other contract also at the risk and the cost of the contractor.

44.3 Deleted

44.4 Deleted

44.5 In case of two contracts entered into as above or where the employer hands over his equipment to the contractor for executing the contract then the contractor shall at the time of taking delivery of equipment through bill of lading or other dispatch documents, furnish trust receipt for plant, equipment and materials and also execute an Indemnity bond in favour of the employer in the form acceptable to the employer for keeping the equipment in safe custody and to utilize the same exclusively for the purpose of the said Contract. Samples of Performa for the Trust receipt and Indemnity bond are enclosed under Section IV (Sample forms and procedures). The employer shall also issue separate authorization letter to the
Contractor to enable him to take physical delivery of plant, equipment and materials from the employer as per Performa enclosed under Section IV (sample forms and procedures).

44.6 The Contract will be signed in two original and the contractor shall be provided with one signed original and the other signed original will be retained by the employer.

44.7 The contractor shall provide free of cost to the employer all the engineering data, drawing and descriptive materials submitted with the bid, in at least two (2) copies to form a part of the contract immediately after notification of Award.

44.8 Subsequent to signing of the contract, the contractor at his own cost shall provide the employer with at least fifteen (15) true copies of contract agreement within thirty (30) days after signing of the contract.

45. **Specific Requirement**

The bidder shall be responsible for safety of human and equipment during the working. It will be the responsibility of the Contractor to co-ordinate and obtain clearance from Electrical Inspector (Govt. of NCT of Delhi) before commissioning. Any additional items, modification due to observation of such statutory authorities shall be provided by the Contractor at no extra cost to the Employer. However the necessary fee of the Inspector shall be reimbursed by DTL.

46. **DTL not to be made party in case of dispute between Contactor and Sub contactor Vendor.**

47. **BLACK-LISTING OF FIRMS/ BANNING OF BUSINESS**

DTL may decide to black-list firms or ban business with them, for specified time, based on facts and circumstances of the particular case generally on the following grounds:

i. Corrupt or Fraudulent practices resorted to by Contractor including mis-representation of facts.
ii. Willful indulgence by the Contractor in supplying sub-standard material irrespective of whether pre-dispatch inspection conducted by DTL or not.
iii. Repeated use of delaying tactic in fulfilling contractual obligations willfully.
iv. Established litigant nature of the contractor to derive undue benefit.
v. Poor performance in one or more contracts.
SECTION-V

SPECIAL CONDITIONS OF CONTRACT (SCC)
SECTION-V

SPECIAL CONDITIONS OF CONTRACT (SCC)

The following bid specific data for the Plant and Equipment to be procured shall amend and/or supplement the provisions in the Conditions of Contract (CC)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>CC Clause Ref. No.</th>
<th>Amendment/Supplement to CC</th>
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<tbody>
<tr>
<td>1.</td>
<td>CC 1.1 &amp; Appendix -4 of Section-F&amp;P</td>
<td><strong>Time/Project Completion Schedule</strong>&lt;br&gt;20 Months from the date of award of work order.&lt;br&gt;Transformer shall be supplied in Phased manner with following tentative delivery Schedule:&lt;br&gt;1&lt;sup&gt;st&lt;/sup&gt; and 2&lt;sup&gt;nd&lt;/sup&gt; Transformer 12 Months from date of award&lt;br&gt;3&lt;sup&gt;rd&lt;/sup&gt; and 4&lt;sup&gt;th&lt;/sup&gt; Transformer 15 Months from date of award&lt;br&gt;5&lt;sup&gt;th&lt;/sup&gt;, 6&lt;sup&gt;th&lt;/sup&gt; and 7&lt;sup&gt;th&lt;/sup&gt; Transformer 17 Months from date of award&lt;br&gt;The Price Variation clause for transformers shall be governed by latest IEEMA (Indian Electrical &amp; Electronics Manufacturers Association) formula as per Appendix 2 of Form of Contract Agreement, Section Forms &amp; Procedures, Volume-I, Attachment 14 of Section-2, Volume-III.</td>
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<td>2.</td>
<td>CC 42.2.1</td>
<td>“The Employer, without prejudice to any other rights or remedies it may possess, may terminate the Contract forthwith in the following circumstances by giving a notice of termination and its reasons therefore to the Contractor, referring to this CC Sub-Clause 42.2”&lt;br&gt;may be read as&lt;br&gt;“The Employer, without prejudice to any other rights or remedies it may possess, may terminate the Contract forthwith in the following circumstances by giving a notice of termination and its reasons therefore to the Contractor, referring to this CC Sub-Clause 42.2 and Performance security (CPG) will be forfeited.”</td>
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<tr>
<td>Sl. No.</td>
<td>CC Clause Ref. No.</td>
<td>Amendment/Supplement to CC</td>
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| 3.     | CC Clause 19.1    | **Supplementing CC Clause 19.1 with the following:**-  
Further, the Contractor shall not subcontract any work to a subcontractor/sub vendor from such countries which shares a land border with India unless such subcontractor/sub vendor fulfils all requirement in regard to ‘Bidder from a country which shares a land border with India as per ITB clause 1.2.2. |

*----- End of Section-V (SCC) ----*
SECTION-VI

FORMS AND PROCEDURES (F&P)
1. BID FORM

Please Refer Volume III
2. BANK GUARANTEE FOR BID SECURITY

Ref ….................................................. Bank Guarantee No…………………………..
Date …..................................................
To ................................................................
................................................................

Dear Sir,

In accordance with your invitation for Bid under your Specification No…………………………….M/s……………………………………………………………
…………………………….having its Registered Office …………………………………………………..(hereinafter called the “Bidder”) wish to participate in the said Bid for ……………………... and you, as a special favour, have agreed to accept Bank Bid Guarantee for an amount of Rs………………(Rupees…………………………………….only) valid upto …………………….. on behalf of the Bidder in lieu of Bid deposit required to be made by the Bidder, as a condition precedent for participation in the said Bid.

We, ……. having our Registered Office at ……………. guarantee and undertake to pay immediately on demand by Delhi Transco Limited the amount of Rs………./- (Rupees…………………………………….Only) without any reservation, protest, demur and recourse. Any such demand made by said 'Owner' i.e. Delhi Transco Limited or its authorized representative shall be conclusive and binding on us irrespective of any dispute or difference raised by the bidder.

This guarantee shall remain valid upto ……………. If any further extension of this guarantee is required, the same shall be extended to such required period on receiving instructions from M/s………………………..on whose behalf this guarantee is issued.

In witness whereof the Scheduled Bank, through its authorized Officer, has set its hand and stamp on this ……………. day of ………at………

Designation with Bank (Scheduled) Stamp

Name: __________________________
Phone No. _______________________
Domain e-mail Id _________________
Official address __________________

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<tr>
<th>SIGNATURE</th>
<th>WITNESS 1</th>
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3a. **FORM OF NOTIFICATION BY THE EMPLOYER TO THE BIDDER FOR FORFEITURE OF BID GUARANTEE AMOUNT**

M/s………………

Ref.: Your proposal against our IFB
No…………………………………………………
Forfeiture of Bid Guarantee amount.

Dear Sirs,

Whereas you have furnished as a part of your proposal the Bid Guarantee in the form of irrevocable and confirmed Letter of Credit No............................................................
dated.................. opened by ......................for a sum of ......................
(Bank's name)
....................................................payable to...............................
..............Name of the Employer) on demand without any reservation, demur or protest,
contest and recourse at..................(Name and place of Bank).

In terms of the aforesaid Bid Guarantee, we do hereby forfeit the Guarantee amount.

For............... (Name of the Employer)

(AUTHORISED SIGNATORY)

N.B. The Letter of Credit should not stipulate any other proforma of notification different from this format. No change whatsoever in the said proforma is acceptable to the Employer.
3b. FORM OF SIGHT DRAFT

Drawn under L.C.
No..................................................dated..............................................of..............................................
...............................................................................................................................................................(Name of Bank that opened the L.C.)

At sight promptly pay to ........................................................ ..................................................
(Name of the Bank at which L.C. is negotiable)

or order sum  of...........................................(for payment to the Employer) for value received.
(Amount of L.C.)

For...............(Name of the Employer)

(AUTHORISED SIGNATORY)

To,

(Name and Address of the Bank which opened L.C.)
4a. FORM OF NOTIFICATION OF AWARD OF CONTRACT' FOR
SUPPLY OF PLANT AND EQUIPMENT

NOTE: INSTRUCTIONS INDICATED IN ITALICS IN THIS NOTIFICATION OF
AWARD ARE TO BE TAKEN CARE OF BY THE ISSUING AUTHORITY.

Ref. No. :
Date :
…..(Contractor's Name & Address)…..

Attn : Mr. ............

Sub : Notification of Award of Contract for Supply of………………………………………………………..
(Package Name) ………………… as per Specification No………………

Dear Sir,

1.0 This has reference to the following:

(i) Our Invitation for Bids (IFB) No. …………………………………... dated ……………

(ii) Bidding Documents for the subject package issued to you vide our letter no. 
………….. dated……………………..comprising the following :

………………………….. (List out all the Sections/Volumes of the Bidding Documents
along with Tender Drawings etc. as issued to the bidder)
…………………………………………

Errata/Amendment No............... to……………………… (Name of Section/Volume
of the Bidding Documents to which Errata/Amendment pertains)………………. issued

to you vide our letter no………………….. dated……………………….

(Applicable only if any Errata/Amendment to the Bidding Documents has been issued
subsequently)

(iii) Clarifications furnished to you on the Bidding Documents vide our letter
no......................dated ……based on the query raised by you/one of the prospective
bidders. (Use as applicable)

(Applicable only if any clarification to the Bidding Documents has been issued
subsequently)

(INCLUDE AS FURTHER SUB-PARAGRAPHS ANY OTHER
CORRESPONDENCE MADE TO THE BIDDER AFTER ISSUANCE OF
BIDDING DOCUMENTS UP TO BID OPENING)

(iv) Your Proposal for the subject package submitted vide your letter No.
………………………………. dated…………………………..and its modification vide
letter no.………………dated …………………………… (Delete if not applicable).

(v) Our Fax message/letter No. ………………………dated……………………

regarding extension of validity of bid and that of the Bank Guarantee towards Bid

Security.

(Applicable only if any extension has been sought subsequently)

(INCLUDE AS FURTHER SUB-PARAGRAPHS ANY OTHER

correspondence made to or by the bidder after bid opening)

(vi) Our Fax message/letter No.…………………….dated………………………………..

inviting you for post bid discussions.

(vii) Post bid discussions and meetings we had with you from……………………………..resulting into the following Minutes of Meeting enclosed

herein with this Notification of award:

(a) Minutes of Meeting regarding Commercial issues (APPENDIX - ....)

(b) Minutes of Meeting on Technical issues (APPENDIX - ....)

(c) Minutes of Meeting regarding Work Schedule (APPENDIX - ....)

(d) Minutes of Meeting regarding Quality Assurance Aspects (APPENDIX- ......)

2.0 We confirm having accepted your proposal submitted vide letter no. ………………

dated ....................and its modification vide letter no.……………..dated (Delete if not

applicable) read in conjunction with all the specifications, terms & conditions of the

Bidding Documents, Your subsequent letters (Use if relevant) and agreed Minutes of

Meeting referred to in para 1.0 above and award on you the Contract for the work of

.........................……...(Indicate brief Scope of

Work).............................................................................of

………………………...(Name of Package) ………………………... for

………………(Name of project) …………………………., as per Specification No. :

……………………(hereinafter referred to as the 'First Contract').

3.0 We have also notified you vide our Notification of Award No.………………for award of another Contract on you for the work of ..........................

(indicate brief scope of work of the Second Contract) ................................

of the equipment/materials to be supplied by you under this 'First Contract' including

Performance and Guarantee test for complete ………………..(Name of Package).

…………………….. for ……………(Name of Project) in accordance as per

Specification No. …………….(hereinafter referred to as the 'Second Contract').

You shall also be fully responsible for the works to be executed under the 'Second

Contract' and it is expressly understood and agreed by you that any breach under the

'Second Contract' shall automatically be deemed as a breach of this 'First Contract'

and vice-versa and any such breach or occurrence or default giving us a right to

terminate the 'Second Contract' and/or recover damages thereunder, shall give us an

absolute right to terminate this Contract and/or recover damages under this 'First

Contract' as well and vice-versa. However, such breach or default or occurrence in the

'Second Contract' shall not automatically relieve you of any of your
responsibility/obligations under this 'First Contract'. It is also expressly understood and agreed by you that the equipment/materials to be supplied by you under this 'First Contract' when installed and commissioned under the 'Second Contract' shall give satisfactory performance in accordance with the provisions of the Contract.

4.0 The total Contract Price for the entire scope of work under the Contract shall be ………..(Specify the amount and currency)……………………….. as per the following break up:

(i) Ex-manufacturing works/place

……………………………………………………
of dispatch price (both in India)/ CIF/CIP port of entry price
(Use as Applicable)
for Main Equipment

(ii) Ex-manufacturing works/place

……………………………………………………
of dispatch price (both in India)/ CIF/CIP port of entry price
(Use as Applicable)
for Mandatory Spares

(iii) Type test charges

……………………………………………………
(Delete if not applicable)
TOTAL (i + ii + iii)

(……………. (Specify the total amount in words)…………………..)

5.0 You shall prepare and finalize the Contract Documents for signing of the formal Contract Agreement and shall enter into the Contract Agreement with us, as per the proforma enclosed with the Bidding Documents, on non-judicial stamp paper of appropriate value within……………..(Specify)…………….days from the date of this Notification of Award.

6.0 This Notification of Award is being issued to you in duplicate. We request you to return its duplicate copy duly signed and stamped on each page including all the enclosed Appendices, by the authorized signatory of your company as a proof of your acknowledgement and confirmation.

Please take the necessary action to commence the work and confirm action.

Yours faithfully,
for and on behalf of
(Name of the Employer)

(Authorised Signatory)

Encl. : As above.
4b. FORM OF 'NOTIFICATION OF AWARD OF CONTRACT' FOR INSTALLATION OF PLANT AND EQUIPMENT

NOTE: INSTRUCTIONS INDICATED IN ITALICS IN THIS NOTIFICATION OF AWARD ARE TO BE TAKEN CARE OF BY THE ISSUING AUTHORITY.

Ref. No. :
Date :

...(Contractor's Name & Address)...

Attn : Mr. ...................

Sub : Notification of Award of Contract for Installation, testing and commissioning of ........ (Package Name) ............. as per Specification No. ......................

Dear Sir,

1.0 This has reference to the following:

(i) Our Invitation for Bids (IFB) No. .......................... dated ..................

(ii) Bidding Documents for the subject package issued to you vide our letter no. ........... dated.......................... comprising the following:

.............................(List out all the Sections/Volumes of the Bidding Documents along with Tender Drawings etc. as issued to the bidder)............................... Errata/Amendment No. ...........

to.......................... (Name of Section/Volume of the Bidding Documents to which Errata/Amendment pertains) ..............issued to you vide our letter no. ...........
dated ..........

(Applicable only if any Errata/Amendment to the Bidding Documents has been issued subsequently)

(iii) Clarifications furnished to you on the Bidding Documents vide our letter no. ........
dated ............ based on the query raised by you/one of the prospective bidders (Use as applicable).

(Applicable only if any clarification to the Bidding Documents has been issued subsequently)

(INCLUDE AS FURTHER SUB-PARAGRAPHS ANY OTHER CORRESPONDENCE MADE TO THE BIDDER AFTER ISSUANCE OF BIDDING DOCUMENTS UP TO BID OPENING)

(iv) Your Proposal for the subject package submitted vide your letter No. ...........
dated ............ and its modification vide letter no.
(Applicable only if any extension has been sought subsequently)
(INCLUDE AS FURTHER SUB-PARAGRAPHS ANY OTHER CORRESPONDENCE MADE TO OR BY THE BIDDER AFTER BID OPENING)

(vi) Our Fax message/letter no. ................... Dated ............... inviting you for post bid discussions.

(vii) Post bid discussions and meetings we had with you from .............. to ........... resulting into the following Minutes of Meeting enclosed herein with this Notification of Award:
(a) Minutes of Meeting regarding Commercial issues (APPENDIX - ....)
(b) Minutes of Meeting on Technical issues (APPENDIX - ....)
(c) Minutes of Meeting regarding Work Schedule (APPENDIX - ....)
(d) Minutes of Meeting regarding Quality Assurance Aspects (APPENDIX - .....)

2.0 We confirm having accepted your proposal submitted vide letter no. ...................dated................ and its modification vide letter no. ................... dated ...................(Delete if not applicable) read in conjunction with all the specifications, terms & conditions of the Bidding Documents, Your subsequent letters (Use if relevant) and agreed Minutes of Meeting referred to in para 1.0 above and award on you the Contract for the work of ...........(Indicate brief Scope of Work) ................ of .............................. (Name of Package) .............................................(hereinafter referred to as the 'Second Contract').

3.0 We have also notified you vide our Notification of Award No. ..................... dated............... for award of another Contract on you for the work of .................... (Indicate brief scope of work of the First Contract) .................... of the equipment/ materials to be supplied by you under the 'First Contract' including Performance and Guarantee Test for complete ...........................................(Name of Package)............. for ...........................................(Name of Project) .................as per Specification No. ...........................................(hereinafter referred to as the 'First Contract'). You shall also be fully responsible for the works to be executed under the 'First Contract' and it is expressly understood and agreed by you that any breach under the 'First Contract' shall automatically be deemed as a breach of this 'Second Contract' and vice-versa and any such breach or occurrence or default giving us a right to terminate the 'First Contract' and/or recover damages there-under, shall give us an absolute right to terminate this Contract and/or recover damages under this 'Second Contract' as well and vice-versa. However, such breach or default or occurrence in the 'First Contract' shall not automatically relieve you of any of your responsibility/obligations under this 'Second Contract'. It is also expressly understood and agreed by you that the
equipment/materials to be supplied by you under the 'First Contract' when erected and commissioned under this 'Second Contract' shall give satisfactory performance in accordance with the provisions of the Contract.

4.0 The total Contract Price for the entire scope of work under the Contract shall be ……….. (Specify the amount and currency)……….. as per the following break up:

(i) Inland transportation and inland transit insurance charges including port clearance, port handling and port charges (Delete if not applicable) for Main Equipment: ……………………………….

(ii) Inland transportation and inland transit insurance charges including port clearance, port handling and port charges (Delete if not applicable) for Mandatory Spares: ……………………………….

(iii) Unloading and handling at site, storage, erection, testing and commissioning including performance testing and insurance covering all the activities: ...

TOTAL (i + ii + iii)

.....................................................................................................(Specify the total amount in words)

5.0 You shall prepare and finalize the Contract Documents for signing of the formal Contract Agreement and shall enter into the Contract Agreement with us, as per the proforma enclosed with the Bidding Documents, on non-judicial stamp paper of appropriate value within …………….. ... (Specify)……… ...days from the date of this Notification of Award.

6.0 This Notification of Award is being issued to you in duplicate. We request you to return its duplicate copy duly signed and stamped on each page including all the enclosed Appendices, by the authorized signatory of your company as a proof of your acknowledgement and confirmation.

Please take the necessary action to commence the work and confirm action.

Yours faithfully,

for and on behalf of

(Name of the Employer)

(Authorised Signatory)
5. FORM OF CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT is made the .................... day of ............, 20..........

BETWEEN
(1) .................................................................a corporation incorporated under the laws
    (Name of Employer)
of ...........................................................and having its principal place of business
    (law of country of Employer)
at ..........................................................(Address of Employer) (hereinafter called "the Employer")

and

(2) ..........................................................., a corporation incorporated under the laws of
    (Name of Contractor)
 ........................................................... and having its principal place of business
    (Country of Contractor)
at .......................................................... (Address of Contractor) (hereinafter called "the Contractor")

WHEREAS the Employer desires to engage the Contractor to design, manufacture, test,
deliver, install, complete and commission certain Facilities, viz.

.......................................................................................... ("the Facilities") and the
    (List of Facilities)
Contractor has agreed to such engagement upon and subject to the terms and conditions
hereinafter appearing.

NOW IT IS HEREBY AGREED as follows:

Article 1. Contract Documents

1.1 Contract Documents (Reference CC Clause 2)

The following documents shall constitute the Contract between the Employer and the
Contractor, and each shall be read and construed as an integral part of the Contract:

(1) This Contract Agreement and the Appendices hereto

(2) Notification of Award.

(3) Conditions of Contract & SCC

(4) Technical Specifications and Drawings

(5) The Bid and Price Schedules submitted by the Contractor

(6) Procedures (as listed)

(7) Any other documents shall be added here
1.2 Order of Precedence (Reference CC Clause 2)

In the event of any ambiguity or conflict between the Contract Documents listed above, the order of precedence shall be the order in which the Contract Documents are listed in Article 1.1 (Contract Documents) above.

1.3 Definitions (Reference CC Clause 1)

1.3.1 Capitalized words and phrases used herein shall have the same meanings as are ascribed to them in the Conditions of Contract.

Article 2. Contract Price and Terms of Payment

2.1 Contract Price (Reference CC Clause 11)

The Employer hereby agrees to pay to the Contractor the Contract Price in consideration of the performance by the Contractor of its obligations hereunder. The Contract Price shall be the aggregate of:

…………………………………………………………..

…………………………………………………………..

(amount in words)

…………………………………………………………..

(amount in figures in INR)

or such other sums as may be determined in accordance with the terms and conditions of the Contract.

2.2 Terms of Payment (Reference CC Clause 12)

The terms and procedures of payment according to which the Employer will reimburse the Contractor are given in Appendix 1 (Terms and Procedures of Payment) hereto.

Article 3. Effective Date for Determining Time for Completion

3.1 Effective Date (Reference CC Clause 1)

The Time of Completion of Facilities shall be determined from the date of the Notification of Award provided all of the following conditions have been fulfilled within a period of two (2) months from the date of said Notification of Award:

(a) This Contract Agreement has been duly executed for and on behalf of the Employer and the Contractor;

(b) The Contractor has submitted to the Employer the Performance Security and the Advance Payment Guarantee;

(c) The Employer has paid the Contractor the Advance Payment.
Each party shall use its best efforts to fulfill the above conditions for which it is responsible as soon as practicable.

3.2 If the Conditions listed under 3.1 are not fulfilled within two (2) months from date of Notification of Award because of reasons attributable to the Employer, the contract would become effective only from the date of fulfillment of the above conditions and, the parties shall discuss and agree on an equitable adjustment to the Contract Price and the time for completion and/or other relevant conditions of the Contract. The Contractor shall not however, benefit (in reckoning the Time for Completion) on account of its delay in providing the Performance Security or the Bank Guarantee for advance payment beyond the period provided in the Contract.

Article 4. It is expressly understood and agreed by and between the Contractor and the Employer that the Employer is entering into this Agreement solely on its own behalf and not on behalf of any other person or entity. In particular it is expressly understood and agreed that the Government of India (GoI) is not a party to this Agreement and has no liabilities, obligations or rights hereunder. It is expressly understood and agreed that the Employer is an independent legal entity with power and authority to enter into contracts solely on its own behalf under the applicable laws of India and the general principals of Contract Law.

The Contractor expressly agrees, acknowledges and understands that the Employer is not an Agent, Representative or Delegate of the GoI. It is further understood and agreed that the GoI is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the Contract. Accordingly, the Contractor expressly waives, releases and foregoes any and all actions or claims, including cross claims, impleader claims or counter claims against the GoI arising out of this Contract and covenants not to sue the GoI as to any manner, claim, cause of action or thing whatsoever arising of or under this Agreement.

Article 5. Appendices

The Appendices listed in the attached List of Appendices shall be deemed to form an integral part of this Contract Agreement.

Reference in the Contract to any Appendix shall mean the Appendices attached hereto, and the Contract shall be read and construed accordingly.

Article 6. Deleted

Article 7. Notwithstanding the award of contract under two separate contracts, any breach under one contract shall be deemed to be a breach of the other contract(s).

IN WITNESS WHEREOF the Employer and the Contractor have caused this Agreement to be duly executed by their duly authorized representatives the day and year first above written.
Signed by for and
on behalf of the Employer

Signed by for and
on behalf of the Contractor

Signature

Title

in the presence of

in the presence of

CONTRACT AGREEMENT
dated the ................................................. day of ………………….... 20.....

BETWEEN

("the Employer")

and

("the Contractor")

(Separate Contract Agreements shall be executed by the Employer and the Contractor in accordance with the Construction of the Contract stipulated at clause 44 of CC. The forms of Contract would be similar except for necessary changes required to suit the individual Contracts).

APPENDICES

Appendix 1 Terms and Procedures of Payment
Appendix 2 Price Adjustment
Appendix 3 Insurance Requirements
Appendix 4 Time Schedule
Appendix 5 List of Approved Subcontractors
Appendix 6 Scope of Works and Supply by the Employer
Appendix 7 List of Document for Approval or Review
Appendix 8 Functional Guarantees
Appendix 9 Integrity Pact (to be appended at the Stage of Contract Award.)
APPENDIX 1

1.0 TERMS AND PROCEDURES OF PAYMENT

The payment to the Contractor under the Contract will be made by the Owner in line with Clause 12.0, Section-CC, Conditions of Contract, Volume-I of the Bidding Documents and as per the guidelines and conditions specified hereunder, on the basis of the Price Break-up given in the section on price schedules. Payments will be made in Indian currency i.e. INR. The Contractor may make applications for payment in respect of part deliveries as work proceeds.

In addition to the Conditions stipulated under Clause 12.0, Section-CC, Conditions of Contract, the following terms & Conditions will apply.

All payments made during the Contract will be on account payment only.

1.1 Supply Portion

a) Advance Payment
10% (Ten percent) of the Ex-works price component (inclusive of mandatory spares) of the Contract price shall be paid as *interest bearing advance after signing the Contract Agreement and on submission of:
   i) Unconditional acknowledgement of LOA by the contractor
   ii) Contractor’s detailed invoice
   iii) Unconditional and irrevocable Advance Bank Guarantee** for 110% of the advance amount
   iv) Performance Security
   v) Detailed BAR CHART and its approval by DTL
   vi) Execution of Contract Agreement.

Note:

*This payment is an optional payment. The Contractor has the option of taking the interest bearing initial advance or otherwise. In case, the Contractor opts for this interest bearing initial advance, the same shall be paid to the Contractor on fulfillment of above conditions and an interest on monthly outstanding amount will be charged at the rate of SBI MCLR +1% at the time of disbursement of advance. The Interest shall be calculated from the date of interest amount paid and charged till the date of posting of Invoice by Finance department. The monthly outstanding amount for the purpose of calculating the interest shall be worked out at the end of each calendar month considering proportionate adjustment of advance against dispatch payment. In case, the Contractor opts not to take interest bearing advance as above, it would be mandatory for him to submit the documents listed at S. No.(i), (iv) and (v) and (vi) above within thirty (30)days of issuance of LOA.

**The bank guarantee(s) for advance shall be kept valid till 90 days after issuance of Operational Acceptance Certificate. Recovery of the advance amount shall be made from each running bill proportionately.
b) Progressive Payment

i) Fifty percent (50%) of the CIF / Ex-works price component (inclusive of mandatory spares) of each item (as identified in the price schedule) shipped shall be paid through irrevocable Letter of Credit (L/C) established in favour of the Contractor and on submission of documents specified in CC Clause 21.0.

## In case, the Contractor opts not to take interest bearing initial advance then this payment shall be 60% instead of 50%.

ii) Further Twenty five percent (25%) of the CIF / Ex-Works price (exclusive of mandatory spares) of each item shipped shall be paid after receipt and storage of material at site and on physical verification by the Employer.

iii) For mandatory spares, balance Forty percent (40%) of the CIF / Ex-Works Price of each item shipped shall be paid after receipt and storage of material at site and on physical verification by the Employer.

c) Final Payment

The final fifteen percent (15%) of the CIF / Ex-Works price component (exclusive of mandatory spares) of the equipment shall be paid on successful completion of erection, testing and commissioning, supply of mandatory spares as per scope of contract, issuance of Operational Acceptance Certificate and proof of submission of the required no. of reproducible, O&M manuals, approved drawings, data sheets, test reports, pamphlets and manual of spares, maintenance & testing equipment etc.

1.2 DELETED

1.3 TRANSPORTATION & INSURANCE CHARGES

Hundred Percent (100%) of transportation and insurance charges shall be paid to the Contractor pro-rata to the value of the equipment received at site and on production of invoices by the Contractor. The aggregate of all such pro-rata payments shall, however, not exceed the total amount quoted by the bidder in his proposal and incorporated in the Contract.

1.4 ERECTION PRICE COMPONENT (INCLUDING CHARGES FOR CIVIL WORKS)

a) Advance

Ten Percent (10%) of the total Contract Price for services viz. installation (including civil works) component except transportation & insurance shall be paid as *interest bearing initial advance on establishment of Contractor’s Site office and submission of a bank guarantee* of 110% of the advance amount valid till 90 days after issuance of Operational Acceptance Certificate.

*This payment is an optional payment. The Contractor has the option of taking the interest bearing advance or otherwise.
In case, the Contractor opts for this interest bearing advance, the same shall be paid to the Contractor on fulfillment of above conditions and an interest on monthly outstanding amount will be charged at the rate of SBI MCLR +1% at the time of disbursement of advance. The monthly outstanding amount for the purpose of calculating the interest shall be worked out at the end of each calendar month against the progressive payment for the work done.

In case, the Contractor opts not to take interest bearing advance as above, it would be mandatory for him to submit the documents listed at S. No.(i), (iv),(v) and (vi) of 1.1 (a) above within thirty (30)days of issuance of LOA.

b) Progressive Payment

Ninety Percent (90%) of the total installation (including civil works) component of the Contract price (In case the contractor opts not to take interest bearing advance as above) or Eighty percent (80%) of the total installation (including civil works) component of the Contract price (In case the contractor opts to take interest bearing advance as above) shall be paid on certification by employer representative for the successful completion of installation services based on milestone.

c) Final Payment

The balance Ten Percent (10%) of the total installation (including civil works) price components of contracts price shall be paid on final issuance of Operational Acceptance Certificate after successful completion of erection, testing and commissioning, proof of submission of the required no. of reproducible, O&M manuals, approved drawings, data sheets, test reports, pamphlets and manual of spares, maintenance & testing equipment etc.

1.5 Deleted

1.6 “Commissioning” for the purpose of payments shall mean satisfactory completion of all supplies, erection, inspection, commissioning checks and successful completion of all site tests and continuous energisation of the equipment/ materials at rated voltage at site as per the Contract and to the satisfaction/ approval of DTL. The contractor will clear the sites and the balance materials, if any, will be shifted to proper place as per instruction of the Site Engineer. The necessary “No Dues Certificates” for electricity and water will required to be submitted, if any, from local agency(s)/ authority(s).

1.7 Taxes & Duties

Taxes & Duties in respect of transaction between Employer and the Contractor as applicable for destination site/state on all items of supply including bought-out finished items (as identified in the Contract), which shall be dispatched directly from the sub-vendor’s works to the Employer’s site will be paid after each shipment against documentary evidence. This payment shall be released by Employer directly to the Contractor against invoices to be submitted by the Contractor.
1.8 **MODE OF PAYMENT**

Payments shall be made by DTL within Thirty (30) days of receipt of Complete GST compliance tax invoices and supported by the requisite documents and fulfillment of stipulated conditions, if any. All the payment shall be released to the Contractor directly through ECS. For this the contractor shall have to provide their Bank Account No., Bank Name, RTGS / MICR / IFSC and other details to our AM(F)SB / AM(F)Works, IIInd Floor, pre-fabricated building, Rajghat Power House, New Delhi - 110002.

Payment of GST component shall be made only if vendor deposited the GST and the credit for the same reflected in the form GSTR3 (Monthly Return) of the GST network and in case of dis-allowance of credit in GSTR3, the amount shall be recovered from vendor with the penalty as per the provision stipulated in GST Act/Law.
APPENDIX 2

PRICE ADJUSTMENT

The prices are to remain FIRM and FIXED for the duration of the Contract except for Power Transformer.

Price adjustment for 500 MVA Power Transformer
The price variation as per latest IEEMA (Indian Electrical & Electronics Manufacturers Association) formula and any further amendment thereof shall be applicable for power transformer as given below:

PRICE VARIATION CLAUSE FOR POWER TRANSFORMERS COMPLETE WITH ALL ACCESSORIES AND COMPONENTS
(of voltage above 33 kV and up to 400 kV )
of supplied against domestic contracts

This price variation clause is applicable for Transformers and Reactors of voltage above 33 kV and up to 400 kV supplied against domestic contracts. A separate price variation clause IEEMA/PVC/PWR TRF Up to 400 kV/DE/2021 has been evolved for above types of Transformers and Reactors supplied against export/deemed export contracts.

The price quoted/confirmed is based on the input cost of raw materials/components and labour cost as on the date of quotation and the same is deemed to be related to prices of raw materials and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment, up or down in accordance with the following formula:

\[ P = \frac{P_o}{100} \left( 6 + \frac{C}{C_o} + \frac{62}{E S_o} + \frac{27}{I S_o} + \frac{12}{I M_o} + \frac{9}{T O_o} + \frac{10}{W_o} \right) \]

Wherein,

- \( P \) = Price payable as adjusted in accordance with the above formula
- \( P_o \) = Price quoted/confirmed.
- \( C \) = Price of CC copper rods (refer notes).
- \( C_o \) = This price is as applicable for the month, ONE month prior to the date of tendering.
- \( E S \) = Price of CRGO Electrical Steel Lamination (refer note).
- \( E S_o \) = This price is as applicable for the month, ONE month prior to the date of tendering.
- \( I S \) = Average price of steel Plates 10 mm thick (refer notes).
- \( I S_o \) = This price is as applicable for the month, ONE month prior to the date of tendering.
- \( I M \) = Price of Insulating Materials (refer notes).
- \( I M_o \) = This price is as applicable for the month, ONE month prior to the date of tendering.
- \( T O \) = Price of Transformer Oil (refer notes).
- \( T O_o \) = This price is as applicable for the month, ONE month prior to the date of tendering.
- \( W \) =
Wo = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base 2016 = 100) This index number is as applicable for the month, THREE months prior to the date of tendering.

For example, if date of tendering falls in December 2021, applicable prices of Copper Rods (C₀), Steel Plates 10 mm thick (IS₀), CRGO Electrical Steel Laminations (ES₀) and Insulating material (IM₀) and Transformer Oil (TO₀) should be as on 1st November 2021 and all India average consumer price index no. (W₀) should be for the month of 1st September 2021.

The above prices and indices are as published by IEEMA vide circular reference number IEEMA(PVC)/PWR_DIST_TRF(R-1)/_/_/ONE months prior to the date of Tendering.

C = Price of CC copper rods (refer notes) This price is as applicable for the month, TWO months prior to the date of delivery.

ES = Price of CRGO Electrical Steel Lamination (refer note) This price is as applicable for the month, TWO months prior to the date of delivery.

IS = Average price of Steel Plates 10 mm thick (refer notes) This price is as applicable for the month, TWO months prior to the date of delivery.

IM = Price of Insulating Materials (refer notes) This price is as applicable for the month, TWO months prior to the date of delivery.

TO = Price of Transformer Oil (refer notes) This price is as applicable for the month, ONE month prior to the date of delivery.

W = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2016 = 100) This index number is as applicable for the month, THREE months prior to the date of delivery.

For example, if date of delivery in terms of clause given below falls in December 2022, applicable prices of Copper Rods (C), Insulating material (IM), CRGO Electrical Steel Lamination (ES), Plates 10 mm thick (IS) should be as on 1st October 2022 and Transformer Oil (TO) should be 1st November 2022 and all India average consumer price index no. (W) should be for the month of September 2022.

The date of delivery is the date on which the transformer is notified as being ready for inspection/dispatch (in the absence of such notification, the date of manufacturer’s dispatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.
**Note**: All prices are exclusive of GST and exclusive of any other central, state or local taxes etc.

(a) The details of prices are as under:

1. Price of 8 mm CC copper rod (in Rs/MT) is ex-works price as quoted by the primary producer.

2. The price of CRGO is the price of CRGO Electrical Steel Lamination in Rs./MT suitable for Transformers of voltage above 33 kV and up to 400 kV

3. Price of Steel is the average retail price of steel plates 10 mm thick as published by Joint Plant Committee (JPC) in Rs./MT

4. The price of Insulating materials (in Rs./Kg) of pre-compressed pressboards of size 10 mm thick, 3200 mm x 4100 mm is the average C&F price in free currency per MT converted into Indian Rupees with applicable exchange rates prevailing as on 1st working day of the month as quoted by primary suppliers. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.

5. The price of Transformer Oil (in Rs./K.Ltr) is the average price on ex-refinery basis as quoted by primary producers for supply in drums.

b) Some purchasers are purchasing oil immersed Transformers from manufacturers without first filling of oil. Oil for first filling is procured and filled by the purchasers. For such supplies PVC formula, excluding Oil will apply as under:

\[
P = \frac{P_0}{91} \left( 6 + 32 \frac{C}{C_0} + 27 \frac{ES}{ES_0} + 12 \frac{IS}{IS_0} + 4 \frac{IM}{IM_0} + 10 \frac{W}{W_0} \right)
\]

\[
P = \frac{P_0}{100} \left( 6 + 32 \frac{C}{C_0} + 27 \frac{ES}{ES_0} + 12 \frac{IS}{IS_0} + 4 \frac{IM}{IM_0} + 10 \frac{W}{W_0} \right)
\]

Where description of P, P0, C, ES, IS, IM, W etc. remains same as mentioned earlier.
INSURANCE REQUIREMENTS

Insurances to be taken out by the Contractor

In accordance with the provisions of CC Clause 34, the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurances set forth below in the sums and with the deductibles and other conditions specified. The identity of the insurers and the form of the policies shall be subject to the approval of the Employer, such approval not to be unreasonably withheld.

(a) Transit / Marine insurance During supply of materials for supply/ Supply portion of Contract

Covering loss or damage occurring, whilst in transit from the Contractor's or manufacturer's works or stores until arrival at the Site, to the Facilities (including spare parts therefore) and to the Construction Equipment to be provided by the Contractor or its Subcontractors.

(i) For Imported Plant/ Equipment/ Materials

<table>
<thead>
<tr>
<th>Amount</th>
<th>Deductible limits</th>
<th>Parties Insured</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>125%* of the (CIF value)</td>
<td>NIL</td>
<td>Contractor &amp; Employer</td>
<td>Warehouse</td>
<td>Warehouse + 90 Days</td>
</tr>
</tbody>
</table>

*Price variation @ 10 % per Annum of CIF cost shall be taken subject to a maximum of 30% or specified otherwise, whichever is lower.

(ii) For Domestic Plant/ Equipment/ Materials

<table>
<thead>
<tr>
<th>Amount</th>
<th>Deductible limits</th>
<th>Parties Insured</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>110%* of the (FOR value)</td>
<td>NIL</td>
<td>Contractor &amp; Employer</td>
<td>Warehouse</td>
<td>Warehouse + 90 Days</td>
</tr>
</tbody>
</table>

*Price variation @ 10 % per Annum of CIF cost shall be taken subject to a maximum of 30% or specified otherwise, whichever is lower.

(b) Storage Cum Erection (SCE)/ Installation Insurance: All Risks Coverage

Covering physical loss or damage to all the equipment, material and facilities being supplied, under the contract, from point of receipt at site to Completion of the Facilities/ commissioning including handling, storage, erection, testing etc with an
extended maintenance coverage for the Contractor's liability in respect of any loss or damage occurring during the Defect Liability Period while the Contractor is on the Site for the purpose of performing its obligations during the Defect Liability Period.

<table>
<thead>
<tr>
<th>Amount</th>
<th>Deductible limits</th>
<th>Parties Insured</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>105% of the (Contract Price)</td>
<td>NIL</td>
<td>Contractor / Sub-contractor &amp; Employer</td>
<td>Receipt at site</td>
<td>Upto Defect Liability period</td>
</tr>
</tbody>
</table>

(c) Materials/Plants/ Equipments supplied By Employer As per (a) Above

(d) Third Party Liability Insurance

covering bodily injury or death suffered by third parties (including the Employer's personnel) and loss of or damage to property (including the Employer's property and any parts of the Facilities which have been accepted by the Employer) occurring in connection with the supply and installation of the Facilities.

<table>
<thead>
<tr>
<th>Amount</th>
<th>Deductible limits</th>
<th>Parties Insured</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rs. 0.5 million per person per occasion</td>
<td>NIL</td>
<td>Contractor / Sub-contractor</td>
<td>Commencement of work</td>
<td>Upto Defect Liability period</td>
</tr>
</tbody>
</table>

(e) Automobile Liability Insurance

covering use of all vehicles used by the Contractor or its Subcontractors (whether or not owned by them) in connection with the supply and installation of the Facilities. Comprehensive insurance in accordance with statutory requirements.

(f) Worker's Compensation

in accordance with the statutory requirements applicable in any country where the Facilities or any part thereof is executed.

(g) Employer's Liability

in accordance with the statutory requirements applicable in any country where the Facilities or any part thereof is executed.

(h) Other Insurances

The Contractor is also required to take out and maintain at its own cost the following insurances:
The Employer shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to CC Sub-Clause 34.1 above except for the Third Party Liability, Worker's Compensation and Employer's Liability Insurances, and the Contractor's Subcontractors shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to CC Sub Clause 34.1 above except for the Transit / Marine insurance, Worker's Compensation and Employer's Liability Insurances, and all insurer's rights of subrogation against such co-insured for losses or claims arising out of the performance of the Contract shall be waived under such policies.

**Insurances to be taken out by the Employer**

The Employer shall at its expense take out and maintain in effect during the performance of the Contract the following insurances. Details:...

<table>
<thead>
<tr>
<th>Amount</th>
<th>Deductible limits</th>
<th>Parties Insured</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIL</td>
<td></td>
<td>Contractor / Sub-contractor &amp; Employer</td>
<td>Receipt at site</td>
<td>Upto Defect Liability period</td>
</tr>
</tbody>
</table>
APPENDIX 4

TIME SCHEDULE

1. The Project Completion Schedule shall be as follows:

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Activities</th>
<th>Duration in months from the effective date of Contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Taking Over by the employer upon successful completion of:</td>
<td>Time/Project Completion Schedule</td>
</tr>
<tr>
<td></td>
<td>Design, Supply, Erection, Testing &amp; Commissioning of 05 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub- Stations of DTL on turnkey basis</td>
<td>20 Months from the date of award of work order. Transformer shall be supplied in Phased manner with following tentative delivery Schedule:</td>
</tr>
<tr>
<td></td>
<td>1st and 2nd Transformer</td>
<td>12 Months from date of award</td>
</tr>
<tr>
<td></td>
<td>3rd and 4th Transformer</td>
<td>15 Months from date of award</td>
</tr>
<tr>
<td></td>
<td>5th Transformer</td>
<td>17 Months from date of award</td>
</tr>
</tbody>
</table>

The transformers are required for the following 400kV substations:

i. 400kV Tikrikalan-03 Nos.
ii. 400kV Bawana- 01 No.
iii. 400 KV Bamnauli-01 No.

Note: The location of site for transformer may undergo change if so required by the Employer within Delhi.

1.1 The bidder shall include in his proposal his programme for furnishing and installation of the equipment including related civil work covered under this package. The programme shall be in the form of a master network plan (MNW) and shall identify the various activities like design, engineering, manufacturing, supply, installation, factory testing, transportation to site, site testing and commissioning guarantee test and operational acceptance etc. of the entire project work. The network plan shall conform to the above completion schedule. No credit will be given for earlier completion.

This master network will be discussed and agreed before Award in line with above, engineering drawing and data submission schedule shall also be discussed and finalized before Award. Liquidated damages for delay in successful completion of taking over at rates specified in Clause 26.2 of CC shall be applicable beyond the date specified above.

1.2 The employer reserves the right to request minor changes in the work schedule at the time of Award of Contracts to the successful Bidder.
1.3 The successful Bidder shall be required to prepare detailed Network(s) and project implementation plans & programs and finalize the same with the Employer as per the requirement specified in Technical Specifications, which shall form a part of the Contract.
APPENDIX 5

LIST OF APPROVED SUBCONTRACTORS

Prior to award of Contract, the following details shall be completed indicating those subcontractors proposed by the Bidder by Attachment to its bid that are approved by the Employer for engagement by the Contractor during the performance of the contract.

The following Subcontractors are approved for carrying out the item of the facilities indicated. Where more than one Subcontractor is listed, the Contractor is free to choose between them, but it must notify the Employer of its choice in good time prior to appointing any selected Subcontractor. In accordance with CC Sub-Clause 19.1, the Contractor is free to submit proposals for Subcontractors for additional items from time to time. No Subcontractors shall be placed with any such Subcontractors for additional items until the Subcontractors have been approved in writing by the Employer and their names have been added to this list of Approved Subcontractors.

<table>
<thead>
<tr>
<th>Item of Facilities</th>
<th>Approved Subcontractors</th>
<th>Nationality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 6

SCOPE OF WORKS AND SUPPLY BY THE EMPLOYER

The following personnel, facilities, works and supplies will be provided/ supplied by the Employer, and the provisions of CC 10, 20, 21 and 24 as well as Employer responsibilities stated in technical specifications shall apply as appropriate.

All personnel, facilities, works and supplies will be provided by the Employer in good time so as not to delay the performance of the Contractor in accordance with the approved Time Schedule and Program of Performance pursuant to CC Sub-Clause 18.2.

Unless otherwise indicated, all personnel, facilities, works and supplies will be provided free of charge to the Contractor.

Personnel Charge to Contractor – None

NIL

Facilities Charge to Contractor - None except as noted

1. Permission will be arranged by the Employer for full site and facilities access as required for site surveys and for the installation, connection and testing of complete equipment and systems. Such permission shall be requested by the Contractor one month prior to the Scheduled need for such access, consistent with the Contractors "Project Implementation Plan", Subsequent to approval of such "Plan" by Employer.

Electricity and Water Charge to Contractor - as noted

The Contractor shall be entitled to use for the purposes of the facilities such supplies of electricity and water as may be available on the Site and shall provide any apparatus necessary for such use. The Contractor shall pay the Employer at the applicable tariff plus Employer's overheads, if any, for such use. Where such supplies are not available, the Contractor shall make his own arrangement for provision of any supplies he may require.

Works Charge to Contractor - None

---------------------------------------------------------------------------NIL---------------------------------------------------------------------------

Supplies Charge to Contractor - None

---------------------------------------------------------------------------NIL---------------------------------------------------------------------------
LIST OF DOCUMENTS FOR APPROVAL OR REVIEW

Pursuant to CC Sub-Clause 20.3.1, the Contractor shall prepare or cause its Subcontractor to prepare, and present to the Project Manager in accordance with the requirements of CC Sub-Clause 18.2 (Program of Performance), the following documents for:

A. Approval
1. 
2. 
3. 

B. Review
1. 
2. 
3. 

Note:

Bidder shall furnish the exhaustive list, which shall be discussed and finalized for incorporation into the Contract Agreement.
FUNCTIONAL GUARANTEES

GUARANTEES, LIQUIDATED DAMAGES FOR NON PERFORMANCE

1. The equipment offered shall meet the rating and performance requirements stipulated in Technical Specification for various equipment or indicated in Data requirement.

2. In particular, Power Transformer offered under this contract shall meet the maximum loss limit requirement as stipulated in technical specifications. Penalties shall be levied on the manufacturer/contractor (as the case may be) if losses measured during routine test are found to be within +2% tolerance of the losses specified in technical specifications, beyond which the transformer shall be liable for rejection. No benefit shall be given for supply of transformer with losses (measured during routine tests) less than the losses specified in technical specifications.
6. PROFORMA OF BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No.…………………………. Date ……………….………..

To,

[Name and address of the Employer]

1) In consideration of the Delhi Transco Limited (hereinafter called “The Undertaking”) having agreed to accept from M/s………………………………………… (hereinafter called the said contractor(s) from the demand, under the terms & conditions of an agreement dated………………… between Delhi Transco Limited& M/s…………………… for supply of………………….. Nos.…………………… in respect of NOA No………………………………… dated…………………. (hereinafter called the agreement) security deposit for the due fulfillment of the said contract of the terms & conditions contained in the said agreement on production of Bank Guarantee for Rs………………… (Rupees………………………). We Name of Bank with address) (hereinafter referred to as “The Bank”) do hereby undertake to pay to the undertaking amount not exceeding Rs…………… (Rupees…………………………) against any loss or damage caused to or suffered or would be caused to the said contractor of any of the terms & conditions in the said agreement. As such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs………………… (Rupees…………………………).

2) We (Name of Bank with address) do hereby undertake to pay the amount due and payable under this guarantee without any demur, merely on a demand for the undertaking stating that the amount claimed due by a way of loss or damage caused to or would be caused to suffered by the undertaking by reason of any breach, by the said contractor(s) or any of the terms & conditions contained in the said agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs………………… (Rupees…………………………).

3) We (Name of Bank with address), further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for performance of the said agreement and that it shall continue to be enforceable till all the dues of the undertaking by virtue of the said agreement have been fully paid and its claims satisfied or discharged of till (Date of validity) the undertaking certified that the terms & conditions of the said agreement have been fully and properly carried out by the said contractor(s) and accordingly guarantee is made on us in writing on or before the (Date of validity).

4) We (Name of Bank with address), further agree with the undertaking that the undertaking shall have the fullest liberty without our consent and without effecting in any manner our obligations hereunder to vary any of the agreement or to enforce any of the performance by the said contractor and to forebear or enforce any of the terms & conditions relating to the said or any such variation, or extension being warranteed to the said contract(s) for any forbearance, act or omission on the part of the undertaking or any indulgence by the Undertaking to the contractor(s) or by any such matter or thing
whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

5) We, (Name of Bank with address), lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Undertaking in writing and to extend the period of guarantee, if required for any reason.

6) “Notwithstanding anything contained herein above, our liability under this guarantee is restricted to Rs…………… (Rupees………………………..) and the guarantee shall remain in force upto (date of validity) unless a demand or claim in writing is presented on the bank within (date of validity). The Bank shall be relieved and discharged from all liabilities there under”

Dated the……………………….. Day of …………………….200

For (Name of Bank)

(BRANCH MANAGER)

WITNESS

1…………………………….
7. BANK GUARANTEE FORM FOR ADVANCE PAYMENT

Date................
Contract No........

[Name of Contract]

To: [Name and address of the Employer]

Dear Ladies and/or Gentlemen,

We refer to the Contract ("the Contract") signed on........................................................................................................ between you and...........................

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

("the Contractor") concerning design, execution and completion of (Brief description of the Facilities) .................................................................

Whereas, in accordance with the terms of the said Contract, the Employer has agreed to pay or cause to be paid to the Contractor an Advance Payment in the amount of Indian Rupees (INR)..........................................................................................................................

(Amount in words)
.........................................................................................................................(....................)

(Amount in figures in INR)

By this letter we, the undersigned, ................................, a Bank (or company) organized under the laws of ............................................................ and having its registered/principal office at....................................................... do hereby jointly and severally with the Contractor irrevocably guarantee repayment of the said amounts upon the first demand of the Employer without cavil or argument in the event that the Contractor fails to commence or fulfill its obligations under the terms of the said Contract, and in the event of such failure, refuses to repay all or part (as the case may be) of the said advance payment to the Employer.

Provided always that the Bank's obligation shall be limited to an amount equal to the outstanding balance of the advance payment, taking into account such amounts, which have been repaid by the Contractor from time to time in accordance with the terms of payment of the said Contract as evidenced by appropriate payment certificates.

This Guarantee shall remain in full force from the date upon which the said advance payment is received by the Contractor until the date upon which the Contractor has fully repaid the amount so advanced to the Employer in accordance with the terms of the Contract. At the time at which the outstanding amount is NIL, this Guarantee shall become null and void, whether the original is returned to us or not.

Any claims to be made under this Guarantee must be received by the Bank during its period of validity, i.e. upto 90 (ninety) days after the date of operational acceptance by the Employer i.e. on or before.........................................................(year, month, date).
Yours truly,
For and on behalf of the Bank

[Signature of the authorised signatory(ies)]
Signature_______________________
Name_______________________
Designation_______________________
POA Number_______________________
Contact Number(s): Tel.______________Mobile______________
Fax Number_______________________
email ____________________________
Common Seal of the Bank______________________
Witness:
Signature_______________________
Name_______________________
Address______________________________
Contact Number(s): Tel.______________Mobile______________
email ____________________________

Note:

1. The non-judicial stamp papers of appropriate value shall be purchased in the name of bank who issues the 'Bank Guarantee'.
2. Advance Bank Guarantee is to be provided by the successful bidder in the form of a bank guarantee which should be issued either:
   (a) by a reputed bank located in the country of Employer and acceptable to the Employer, or
   (b) by a foreign bank confirmed by either its correspondent bank located in the country of Employer which should be reputed and acceptable to the Employer, or
   (c) by a Public Sector Bank in the country of Employer.

All banks shall be nationalized and scheduled banks operating in India.
8. FORM OF COMPLETION CERTIFICATE

Date……………………

Name of Contract………
Contract No…………...

To:
(Name and address of the Contractor)

Dear Ladies and/or Gentlemen,

Pursuant to CC 24 (Completion of the Facilities) of the Conditions of the Contract entered into between yourselves and the Employer dated ………………………………….. relating to the …………………………………
(Brief description of the Facilities)

we hereby notify you that the following part(s) of the Facilities was (were) complete on the date specified below, and that, in accordance with the terms of the Contract, the Employer hereby takes over the said part(s) of the Facilities, together with the responsibility for care and custody and the risk of loss thereof on the date mentioned below :

1. Description of the Facilities or part thereof …………………………………………………

2. Date of Completion ………………………………………………………………………

However, you are required to complete the outstanding items listed in the attachment hereto as soon as practicable.

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defects Liability Period.

Very truly yours,

Title
(Project Manager)
9. FORM OF OPERATIONAL ACCEPTANCE CERTIFICATE

Date……………………

Name of Contract………
Contract No……………

To:

(Name and address of the Contractor)

Dear Ladies and/or Gentlemen,

Pursuant to CC 25.3 (Operational Acceptance) of the Conditions of the Contract entered into between yourselves and the Employer dated………………...
relating to the ………………………………………………
(Brief description of the facilities)

we hereby notify you that the Functional Guarantees of the following part(s) of the Facilities were satisfactorily attained on the date specified below.

1. Description of the Facilities or part thereof ………………………………

2. Date of Operational Acceptance : ………………………………………

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defects Liability Period.

Very truly yours,

Title
(Project Manager)
10. CHANGE ORDER PROCEDURE

Contract No. ………………………

CONTENTS

1. GENERAL

2. CHANGE ORDER LOG

3. REFERENCE FOR CHANGES

1. ANNEXURES

ANNEX 1 Request for Change Proposal
ANNEX 2 Estimates for Change Proposal
ANNEX 3 Acceptance of Estimates
ANNEX 4 Change Proposal
ANNEX 5 Change Order
ANNEX 6 Pending Agreement Change Order
ANNEX 7 Application for Change Proposal
ANNEX 8 Change Order Log
CHANGE ORDER PROCEDURE

1. **General**

   This section provides samples of procedures and forms for implementing changes in the Facilities during the performance of the Contract in accordance with CC 39 (Change in Facilities) of the Conditions of Contract.

2. **Change Order Log**

   The Contractor shall keep an up-to-date change Order Log to show the current status of Requests for Change and Changes authorized or pending as Annex-8 Entries of the Changes in the Change Order Log shall be made to ensure that the log is up-to-date. The Contractor shall attach a copy of the current Change Order Log in the monthly progress report to be submitted to the Employer.

3. **References for Changes**

   (i) Request for Changes as referred to in CC Clause 39 shall be serially numbered CR-X-nnn.

   (ii) Estimate for Change Proposal as referred to in CC Clause 39 shall be serially numbered CN-X-nnn.

   (iii) Acceptance of Estimate as referred to in CC Clause 39 shall be serially numbered CA-X-nnn.

   (iv) Change Proposal as referred to in CC Clause 39 shall be serially numbered CP-X-nnn.

   (v) Change Order as referred to in CC Clause 39 shall be serially numbered CO-X-nnn.

   **Notes:**

   (a) Requests for Change issued from the Employer’s Home Office and the site representatives of the Employer shall have the following respective references:

       Home Office CR-H-nnn
       Site CR-S-nnn

   (b) The above number “nnn” is the same for Request for Change, Estimate for Change Proposal Acceptance of Estimate, Change Proposal Change Order.
REQUEST FOR CHANGE PROPOSAL

To : (Contractor’s Name and Address) Date : …………………

Attention : (Name and Title)

(Contract Name)………………… (Contract No.)…………………..

Dear Ladies and/ or Gentlemen :

With reference to the captioned Contract, you are requested to prepare and submit a Change Proposal for the Change noted below in accordance with the following instructions within ………………days of the date of this letter. (or on before [date])

1. Title of Change :

2. Change Request No………………… (Rev…………………)

3. Originator of Change:
   Employer (Name)…………………………………………………..
   Contractor (by Application for Change Proposal No………*)
   * Refer to ANNEX 7.

4. Brief Description of Change :

5. Facilities and/ or Item No. of equipment related to the requested Change :

* Refer to ANNEX 7.
6. Reference drawings and/or technical documents for the request of Change:

<table>
<thead>
<tr>
<th>Drawings No. / Document No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
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<td></td>
</tr>
</tbody>
</table>

7. Detailed conditions or special requirements on the requested Change:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. General Terms and Conditions:

(1) Please submit your estimate to us showing what effect the requested Change will have on the Contract Price.

(2) Your estimate shall include your claim for the additional time, if any for completion of the requested Change.

(3) If you have any opinion negative to the adoption of the requested Change in connection with the conformability to the other provisions of the Contract on the safety of the Plant or Facilities Please inform us of your opinion in your proposal of revised provisions.

(4) Any increase or decrease in the work of the Contractor relating to the services of its personnel shall be calculated.

(5) You shall not proceed with the execution of the work for the requested Change Until we have accepted and confirmed the amount and nature in writing

……………………………

(Employer’s Name)

(Signature)

……………………………

(Name of signatory)

……………………………

(Title of signatory)
ESTIMATE FOR CHANGE PROPOSAL

(Contractor’s Letterhead)

To: (Employer’s Name and Address) Date: ………………………

Attention: (Name and Title)

Contract Name…………………………….

Contract Number…………………………….

Dear Ladies and /or Gentlemen:

With reference to your Request for Change Proposal, we are pleased to notify you of the approximate cost of preparing the below-referenced Change Proposal in accordance with CC Sub-Clause 39.2.1 of the Conditions of Contract. We acknowledge that your agreement to the cost of preparing the Change Proposal, in accordance with CC Sub-Clause 39.2.2, is required before estimating the Cost for Change work.

1. Title of Change …………………………………………………………………

2. Change Request No………………………………..(Rev………………………)

3. Brief Description of Change :

4. Scheduled Impact of Change :

5. Cost for Preparation of Change Proposal (in the currencies of the Contract)

<table>
<thead>
<tr>
<th></th>
<th>Engineering</th>
<th>(Amount)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Engineer</td>
<td>_____ hrs x _____ rate/hr =</td>
<td>_______</td>
</tr>
<tr>
<td>(ii) Draftsperson</td>
<td>_____ hrs x _____ rate/hr =</td>
<td>________</td>
</tr>
<tr>
<td>Sub-total</td>
<td>_____ hrs</td>
<td>________</td>
</tr>
<tr>
<td>Total Engineering Cost</td>
<td></td>
<td>________</td>
</tr>
</tbody>
</table>
(b) Other Cost

Total Cost (a) + (b)  

__________________________

(Contractor’s Name)

__________________________

(Signature)

__________________________

(Name of Signatory)

__________________________

(Title of signatory)
ACCEPTANCE OF ESTIMATES

To : (Contractor’s Name and Address)        Date : …………………
Attention : (Name and Title)…………………………………………………….
…………………………………………………………………………………....
Contract Name : ………………………
Contract Number………………………….

Dear Ladies and /or Gentlemen :

We hereby accept your Estimate for Change Proposal and agree that you should proceed with the preparation of the Change Proposal.

1. Title of Change : …………………………………………………………….

2. Change Request No. .......................... (Rev ..................)

3. Estimate for Change Proposal No. ........... (Rev ..................)

4. Acceptance of Estimate No..................... (Rev ..................)

5. Brief Description of Change :
   …………………………………………………………………………………
   …………………………………………………………………………………
   …………………………………………………………………………………

6. Other Terms and Conditions In the event that we decide not to order the Change accepted, you shall be entitled to compensation for the cost of preparation of Change Proposal described in your estimate for Change Proposal mentioned in para. 3 above in accordance with CC Clause 39.0 of the Conditions of Contract.

……………………………… (Employer’s Name)
……………………………… (Signature)
……………………………… (Name and Title of signatory)
CHANGE PROPOSAL

To : (Employer’s Name and Address) Date : ………………..

Attention : (Name and Title)

(Contract Name) …………………. (Contract No.) …………………

Dear Ladies and / or Gentlemen

In response to your Request for Change Proposal No. ………we hereby submit our proposal as follows :

1. Title of Change : (Name) ………………………………………

2. Change Request No. ……………………(Rev ………………………)

3. Originator of Change : Employer (Name) ……………………. Contractor (Name) ………………….

4. Brief Description of Change :

5. Reasons for Change :

6. Facilities and/ or Item No. of equipment related to the requested Change :

7. Reference drawings and/ or technical documents for the requested Change :

Drawing No. / Document No. Description
…………………………. ………………………
…………………………. ………………………
8. Estimate of increase / decease / (in the currencies of the contract to the Contract Price resulting from Change Proposal

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Direct Material</td>
<td></td>
</tr>
<tr>
<td>(b) Major construction equipment</td>
<td></td>
</tr>
<tr>
<td>(c) Direct field labour (Total hrs)</td>
<td></td>
</tr>
<tr>
<td>(d) Subcontracts</td>
<td></td>
</tr>
<tr>
<td>(e) Indirect material and labour</td>
<td></td>
</tr>
<tr>
<td>(f) Site supervision</td>
<td></td>
</tr>
<tr>
<td>(g) Head office technical staff salaries</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Position</th>
<th>Hours</th>
<th>Rate/hr</th>
<th>Total Hours @ Rate/hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process engineer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project engineer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment engineer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procurement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draftsperson</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(h) Extraordinary costs (computer, travel, etc.)

(i) Fee for general administration % of Items

(j) Taxes and customs duties

**Total lump sum cost of Change Proposal**

[sum of Items (a) to (j)]

**Cost to prepare Estimate for Change Proposal**

(amount payable if Change is not accepted)

9. Additional time for Completion required due to Change Proposal:

10. Effect on the other Functional Guarantees.

11. Effect on the other terms and Conditions of the Contract.

12. Validity of this Proposal: Within days after receipt of this Proposal by the Employer.

13. Other Terms and Conditions of this Change Proposal:
(a) You are requested to notify us of your acceptance, comments or rejection of this detailed Change Proposal within……………….days from your receipt of this Proposal.

(b) The amount of any increase and/ or decrease shall be taken into account In the adjustment of the Contract Price.

(c) Contractor’s cost for preparation of this Change Proposal:

(Note) This cost shall be reimbursed by the Employer in case of Employer’s withdrawal or rejection of this Change Proposal without default of the Contractor in accordance with CC Clause 39.0 of the Conditions of Contract.

........................................
(Contractor’s Name)

........................................
(Signature)

........................................
(Name of signatory)

........................................
(Title of signatory)
CHANGE ORDER

To: (Employer’s Name and Address)  Date: ....................

Attention: (Name and Title)

(Contract Name) ..................  (Contract No.) .................

Dear Ladies and / or Gentlemen:

We approve the Change Order for the work specified in the Change Proposal No. ....... and agree to adjust the Contract Price, Time for Completion and / or other conditions of the Contract in accordance with CC Clause 39.0 of Conditions of Contract.

1. Title of Change: (Name) ........................................

2. Change Request No. ...........(Rev..........................)

3. Change Order No..............(Rev.........................)

4. Originator of Change: Employer (Name) ......................
   Contractor (Name) ..........................

5. Authorized Price:
   Ref. No. .......................(Number)
   Date: .....................
   Foreign currency portion ....... plus Local currency portion ...........

6. Adjustment of Time for Completion
   None     Increase ............. days  Decrease ............... days

7. Other effects, if any
   Authorized by: .........................  Date: ......................
   (Employer)
   Accepted by: ..........................  Date: .....................
   (Contractor)
PENDING AGREEMENT CHANGE ORDER

(Contractor’s Letterhead)

To : (Employer’s Name and Address)  Date : …………………

Attention : (Name and Title)

(Contract Name) .......... (Contract No.) .................

Dear Ladies and / or Gentlemen :

We instruct you to carry out the work in the Change Order detailed below in accordance with CC 39.0 of the Conditions of Contract.

1. Title of Change : (Name) ...........................................
2. Employer Request for Change Proposal No……(Rev ………)  Dated………
3. Contractor’s Change Proposal No………………(Rev……….)  Dated………
4. Brief Description of Change :

5. Facilities and/ or Item No. of equipment related to the requested Change :

6. Reference drawings and/ or technical documents for the requested Change
Drawing No. / Document No. Description

7. Adjustment of time for completion :

8. Other change in the Contract terms :

9. Other terms and Conditions :

(Contractor’s Name)

(Signature)

(Name of signatory)

(Title of signatory)
APPLICATION FOR CHANGE PROPOSAL

(Contractor’s Letterhead)

To : (Employer’s Name and Address)   Date : …………………

Attention :    (Name and Title)

(Contract Name) ……………………….   (Contract No.) …………………

Dear Ladies and / or Gentlemen :

We hereby propose that the below mentioned work be treated as a Change in the Facilities.

1. Title of Change :
   (Name) ………………………..……………………..………..

2. Application for Change Proposal No………………(Rev ………………)
   Dated …………….

3. Brief Description of Change :
   …………………………..………………………..………………………..
   …………………………..………………………..………………………….

4. Reasons for Change :
   …………………………..………………………..…………………………..
   …………………………..………………………..…………………………..

5. Order of Magnitude Estimation (in the currencies of the Contract).
   ……………………………………………………………………………….
   ……………………………………………………………………………….

6. Scheduled Impact of Change :
   ……………………………………………………………………………….
   ……………………………………………………………………………….

7. Effect on Functional Guarantee. If any :
   ……………………………………………………………………………….
   ……………………………………………………………………………….

8. Appendix
(Contractor’s Name)

(Signature)

(Name of signatory)

(Title of signatory)
# CHANGE ORDER LOG

(Contractor’s Letterhead)

To : (Employer’s Name and Address)    Date :  .....................

Attention :  (Name and Title)

(Contract Name)  .......................    (Contract No.)  .....................

Dear Ladies and / or Gentlemen :

(Contract Name)  .......................    (Contract No.)  .................

We hereby furnish the up-to date change order log to show the current status of request for changes and authorized or pending.

<table>
<thead>
<tr>
<th>S1. No.</th>
<th>Employer’s Request for change</th>
<th>Contractor’s application for change proposal including revision</th>
<th>Contractor’s Change proposal including revision</th>
<th>Pending Change order No. proposal No.</th>
<th>Remarks*</th>
</tr>
</thead>
</table>

(Contractor’s Name)
(Signature)

(Name of signatory)

Title of Signatory

Note :

(i) *In case Employer has authorized to carryout the work pending agreement change order, the details of such authorization shall be furnished.

(ii) The contractor shall attach a copy of the current change order log in the monthly progress report to be submitted to the Employer every month.
11. FORM OF INDEMNITY BOND TO BE EXECUTED BY THE CONTRACTOR FOR THE EQUIPMENT HANDED OVER IN ONE LOT BY DELHI TRANSCO LTD. FOR PERFORMANCE OF ITS CONTRACT

INDEMNITY BOND

THIS INDEMNITY BOND is made this ........ day of............... 200...... by............... a Company registered under the Companies Act, 1956/ Partnership firm/ proprietary concern having its Registered Office at.............(hereinafter called as ‘Contractor’ or “Obligor” which expression shall include its successors and permitted assigns) in favour of DELHI TRANSCO LTD, a Company incorporated under the Companies Act, 1956 having its Registered Office at Shakti Sadan, Kotla Road, New Delhi-110002.

WHEREAS DELHI TRANSCO LTD. has awarded to the Contractor a contract for ......................vide its Notification of Award/ Contract No......................... dated ..............and its Amendment No...................... (applicable when amendments have been issued) (hereinafter called the “Contract”) in terms of which DTL is required to hand over various Equipments to the Contractor for execution of the Contract.

And WHEREAS by virtue of Clause No............of the said Contract, the Contractor is required to execute an Indemnity Bond in favour of DTL for the Equipment handed over to it by DTL for the purpose of performance of the Contract/ Erection portion of the contract (hereinafter called the “Equipment”)

AND THEREFORE, This Indemnity Bond witnesseth as follows:

1. That in consideration of various Equipments as mentioned in the Contract, valued at (amount in words..........................) handed over to the Contractor for the purpose of performance of the Contract, the Contractor hereby undertakes to indemnify and shall keep DTL indemnified, for the full value of the Equipment. The Contractor hereby acknowledges receipt of the Equipments as per dispatch title documents handed over to the Contractor duly endorsed in their favour and detailed in the Schedule appended hereto. It is expressly understood by the Contractor that handing over of the dispatch title documents in respect of the said equipments duly endorsed by DTL in favour of the contractor shall be construed as handing over of the equipment purported to be covered by such title documents and the contractor shall hold such equipment in trust as a Trustee for and on behalf of DTL.

2. That the contractor is obliged and shall remain absolutely responsible for the safe transit/protection and custody of the equipment of DTL project Site against all risks whatsoever till the equipment are duly used/erected in accordance with the terms of the contract and the plant/package duly erected and commissioned in accordance with the terms of the contract, is taken over by DTL. The contractor undertakes to keep DTL harmless against any loss or damage that may be caused to the equipments.

3. The contractor undertakes that the equipment shall be used exclusively for the performance/execution of the contract strictly in accordance with its terms and
conditions and no part of the equipment shall be utilized for any other work or purpose whatsoever. It is clearly understood by the contractor that non observance of the obligations under this indemnity bond by the contractor shall inter-alia constitute a criminal breach of trust on the part of the contractor for all intents and purpose including legal/penal consequences.

4. That DTL is and shall remain the exclusive owner of the equipment free from all encumbrances, charges or liens of any kind, whatsoever. The equipment shall be all times be open to inspection and checking by the employer or employer’s representative in this regard. Further DTL shall always be free at all times to take possession of the equipment in whatever form the equipment may be, if in its opinion, the equipments are likely to be endangered, mis-utilised or intended for use other than those specified in the contract, by any acts of omission or commission on the part of the contractor or any other person or on account of any reason whatsoever and the contractor binds himself and undertakes to comply with the directions of demand of DTL to return the equipment without any demur or reservation.

5. That this indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipment or the same or any part thereof is mis-utilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Employer’s Representative as to assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and /or damaged Equipment at its own cost and/ or shall pay the amount of loss to DTL without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to DTL against the Contractor under the Contract and under this Indemnity Bond.

6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with the terms and conditions of this Bond to the satisfaction of DTL, THEN. The above Bond shall be void, but otherwise, it shall remain in full force and virtue.

IN WITNESS, the Contractor has hereunto set its hand through its authorized representative under the common seal of the Company, the day, month and year first above mentioned.

SCHEDULE

<table>
<thead>
<tr>
<th>Particulars of the Equipment</th>
<th>Quantity</th>
<th>Particulars of Despatch title Documents</th>
<th>Value of the Equipment</th>
<th>Signature of Attorney in Handed token of receipt</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR/ GR No.</td>
<td></td>
<td>RR/ GR No.</td>
<td>RR/ GR No.</td>
<td>RR/ GR No.</td>
</tr>
<tr>
<td>Date of lading &amp; Carrier</td>
<td></td>
<td>Date of lading &amp; Carrier</td>
<td>Date of lading &amp; Carrier</td>
<td>Date of lading &amp; Carrier</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
For and on behalf of

M/s………………………………..

WITNESS

1. 1. Signature……………………. Signature……………………………
2. Name………………………… Name………………………………
3. Address……………………… Address……………………………

Authorized representative

2. 1. Signature…………………….
2. Name………………………… (Common Seal)
3. Address……………………… (In case of Company)

Indemnity Bonds are to be executed by the authorized person and (i) in case of contracting Company under common seal of the Company or (ii) having the power of attorney issued under common seal of the company with authority to execute Indemnity Bonds, (iii) in case of (ii), the original Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.
12. FORM OF INDEMNITY BOND TO BE EXECUTED BY THE CONTRACTOR FOR THE EQUIPMENT HANDED OVER IN INSTALLMENTS BY DELHI TRANSCO LTD FOR PERFORMANCE OF ITS CONTRACT

INDEMNITY BOND

THIS INDEMNITY BOND is made this ..............day of ..................200................by.................. a Company registered under the Companies Act, 1956/ Partnership firm/ proprietary concern having its Registered Office at ....................................... (hereinafter called as ‘Contractor’ or ‘Obligor’ which expression shall include its successors and permitted assigns) in favor of DELHI TRANSCO LTD a Company incorporated under the Companies Act, 1956 having its Registered Office at Shakti Sadan, Kotla Marg, New Delhi-110002

WHEREAS DTL has awarded to the Contractor a Contractor for .................vide Its Notification of Award/Contract No. ........................................ dated .............. and Amendment No. ......................................... (applicable when amendments have been issued) (hereinafter called the “Contract”) in terms of which DTL is required to handover various Equipments to the Contractor for execution of the Contract.

AND WHEREAS by virtue of Clause No. of the said Contract, the Contractor is Required to execute an Indemnity Bond in favour of DTL for the Equipment handed over to it by DTL for the purpose of performance of the contract/ Erection portion of the Contract (hereinafter called the “Equipment”.)

NOW THEREFORE, This Indemnity Bond witnessed as follows:

1. That in consideration of various Equipments as mentioned in the Contract, valued at (amount in words ..................) to be handed over to the Contractor in installments from time to for the purpose of performance of the contract, the Contractor hereby undertakes to indemnify and shall keep DTL indemnified, for the full value of Equipment. The Contractor hereby acknowledges receipt of the initial installment of the equipment per details in the schedule appended hereto. Further, the Contractor agrees to acknowledge receipt of the subsequent installments of the Equipment as required by DTL in the form of Schedules consecutively numbered which shall be attached to this Indemnity bond so as to form integral parts of this Bond. It is expressly understood by the Contractor shall be construed as handing over the Equipment purported to be covered by such title documents and the Contractor shall hold Equipments in trust as a Trustee for and on behalf of DTL

2. That the contractor is obliged and shall remain absolutely responsible for the safe transit/protection and custody of the equipment of DTL project Site against all risks whatsoever till the equipment are duly used/erected in accordance with the terms of the contract and the plant/package duly erected and commissioned in accordance with the terms of the contract, is taken over by DTL. The contractor undertakes to keep DTL harmless against any loss or damage that may be caused to the equipments.

3. The contractor undertakes that the equipment shall be used exclusively for the performance/execution of the contract strictly in accordance with its terms and
conditions and no part of the equipment shall be utilized for any other work or purpose whatsoever. It is clearly understood by the contractor that non observance of the obligations under this indemnity bond by the contractor shall inter-alia constitute a criminal breach of trust on the part of the contractor for all intents and purpose including legal/penal consequences.

4. That DTL is and shall remain the exclusive owner of the equipment free from all encumbrances, charges or liens of any kind, whatsoever. The equipment shall be all times be open to inspection and checking by the employer or employer’s representative in this regard. Further DTL shall always be free at all times to take possession of the equipment in whatever form the equipment may be, if in its opinion, the equipments are likely to be endangered, mis-utilised or intended for use other than those specified in the contract, by any acts of omission or commission on the part of the contractor or any other person or on account of any reason whatsoever and the contractor binds himself and undertakes to comply with the directions of demand of DTL to return the equipment without any demur or reservation.

5. That this indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipment or the same or any part thereof is mis-utilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Employer’s Representative as to assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Equipment at its own cost and/or shall pay the amount of loss to DTL without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to DTL against the Contractor under the Contract and under this Indemnity Bond.

6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with the terms and conditions of this Bond to the satisfaction of DTL, then, the above Bond shall be void, but otherwise, it shall remain in full force and virtue.

IN WITNESS, the Contractor has hereunto set its hand through its authorized representative under the common seal of the Company, the day, month and year first above mentioned.

SCHEDULE No. 1

<table>
<thead>
<tr>
<th>Particulars of the Equipment</th>
<th>Quantity</th>
<th>Particulars of Despatch title Documents</th>
<th>Value of the Equipment</th>
<th>Signature of Attorney in Handed token of receipt</th>
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</thead>
<tbody>
<tr>
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<td>Date of lading &amp; Carrier</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
For and on behalf of

M/s………………………………..

WITNESS

1. 1. Signature……………………. Signature……………………
    2. Name………………………… Name……………………
    3. Address……………………… Address……………………

Authorized representative

2. 1. Signature……………………
    2. Name………………………… (Common Seal)
       (In case of Company)
    3. Address……………………

Indemnity Bonds are to be executed by the authorized person and (i) in case of contracting Company under common seal of the Company or (ii) having the power of attorney issued under common seal of the company with authority to execute Indemnity Bonds, (iii) in case of (ii), the original Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.
13. **FORM OF AUTHORIZATION LETTER: DELHI TRANSCO LIMITED.**

REF. No.

DATE:

TO,

M/s………………………

…………………………

…………………………

REF: Contract No……………………… dated …………. for……………………… awarded by Delhi Transco limited.

**Dear Sir,**

Kindly refer to Contract No. …………………………. Dated …………. for …………. You are hereby authorized on behalf of Delhi Transco Limited, having its registered office at Delhi Transco Limited, Shakti Sadan, Kotla Road New Delhi-110002 and its project at ………….to take physical delivery of materials/equipments covered under Dispatch Document/Consignment Note No………………dated……………………… and as detailed in the enclosed schedule for the sole purpose of successful performance of the aforesaid contract and for no other purpose, whatsoever.

(Signature of Project Authority)**

Designation ………………………

Date …………………………….

Encl: As above

**To be signed not below the rank of Manager.
  • Mention LR/RR No.
14. FORM OF TRUST RECEIPT FOR PLANT, EQUIPMENT AND MATERIALS RECEIVED

We M/s (Contractor’s Name) having our Principal place of business at having been awarded a Contract No. dated for (Contract Name) by (Name of Employer). We do hereby acknowledge the receipt of the Plant, Equipment and Materials as are fully described and mentioned under Documents of Title/RR/LR etc and in the schedule annexed here to, which shall form an integral part of this receipt as “Trustee” of (Name of Employer). The aforesaid materials etc. so received by us shall be exclusively used in the successful performance of the aforesaid contract and for no other purpose whatsoever. We undertake not to create any charge, lien or encumbrance over the aforesaid materials etc, in favour of any other person /institution (s) / Banks.

For M/s ____________________

(Contractor’s Name)

Dated: ______________

Place: ______________

(AUTHORISED SIGNATORY)

SEAL OF COMPANY
15. FORM OF EXTENSION OF BANK GUARANTEE

Ref. No…………………….. Dated……………………..

Delhi Transco Limited,
Shakti Sadan, Kotla Road
New Delhi 110002.
India

Dear Sirs,


At the request of M/s ……………………. We ………………….. Bank branch office at……………. Having its Head Office at …………………… do hereby extend our liability under the above mentioned Guarantee No……………………… dated ………….. for a further period of ………………. Years/Month from ……………. Expire on ……………….

Except as provided above, all other terms and conditions of the original Bank Guarantee No…………………….. dated……………… shall remain unaltered and binding.

Please treat this as an integral part of the original Guarantee to which it would be attached.

Yours Faithfully,

For……………………………
Manager. Agent/Accountant

Power of attorney No………….
Dated …………………………

SEAL OF BANK

Note : The non. Judicial stamp paper of appropriate value shall be purchased in the name of the bank who has issued the bank Guarantee.
16. FORM OF POWER OF ATTORNEY FOR JOINT VENTURE/CONSORTIUM

(On Non-judicial Stamp paper of Appropriate Value to be purchased in the name of joint venture/ Consortium)

KNOW ALL MEN BY THESE PRESENTS THAT WE, the partners whose details are given hereunder …………………………… have formed a Joint venture/ Consortium under the laws of ………………………. And having our Registered Office(S) / Head Office (s) at ………………………………………… ( hereinafter called the Joint venture/ Consortium which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) acting through M/s ……………………………being the partner in-charge do hereby constitute, nominate and appoint M/s …………………………………… a Company incorporated under the laws of ……………………………..and having its registered / Head Office at ………………… as our duly constituted lawful Attorney (hereinafter called “ Attorney” or “ Authorized Representative” or “ Partner In- charge”) to exercise all or any of the powers for and on behalf of the joint venture/ Consortium in regard to Specification No………………….. Package ……………………… the bids for which have been invited by Delhi Transco Limited, Shakti Sadan Building, Kotla Road, New Delhi, India ( hereinafter called the “ Employer”) to undertaking the following acts :

i) To submit proposal and participate in the aforesaid Bid Specification of the Employer on behalf of the “Joint venture/ Consortium”.

ii) To negotiate with the employer the terms and conditions for award of the Contract pursuant to the aforesaid Bid and to sign the Contract with the Employer for and on behalf of the ‘JOINT VENTURE/ CONSORIUM’.

iii) To do any other act or submit any document related to the above.

iv) To receive, accept and execute the Contract for and on behalf of the “Joint venture/ Consortium”.

It is clearly understood that the partner In-charge (Lead Partner) shall ensure performance of the Contract(s) and if one or more partner fail to perform their respective portions of the Contract(s), the same shall be deemed to be default by all the partners.

It is expressly understood that this Power of Attorney shall remain valid binding and irrevocable till completion of the Defect Liability Period in terms of the Contract.

The joint venture/ Consortium hereby agrees and undertakes to ratify and confirm all and whatsoever the said Attorney/ Authorized Representatives/Partner in- charge quotes in the bid, negotiates And signs the Contract with Employer and / or proposes to act on behalf of the Joint venture/ Consortium by virtue of this Power of Attorney and the same shall bind the joint venture/ Consortium as if done by itself.

In WITNESS THEREOF the partners Constituting the joint venture/ Consortium as aforesaid have executed these present on this …………… day of ……………. Under the Common Seal(s) of their Companies.

for and on behalf of the

Partners of joint venture/ Consortium

…………………………

…………………………
The Common Seal of the above Partners of the Joint venture/ Consortium:
The Common Seal has been affixed the unto in the presence of:

WITNESS

1. Signature………………………
   Name…………………………..
   Designation ……………………..
   Occupation……………………..

2. Signature………………………
   Name…………………………..
   Designation ……………………..
   Occupation……………………..
17. FORM OF JOINT VENTURE/ CONSORTIUM AGREEMENT

(On non-judicial stamp paper of appropriate value to be purchased in the name of joint venture/ Consortium)

PERFORMA OF JOINT VENTURE/ CONSORTIUM AGREEMENT BETWEEN……………………….. AND ………………………….. FOR BID SPECIFICATION NO……………………….. OF DELHI TRANSCO LIMITED

THIS joint venture/ Consortium agreement executed on this ……………… day of Two thousand……………. between M/s ……………………. a company incorporated under the laws of …………………………….. and having its registered office at…………………………………..(hereinafter called the “Lead partner” which expression shall include its successors executors and permitted assigns), M/s ……………… …………………………….……… a company incorporated under the laws of …………………………………………. and having its registered office at……………………………………………(hereinafter called “the partner” which expression shall include its successors, executors and permitted assigns) and M/s …………………………………………….. a company incorporated under the laws of …………………………………………… and having its registered office at…………………… …..……(hereinafter called “the partner” which expression shall include its successors, executors and permitted assigns) for the purpose of making a bid and entering into a contract (in case of award) against the specification No……………………………… for…………………………(Name of the Package) ……………………..under……………………………………..(Name of the project)………………….of Delhi Transco limited ,a company incorporated under the Companies Act of 1956 having its registered Shakti Sadan, Kotla Road New Delhi-110002, India (hereinafter caller the; “Employer”)

Whereas the employer invited bids as per the above mentioned Specification for the design, engineering, manufacture, supply, installation, testing and commissioning of equipment/materials stipulated in the bidding documents for…………………(Name of the Package) …………….under…………………………….(Name the project)

AND WHEREAS Annexure-A, section-CC (qualification of the bidder) forming part of the bidding documents, stipulates that a joint venture/ Consortium of two or more qualified firms as partners, meeting the joint venture/ Consortium fulfills all other requirements under Annexure-A, Section CC (qualification of the bidder) and in such a case, the BID FROM shall be signed by all the partners so as to legally bind all the partners of the Joint venture/ Consortium, who will be jointly and severally liable to perform the contract and all obligations hereunder.

The above clause further states that the joint venture/ Consortium agreement shall be attached to the bid and the contract performance guarantee will be as per the format enclosed with the bidding document without any restriction or liability for either party.

AND WHEREAS the bid has been submitted to the Employer vide proposal No……………………….. dated………………..by Lead partner based on the joint venture/ Consortium agreement between all the partners under these present and the bid in accordance with the requirements of Annexure-A, section CC (Qualification of the Bidders), has been signed by all the partners.

NOW THIS INDENTURE WITNESS AS UNDER:
In consideration of the above premises and agreements all the partners to this joint venture/Consortium do hereby now agree as follow:

1. In consideration of the award of the contract by the Employer to the joint venture/Consortium partners, we, the partners to the joint venture/Consortium agreement do hereby agree that M/s ……………………….. shall act as lead partner and further declare and confirm that we shall joint and severally be bound unto the Employer for the successful performance of the Contract and shall be fully responsible for the design, engineering, manufacture, supply, and successful performance of the equipments in accordance with the Contract.

2. In case of any breach of the said Contract by the Lead Partner or other partner(s) of the joint venture/Consortium agreement, the partner(s) do hereby agree to be fully responsible for the successful performance of the contract and carry out all the obligations and responsible under the Contract in accordance with the requirements of the Contract.

3. Further if the Employer suffers any loss or damage on account of any breach in the Contract or any shortfall in the performance of the equipment in meeting the performance guaranteed as per the specification in terms if the Contract, the partner(s) of these present undertake to promptly make good such loss or damages caused to the Employer, on its demand without any demur. It shall not be necessary or obligatory for the Employer to proceed against Lead Partner to these presents before proceeding against or dealing with the other Partner(s).

4. The financial liability of the partner of this joint venture/Consortium agreement to the Employer, with respect to any of the claims arising out of the performance or non-performance of the obligations set forth in the said joint venture/Consortium agreement, read in conjunction with the relevant conditions of the Contract shall, however, not be limited in any way so as to restrict or limit the liabilities of any of the partners of the joint venture/Consortium agreement.

5. It is expressly understood and agreed between the partners to the joint venture/Consortium agreement that the responsibilities and obligations of each of the partners shall be as delineated in Appendix-I (* To be incorporated suitably by the partners) to this agreement. It is further agreed by the partners that the above sharing of responsibilities and obligations shall not in any way be a limitation of joint and servable responsibilities of the partners under this Contract.

6. This joint venture/Consortium agreement shall be constructed and interpreted in accordance with the laws of India and the courts of Delhi shall have the exclusive jurisdiction in all matters arising there under.

7. In case of an award of a Contract, we the partners to the joint venture/Consortium agreement do hereby agree that we shall be jointly and severally responsible for furnishing a contract performance security from a bank in favour of the Employer in the currency of the Contract.

8. It is further agreed that the venture agreement shall be irrevocable and shall from an integral part of the Contract, and shall continue to be enforceable till the Employer
discharges the same. It shall be effective from the date first mentioned above for all purpose and intents.

IN WITNESS WHEREOF, the partners to the joint venture/ Consortium agreement have through their authorized representatives executed these present and affixed Common Seals of their companies, on the day, month and year first mentioned above.

1. Common Seal of …………… has been affixed in my/our presence pursuant to the Board of Director's resolution dated... Signature.................................... Name........................................ Designation…………………………

2. Common Seal of …………… has been affixed in my/our presence pursuant to the Board of Director's resolution dated... Signature.................................... Name........................................ Designation…………………………

WITNESSES:
1. ……………………………….. (Signature) Name………………………….. …………………………………. (Official address)
2. ……………………………….. (Signature) Name………………………….. …………………………………. (Official address)
18. PROFORMA OF JOINT UNDERTAKING BY THE PARENT/ GROUP/ SUBSIDIARY/ SISTER CONCERN/COLLABORATOR ALONGWITH THE BIDDER/MANUFACTURER

(On non-judicial stamp paper of appropriate value)

THIS DEED OF UNDERTAKING executed this ………………… day of Two Thousand and……………… by M/s……………………… a company incorporated under the laws of ………………………………………and having its registered office at……………………………..(hereinafter called the “parent/group/subsidiary/sister concern/ collaborator Company” which expression shall include its successors, administrators, executors and permitted assigns) and M/s……………….a company incorporated under the laws of ………………………………………and having its registered office at……………………………..(hereinafter called the “Bidder/Manufacturer” which expression shall include its successors, administrators, executors and permitted assigns) in favour of Delhi Transco Limited, having its Registered office at Shakti Sadan, Kotla Marg, New Delhi.(herein after called the “Employer” which expression shall include its successors, executors and permitted assigns)

WHEREAS the “Employer” invited Bid as per Specification No. ………………. for the execution of ………………..(Insert name of the Project)………

AND WHEREAS Clause No. …………… Section …………… of …………… Vol.-………………forming part of the Bidding Documents inter-alia stipulates that the Bidder and/or Manufacturer alongwith its collaborator/parent company/principal/sister concern must fulfill the Qualifying Requirements for the *……………….. and be jointly and severally bound and responsible for the successful performance of the *………………..offered in the event the bid submitted by the bidder is accepted by the Employer resulting in Contract.

AND WHEREAS the bidder has submitted its bid to the Employer vide Proposal No. …………………dated ……………….based on the collaboration /association of the collaborator/parent company/principal/sister concern with the Bidder/Manufacturer.

NOW THEREFORE THIS UNDERTAKING WITNESSTH as under.

1.0 In consideration of the award of Contract by the Employer to the Bidder (herein after referred to as the “Contract”) we, the parent/group/subsidiary/sister concern/ collaborator and the Bidder/Contractor and /or manufacturer do hereby declare that we shall be jointly and severally bound unto the DELHI TRANSCO LIMITED , for the guarantee quality, timely supply ,successful performance and warranty obligations of the *……………….. and shall be fully responsible for the design, manufacturer , testing, supply on FOR destination delivery at site basis and supervision of unloading at site, storage, erection, testing & commissioning and successful performance of the *………………..in accordance with the Contract Specifications.

2.0 Without in any way affecting the generality and total responsibility in terms of deed of Undertaking, the Collaborator in particular hereby agrees to depute their technical experts from time to time to the Bidder/Contractor’s/Manufacture’s Works/ Owner’s project site as mutually considered necessary by the Owner, bidder/Contractor, Manufacturer and the collaborator to ensure proper design, engineering, manufacturer, testing ,supply on for destination delivery at site basis and supervision of unloading at site , storage, erection, testing and commissioning and successful performance of the collaborator shall advise the manufacturer/ contractor suitable modifications of designs and implement necessary corrective measures to discharge the obligations under the contract.

3.0 This deed of undertaking shall be construed and interpreted in accordance with the laws of India and the Courts in Delhi shall have exclusive jurisdiction in all matters arising under the undertaking.
4.0 As a security, the bidder shall apart from the contractor’s performance guarantee furnish a contract performance guarantee from its Bank in favour of the Employer on a form acceptable to the Employer. The value of such guarantee shall be equivalent to 10% of price of such equipments manufactured in India as identified in the contract awarded by the Employer to the bidder/contractor and it shall be part of guarantee towards the faithful performance/ compliance of this deed of undertaking in terms of the contract. The guarantee shall be unconditional, irrevocable and valid for the entire period of the contract, namely till the end of the defect liability period of Project under the contract. The bank guarantee amount shall be payable to the Employer on demand without any reservation or demur. This shall be in addition to the contract performance guarantee furnished by the contractor.

5.0 We the parent/group/subsidiary/sister concern/ collaborator and bidder/contractor and /or manufacturer agree that this undertaking shall be irrevocable and shall from an integral part of the contract and further agree that this undertaking shall continue to be enforceable till the Employer discharges it. It shall become operative from the effective date of contract.

IN WITNESS WHEREOF the parent/group/subsidiary/sister concern/ collaborator and bidder/contractor and /or manufacturer, have through their Authorized Representatives executed these present and affixed common seals of their respective Companies, on the day, month and year first above mentioned.

WITNESSES:

For parent/group/subsidiary/sister concern/ collaborator

1.-----------------------  Signature of Authorized Representative
(Signature)
(Name in Block Letter)  Name-----------------
(Office Address)  Common seal of Company ----------------------------

2.-----------------------  Signature of Authorized Representative
(Signature)
(Name in Block Letter)  Name-----------------
(Office Address)  Common seal of Company -------------------------------

For Manufacturer

3.-----------------------  Signature of Authorized Representative
(Signature)
(Name in Block Letter)  Name-----------------
(Office Address)  Common seal of Company-----------------------------

Note:
(i) This deed of Joint undertaking duly certified by the Company Secretary shall be submitted along with the bid. Further, the deed of Joint Undertaking attested by Notary Public of the place(s) of the respective executants (s) or registered with the Indian Embassy/ High Commission in the country shall be submitted by the bidder before opening of price bid. In case the bidder fails to submit the deed of Joint Undertaking as mentioned above, the bidders bid guarantee may be forfeited.
(ii) In the event the bidder is a Manufacturer and the collaboration is between collaborator and the Bidder, then the Joint deed of Undertaking shall be continued accordingly.

(iii) *The name(s) of equipment for which Joint deed of undertaking is to be submitted is to be inserted.

(iv) The manufacturer may be having ongoing collaboration agreement or had collaboration agreement in the past with the collaborator.
19. FORM OF TAKING OVER CERTIFICATE

Date…………………….

Name of Contract……
Contract No…………

To:

(Name and address of the Contractor)

Dear Ladies and/or Gentlemen,

Pursuant to CC 24 & 25 of the Conditions of the Contract entered into between yourselves and the Employer dated ………………………relating to the …………………………………
(Brief description of the Facilities)

we hereby notify you that the following part(s) of the Facilities was (were) complete on the date specified below, and that, in accordance with the terms of the Contract, the Employer hereby takes over the said part(s) of the Facilities, together with the responsibility for care and custody and the risk of loss thereof on the date mentioned below:

1. Description of the Facilities or part thereof………………………………………..

2. Date of Completion…

However, you are required to complete the outstanding items listed in the attachment hereto as soon as practicable.

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defects Liability Period.

Very truly yours,

Title
(Project Manager)
Bidding Document

For

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

VOLUME – II
TECHNICAL SPECIFICATION

Tender no-T23P111611
VOLUME – II

TECHNICAL SPECIFICATION

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SECTION – I

PROJECT
PROJECT

1. GENERAL:

1.1 Delhi Transco Ltd. hereinafter termed, as DTL or Owner is a company incorporated under company Act 2013 fully owned by Govt. of NCT of Delhi.

1.2 Delhi Transco Limited (DTL), a Govt. of NCT of Delhi Undertaking is responsible for transmission of Power and Bulk Power Supply (Electrical Energy) in National Capital of Delhi.

1.3 Delhi Transco Ltd. (DTL) requires 07 No. 500 MVA, 400/220/33kV Power Transformers at 400 kV Sub Stations (Tikri-Kalan, Bamnauli & Bawana) of DTL, in Delhi.

2. SCOPE OF WORK

2.1 The scope of this specification covers the following:

Design, Supply, Erection, Testing & Commissioning of following Transformers along with all fittings, NIFPES, accessories, Marshalling box, RTCC panel for each Transformer and mandatory spares:-

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<th>(i)</th>
<th>04x500MVA, 400/220/33kV, 3-Ph, Transformer at Tikrikalan Substation.</th>
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<td>(iii)</td>
<td>02x500MVA, 400/220/33kV, 3-Ph, Transformer at Bawana Substation.</td>
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</table>

NOTE: The location of site for transformer may undergo change if so required by the Employer within Delhi.

2.2 The detailed scope of works is brought out in the subsequent clauses of this section.

2.2.1 04x500MVA, 400/220/33kV ICT at 400kV substation Tikrikalan, Delhi.

   (A) 03x500MVA, 400/220/33kV ICT- Augmentation Work.

   (i) Design, engineering, manufacture, testing at manufacturer’s works, transportation, unloading and delivery at site along with insurance & storage, erection, first filling of oil including 10% extra oil, testing and commissioning of the transformers at site mentioned above including all materials, Nitrogen injection fire prevention & extinguishing system (NIFPES) including civil work, including foundation/Structure (if required), control cables & LT Power cable, including supply of special cable (if any) & accessories for transformers.
(ii) Digital RTCC panel including control cable from marshalling box to RTCC Panel as per requirement. The RTCC panel shall be placed inside the DTL control room or as per the requirement of site in-charge and all cable work between RTCC panel and marshalling box including supply, laying & termination of control cable shall be in the bidder scope.

(iii) Control cable and LT power cable for the successful commissioning of the power transformer and integration with the existing system.

(iv) Design, engineering, manufacture, testing, supply on FOR destination site basis including transportation & insurance, storage at site of mandatory spares as per Bid Price schedule.

(v) Dismantling and Dragging of existing 03 no. old 315 MVA Transformer along with accessories and transportation & unloading of the same to any DTL site/store as per the direction of site incharge.

(vi) Modification of the existing foundation of 03 no. 315MVA transformer including accessories to make it suitable for 500MVA transformers including NIFPES, accessories, soak pit, sump pit, etc.

(vii) Augmentation/extension of earthing connections for the Transformer with additional earthing pits, earthing rods/electrodes, connection to existing substation earth mat (as per site requirement, if any) at sites is included in the scope.

(B) 01x500MVA, 400/220/33kV ICT- New Installation Work.

(i) Design, engineering, manufacture, testing at manufacturer’s works, transportation, unloading and delivery at site along with insurance & storage, erection, first filling of oil including 10% extra oil, testing and commissioning of the transformer at site mentioned above including all materials, Nitrogen injection fire prevention & extinguishing system (NIFPES) including civil work, NCT’s including foundation/Structure (if required), control cables & LT power cable including supply of special cable (if any) & accessories for transformers.

(ii) Digital RTCC panel including control cable from Marshalling box to RTCC Panel as per requirement. The RTCC panel shall be placed inside the DTL control room or as per the requirement of site in-charge and all cable work between RTCC panel and marshalling box including supply, laying & termination of control cable shall be in the bidder scope.

(iii) Control cable and LT power cable for the successful commissioning of the power transformer and integration with the existing system.
Design, engineering, manufacture, testing, supply on FOR destination site basis including transportation & insurance, storage at site of mandatory spares as per Bid Price schedule.

2.2.2 01x500MVA, 400/220/33kV, 3-Ph, Transformers at Bamnauli Substation.

01x500MVA, 400/220/33kV ICT- New Installation Work.

(i) Design, engineering, manufacture, testing at manufacturer’s works, transportation, unloading and delivery at site along with insurance & storage, erection, first filling of oil including 10% extra oil, testing and commissioning of the transformer at site mentioned above including all materials, Nitrogen injection fire prevention & extinguishing system (NIFPES) including civil work, NCT’s including foundation/Structure (if required), control cables & LT power cable including supply of special cable (if any) & accessories for transformers.

(ii) Digital RTCC panel including control cable from Marshalling box to RTCC Panel as per requirement. The RTCC panel shall be placed inside the DTL control room or as per the requirement of site in-charge and all cable work between RTCC panel and marshalling box including supply, laying & termination of control cable shall be in the bidder scope.

(iii) Control cable and LT power cable for the successful commissioning of the power transformer and integration with the existing system.

(iv) Design, engineering, manufacture, testing, supply on FOR destination site basis including transportation & insurance, storage at site of mandatory spares as per Bid Price schedule.

2.2.3 02x500MVA, 400/220/33kV, 3-Ph, Transformers at Bawana Substation.

02x500MVA, 400/220/33kV ICT- Augmentation Work.

(viii) Design, engineering, manufacture, testing at manufacturer’s works, transportation, unloading and delivery at site along with insurance & storage, erection, first filling of oil including 10% extra oil, testing and commissioning of the transformers at site mentioned above including all materials, Nitrogen injection fire prevention & extinguishing system (NIFPES) including civil work, including foundation/Structure (if required), control cables & LT Power cable, including supply of special cable (if any) & accessories for transformers.

(ix) Digital RTCC panel including control cable from marshalling box to RTCC Panel as per requirement. The RTCC panel shall be placed inside the DTL control room or as per the requirement of site in-charge and all
cable work between RTCC panel and marshalling box including supply, laying & termination of control cable shall be in the bidder scope.

(x) Control cable and LT power cable for the successful commissioning of the power transformer and integration with the existing system.

(xi) Design, engineering, manufacture, testing, supply on FOR destination site basis including transportation & insurance, storage at site of mandatory spares as per Bid Price schedule.

(xii) Dismantling and Dragging of existing 02 no. old 315 MVA Transformer along with accessories and transportation & unloading of the same to any DTL site/store as per the direction of site incharge.

(xiii) Modification of the existing foundation of 02 no. 315MVA transformer including accessories to make it suitable for 500MVA transformers including NIFPES, accessories, soak pit, sump pit, etc.

(i) Augmentation/extension of earthing connections for the Transformer with additional earthing pits, earthing rods/electrodes, connection to existing substation earth mat (as per site requirement, if any) at sites is included in the scope.

2.2.4 Petty items like clamps, connector, spares, GI earth wire GI Nut & bolts etc to complete the works.

2.2.5 The complete design and detailed engineering shall be done by the Contractor

2.2.6 Bidder must visit all locations to acquaint himself/herself to site conditions, general arrangements etc, so that Bidder quotes appropriately and there will be no post-award execution related difficulties. The bidder shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the construction and successful commissioning, operation & maintenance of the subject work in all respects. All materials required for the Civil and construction/installation work shall be supplied by the Contractor.

2.2.7 400kV, 220kV & 33kV Terminal Connectors for Transformers.

2.2.8 Owner has standardized the technical specification for the Transformers. Technical specification for such Items, which are not applicable for the scope of this package, shall not be referred to.

3.0 EXCLUSION

The following items of work are specifically excluded from the scope of this specification.
i) Fire protection system for Transformers (except Nitrogen injection fire prevention and extinguishing system (NIFPES)).

4.0 SCHEDULE OF QUANTITIES

The bill of quantity is indicated in the Bid Price Schedules.

Bidder should indicate all such items in the bid proposal sheets which are not specifically mentioned but are essential for execution of the contract. Items which explicitly may not appear in various schedules and required for successful commissioning of the equipments in the scope of specification shall be included in the bid price and shall be provided at no extra cost to Owner.

5.0 REFERENCE DRAWINGS

5.1 The reference drawings that form a part of the specifications are given in the Section - Technical Specification of Transformer. However, the foundation Layout and the position of cooler bank of the Transformers shall depend on the substation layout arrangement and therefore shall be finalized during detailed engineering.

In case of any discrepancy between the drawings and text of specification, the requirements of text shall prevail in general. However, the bidder is advised to get these clarified from Owner.

6.0 DIFFERENT SECTIONS OF TECHNICAL SPECIFICATION

For the purpose of present scope of work, technical specification (Vol. II) shall consist of following sections and they should be read in conjunction with each other.

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<td>5.0</td>
<td>Section-Technical Specification of CONTROL CABLE</td>
</tr>
</tbody>
</table>

In case of any discrepancy between Section-PROJECT and other sections, Section- PROJECT shall prevail over the other sections.

7.0 MANDATORY SPARES

The Mandatory Spares shall be included in the bid proposal by the bidder. The prices of these spares shall be given by the Bidder in the relevant schedule of BPS
and shall be considered for evaluation of bid. It shall not be binding on the Owner to procure all of these mandatory spares.

Mandatory spares shall not be used during the commissioning of the equipment. Any spares required for commissioning purpose shall be arranged by the Contractor. The unutilized spares, if any, brought for commissioning purpose shall be taken back by the Contractor.

8.0 SPECIAL TOOLS AND TACKLES

The bidder shall include in his proposal the deployment of all special tools and tackles required for erection, testing, commissioning and maintenance of equipment. The special tools and tackles shall only cover items which are specifically required for the equipment offered and are proprietary in nature. However a list of all such devices should be indicated in the relevant schedule provided in the BPS. In addition to this, the Contractor shall also furnish a list of special tools and tackles for the various equipment in a manner to be referred by the Employer during the operation of these equipments. The scope of special tools and tackles are to be decided during detail engineering and the list of special tools and tackles, if any shall be finalized.

9.0 SPECIFIC REQUIREMENT

9.1 Transformer with separate cooler bank arrangement, the main tank shall have provision such that cooler banks can be placed on either side of the main tank without the need of any extra member/pipe maintaining the electrical clearances. The position of cooler banks of transformer shall be decided based on substation layout requirement.

9.2 Tertiary winding of Power transformer shall be suitable for connection to LT Transformer for auxiliary supply.

9.3 Managed Ethernet switch, LIU patch cords etc. shall be provided in Marshalling Box. All IEC 61850 compliant signals from various monitoring equipment / accessories shall be wired up to the Ethernet switch.

10.0 FOUNDATIONS (Civil works)

Modification of the existing foundations, creation of new foundation as per the site requirement shall be in the scope of the bidder. Bidder shall carry out all the necessary civil activity for the erection & commission of the transformers.

The work shall conform to the C.P.W.D specifications 1996 vol. I, II, III, IV, V & VI and revised CPWD specifications 2002 for cement mortar, cement concrete & RCC works for works at Delhi with correction slips upto-date for relevant I.S. specification (Latest) whichever are more stringent and as per the direction of the Engineer-in-charge.

11.0 FACILITIES TO BE ARRANGED BY THE CONTRACTOR
For construction purpose, the Contractor shall arrange suitable electricity supply from the Distribution Utility at his own cost and in case of failure of power due to any unavoidable circumstances, the contractor shall make his own necessary arrangements like diesel generator sets etc., at his own cost so that progress of work is not affected and Employer shall in no case be responsible for any delay in works because of non-availability of power.

The contractor shall make his own arrangement for water supply at his own cost and the Employer shall in no case be responsible for any delay in works because of non-availability or inadequate availability of water.

12.0 SHORT CIRCUIT TEST

The requirement of conduction of Dynamic short circuit (DSC) test on 400kV 500MVA transformer shall be as per CEA letter dated 26.06.2023 or further amendments in guidelines/regulations by CEA in this regard, whichever is latest.

13.0 TYPE TEST VALIDITY

The bidder shall submit all the applicable types test reports of the equipment inline with latest edition of IS/IEC and validity of the type test reports shall be as per latest CEA guidelines. The type test reports shall be submitted along with the bid.

If any applicable type test has not been conducted by the bidder, then the same shall be conducted by the bidder free of cost and without affecting the completion period of the project/tender.
SECTION – II
TECHNICAL SPECIFICATION OF
POWER TRANSFORMER
TECHNICAL SPECIFICATION OF POWER/AUTO TRANSFORMERS IN DTL

1.0 GENERAL

1.1 This section covers specification for design, engineering, manufacture, testing, delivery at site including all materials, accessories, unloading, handling, proper storage at site, erection, testing and commissioning of the Transformer.

1.2 The design and workmanship shall be in accordance with the best engineering practices to ensure satisfactory performance throughout the service life.

1.3 Any material and equipment not specifically stated in this specification but which are necessary for satisfactory operation of the equipment shall be deemed to be included unless specifically excluded and shall be supplied without any extra cost.

1.4 Components having identical rating shall be interchangeable.

2.0 SPECIFIC TECHNICAL REQUIREMENTS

The technical parameters of the Transformer are detailed in Annexure-A: Specific Technical Requirements.

3.0 GUARANTEED AND OTHER TECHNICAL PARTICULARS

The manufacturer shall furnish all the Guaranteed and other technical particulars for the offered transformer as called for in Annexure–C: Guaranteed and Other Technical Particulars. The particulars furnished by the manufacturer in this Annexure shall make basis for the design review. Any other particulars considered necessary may also be given in addition to those listed in that Annexure.

4.0 STANDARD RATINGS OF TRANSFORMER

Standard ratings of transformer covered in this specification are as under:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>MVA Rating</th>
<th>Line Voltage rating</th>
<th>Phase</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>500MVA</td>
<td>400/220/33kV</td>
<td>Three phase</td>
<td>Auto Transformer</td>
</tr>
<tr>
<td>2</td>
<td>315MVA</td>
<td>400/220/33kV</td>
<td>Three phase</td>
<td>Auto Transformer</td>
</tr>
<tr>
<td>3</td>
<td>160MVA</td>
<td>220/66/11kV</td>
<td>Three phase</td>
<td>Power Transformer</td>
</tr>
</tbody>
</table>
5.0 PERFORMANCE

5.1 Transformer

5.1.1 The power and auto transformers shall be used for bi-directional flow of rated power. The major technical parameters of three phase transformer units are defined at Annexure – A.

5.1.2 Transformers shall be capable of operating under natural cooled condition up to the specified load. The forced cooling equipment, wherever specified, shall come into operation by pre-set contacts of winding temperature indicator and the transformer shall operate in forced cooling mode initially as ONAF up to specified load and then as OFAF. The Cooling system shall be so designed that the transformer shall be able to operate at full load for at least ten (10) minutes in the event of total failure of power supply to cooling fans and oil pumps without the calculated winding hot spot temperature exceeding 140 deg C. If the Transformer is fitted with two cooler banks, each capable of dissipating 50 per cent of the loss at continuous maximum rating, it shall be capable of operating for 20 minutes at full load /continuous maximum rating in the event of failure of the oil circulating pump or fans/blowers associated with one cooler bank without the calculated winding hot spot temperature exceeding 140 deg C. The contractor shall submit supporting calculations for the above and the same shall be reviewed during design review.

5.1.3 The transformer shall be free from any Electrostatic Charging Tendency (ECT) under all operating conditions and maximum oil velocity shall be such that it does not lead to static discharges inside the transformer while all coolers are in operation.

5.1.4 The transformers shall be capable of operating continuously at the rated MVA without danger, at any tapping with voltage variation of +/-10% corresponding to the voltage of that tapping.

5.1.5 The transformers shall be capable of being over loaded in accordance with IEC 60076-7. There shall be no limitation imposed by bushings, tap changers etc. or any other associated equipment.

5.1.6 The hotspot temperature in any location of the tank shall not exceed 110 degree Celsius at rated MVA. This shall be measured during temperature rise test at manufacturer’s works.

5.1.7 The maximum flux density in any part of the core and yoke at the rated MVA, voltage and

<p>| | | | | |</p>
<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>160MVA</td>
<td>220/66kV</td>
<td>Three phase</td>
<td>Power Transformer</td>
</tr>
<tr>
<td>5</td>
<td>100MVA</td>
<td>220/33/11kV</td>
<td>Three phase</td>
<td>Power Transformer</td>
</tr>
<tr>
<td>6</td>
<td>100MVA</td>
<td>220/33kV</td>
<td>Three phase</td>
<td>Power Transformer</td>
</tr>
<tr>
<td>7</td>
<td>31.5MVA</td>
<td>66/11kV</td>
<td>Three phase</td>
<td>Power Transformer</td>
</tr>
</tbody>
</table>
frequency shall be such that under **10 % continuous** over-voltage condition it does not exceed **1.9 Tesla** at all tap positions.

5.1.8 The transformer and all its accessories including bushing/built in CTs etc. shall be designed to withstand the thermal and mechanical effects of any external short circuit to earth and of short circuits at the terminals of any winding without damage. The transformer shall be designed to withstand the thermal stress due to short circuit for a **duration of 2 seconds** and the same shall be verified during design review.

5.1.9 The following short circuit level shall be considered for the HV & IV System to which the transformers will be connected:

<table>
<thead>
<tr>
<th>System</th>
<th>Short Circuit Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>400kV system</td>
<td>63 kA for 1 sec (sym, rms, 3 phase fault)</td>
</tr>
<tr>
<td>220kV system</td>
<td>50 kA for 1 sec (sym, rms, 3 phase fault)</td>
</tr>
<tr>
<td>66kV system</td>
<td>31.5 kA for 1 sec (sym, rms, 3 phase fault)</td>
</tr>
</tbody>
</table>

However, for transformer design purpose, the through fault current shall be considered limited by the transformer self-impedance only (i.e. $Z_s = 0$).

5.1.10 Transformer shall be capable of withstanding thermal and mechanical stresses due to symmetrical or asymmetrical faults on any terminals. Mechanical strength of the transformer shall be such that it can withstand 3-phase and 1-phase through fault with rated voltage applied to HV and/or IV terminals of transformer. The short circuit shall alternatively be considered to be applied to each of the HV, IV and tertiary (LV) transformer terminals as applicable. The tertiary terminals shall be considered not connected to system source. For short circuit on the tertiary terminals, the in-feed from both HV & IV system shall be limited by the transformer self-impedance only and the rated voltage of HV and IV terminals shall be considered.

5.1.11 Transformers shall withstand, without damage, heating due to the combined voltage and frequency fluctuations which produce the following over fluxing conditions:

- **110 % continuously**
- **125 % for 1 minute**
- **140 % for 5 seconds**

Withstand time for **150% & 170% over fluxing condition** shall be indicated. Over fluxing characteristics up to **170 %** shall be submitted.

5.1.12 The air core reactance of HV winding of transformer of 400 kV voltage class shall not be less than **20%**. External or internal reactors shall not be used to achieve the specified HV/IV, HV/LV and IV/LV impedances.
5.2 Tertiary Windings (if applicable as per Annexure - A)

The tertiary windings shall be suitable for connection of reactors or capacitors which would be subjected to frequent switching and shall be suitable for connection to LT Transformer for auxiliary supply. All the windings shall be capable of withstanding the stresses which may be caused by such switching. The tertiary winding shall be designed to withstand mechanical and thermal stresses due to dead short circuit on its terminals and for 1/3rd of the MVA capacity of the transformer although the cooling for continuous thermal rating of the tertiary winding shall be for 5MVA capacity. Tertiary, if not loaded, i.e. not connected to reactor, capacitor or LT transformer etc., its terminals shall be insulated to avoid any accidental short circuiting.

5.3 Radio Interference and Noise Level

The transformer shall be designed with particular attention to the suppression of harmonic voltage, especially the third and fifth harmonics so as to minimize interference with communication circuits.

The noise level of transformer, when energized at normal voltage and frequency with fans and pumps running shall not exceed the values specified at Annexure- A, when measured under standard conditions.

6.0 MAXIMUM LOSSES

The maximum permissible losses (No load loss, \(I^2R\) loss, auxiliary loss and load loss) at rated voltage/current (at 75 deg C) have been specified in Annexure-A for various ratings of transformers covered under this specification. Following penalties shall be levied on the manufacturer/contractor (as the case may be) if losses measured during routine test are found to be within +2% tolerance of the losses specified in Annexure–A, beyond which the transformer shall be liable for rejection. No benefit shall be given for supply of transformer with losses (measured during routine tests) less than the losses specified in Annexure –A.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Differential of specified losses vs Measured losses</th>
<th>Rate (in INR/kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No load loss</td>
<td>Rs.10,00,000/kW</td>
</tr>
<tr>
<td>2</td>
<td>(I^2R) Losses/ Load Losses (differential of whichever loss is higher shall be considered for penalty)</td>
<td>Rs.8,00,000/kW</td>
</tr>
<tr>
<td>3</td>
<td>Auxiliary Losses</td>
<td>Rs.8,00,000/kW</td>
</tr>
</tbody>
</table>

Note: For a fraction of a KW, the penalty shall be applied on pro-rata basis
7.0 DYNAMIC SHORT CIRCUIT TEST REQUIREMENT AND VALIDITY

The Transformer the design of which is similar to the offered transformer, should have been successfully tested for short circuit withstand capability as per IS 2026 Part-5/ IEC-60076-5. The criteria for similar transformers shall be as per latest CEA guidelines. The relevant Test Report / Certificate shall be enclosed with the bid. **The validity of Dynamic Short Circuit test for transformer shall be as per CEA’s letter dated 26.06.2023 or further amendments in guidelines/regulations by CEA in this regard, whichever is latest.**

Further design review of the offered transformer shall be carried out based on the design of reference transformer, which has already been subjected to short circuit test. In case manufacturer has not conducted the short circuit test earlier, the same shall be carried out on offered transformer at his own cost.

**The requirement of conduction of Dynamic short circuit (DSC) test on 400kV 500MVA transformer shall be as per CEA letter dated 26.06.2023 or further amendments in guidelines/regulations by CEA in this regard, whichever is latest.**

For these transformers, theoretical evaluation of the ability to withstand the dynamic effects of short circuit, based on calculation and consideration of the design characteristic and manufacturing practices, shall be carried out as per IS 2026 Part (5) / IEC-60076-5 and any amendment thereof. The criteria for selection of similar reference transformer for dynamic short circuit withstand test shall be as per CEA guidelines.

*(Note: Bidder is required to submit details in format as per CEA guidelines for comparison of characteristics in order to verify the similarity criteria which shall be evaluated/ considered during techno-commercial evaluation of the bid)*

8.0 TYPE TESTS REQUIREMENT AND VALIDITY

The offered transformer or the transformer, the design of which is similar to the offered transformer, should have been successfully type tested within last 5 years as on the last date of submission of bid. Manufacturer may use same or different approved make of Bushings, Tap changer and other accessories used in type tested or short circuit tested unit in their transformer. Further, type test report of transformer shall only be acceptable provided the offered transformer has been manufactured from the same plant.

Central Electricity Authority’s “Guidelines for the validity period of type tests conducted on major electrical equipment in power transmission system” shall be followed for details regarding the validity of type tests.

9.0 DESIGN REVIEW

9.1 The transformer shall be designed, manufactured and tested in accordance with the best international engineering practices under strict quality control to meet the requirement stipulated...
in the technical specification. Adequate safety margin w.r.t. thermal, mechanical, dielectric and electrical stress etc. shall be maintained during design, selection of raw material, manufacturing process etc. in order to achieve long life of transformer with least maintenance.

9.2 Design reviews shall be conducted by the purchaser during the procurement process; however, the entire responsibility of design shall be with the manufacturer. Purchaser may also visit the manufacturers works to inspect design, manufacturing and test facilities. The scope of such design review shall include but not limited to the requirement as mentioned at Annexure-N.

9.3 The design review shall be finalized before commencement of manufacturing activity and shall be conducted generally following the “CIGRE TB 529: Guidelines for conducting design reviews for power transformers”.

9.4 The manufacturer shall provide all necessary information and calculations to demonstrate that the transformer meets the requirements of mechanical strength and inrush current.

9.5 The manufacturer will be required to demonstrate the use of adequate safety margins for thermal, mechanical, dielectric and vibration etc. in design to take into account the uncertainties of his design and manufacturing processes. The scope of such design review shall include but not limited to the requirement.

9.6 Each page of the design review document shall be duly signed by the authorized representatives of manufacturer and purchaser and shall be provided to the purchaser for record and reference before commencement of manufacturing.

10.0 SERVICE CONDITION

The transformer/reactor shall be designed for the following service conditions as specified hereunder:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Site altitude</td>
<td>Less Than 1000meters</td>
</tr>
<tr>
<td>ii)</td>
<td>Maximum ambient temperature</td>
<td>50 Degree Celsius</td>
</tr>
<tr>
<td>iii)</td>
<td>Yearly weighted average cooling air ambient temperature</td>
<td>43.3 Degree Celsius</td>
</tr>
<tr>
<td>iv)</td>
<td>Monthly average cooling air temperature of hottest month</td>
<td>45 Degree Celsius</td>
</tr>
<tr>
<td>v)</td>
<td>Minimum cooling air temperature</td>
<td>0 degree Celsius</td>
</tr>
<tr>
<td>vi)</td>
<td>Wave shape of supply voltage</td>
<td>Sinusoidal</td>
</tr>
<tr>
<td>vii)</td>
<td>Total Harmonic current</td>
<td>As per IEC</td>
</tr>
<tr>
<td>viii)</td>
<td>Seismic zone and ground acceleration (both in horizontal &amp; vertical direction)</td>
<td>Zone-IV, Horizontal :0.3g</td>
</tr>
<tr>
<td>ix)</td>
<td>Combined voltage and frequency variation</td>
<td>As per CEA guidelines</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th></th>
<th>Wind zone as per wind map provided in National Building Code</th>
<th>Wind Zone Five (05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>xi)</td>
<td>Maximum humidity</td>
<td>100% RH</td>
</tr>
<tr>
<td>xii)</td>
<td>Minimum humidity</td>
<td>10% RH</td>
</tr>
<tr>
<td>xiii)</td>
<td>Specific Creepage Distance of insulation in air</td>
<td>31mm/kV</td>
</tr>
</tbody>
</table>

### 11.0 CONSTRUCTION DETAILS

The construction details and features of transformer shall be in accordance with the requirement stated hereunder.

#### 11.1 Tank & tank cover

11.1.1 The tank shall be of proven design of either Bell type with bolted/ welded joint or conventional (preferable) with bolted/welded top cover. Bell type tank, if provided, shall have joint as close as possible to the bottom of the tank.

11.1.2 The tank shall be designed in such a way that the Transformer can be rested on concrete plinth foundation directly or on roller assembly.

11.1.3 Tank shall be fabricated from tested quality low carbon steel of adequate thickness. Unless otherwise approved, metal plate, bar and sections for fabrication shall comply with IS 2062.

11.1.4 The base of each tank shall be so designed that it shall be possible to move the complete transformer unit by skidding in any direction without damage when using plates or rails and the base plate shall have following minimum thickness.

<table>
<thead>
<tr>
<th>Length of tank (m)</th>
<th>Minimum plate thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat bases</td>
<td></td>
</tr>
<tr>
<td>Over 2.5 m but less than 5m</td>
<td>20</td>
</tr>
<tr>
<td>Over 5 m but less than 7.5m</td>
<td>26</td>
</tr>
<tr>
<td>Over 7.5 m</td>
<td>32</td>
</tr>
</tbody>
</table>

11.1.5 Tank shall be capable of withstanding, without damage, severe strains that may be induced under normal operating conditions or forces encountered during lifting, jacking and pulling during shipping and handling at site or factory. Tank, tank cover and associated structure should be adequately designed to withstand, without damage or permanent deflection / deformation, the forces arising out of normal oil pressure, test pressures, vacuum, seismic conditions and short circuit forces specified.

11.1.6 All seams and joints which are not required to be opened at site, shall be factory welded, and shall be double welded [i.e. with a continuous cord on both sides of the plate (inside and out-
side of the tank), bottom & cover of the tank, turrets, flanges, etc.] to ensure adequate strength. Butt welds on parts that are mechanically stressed or under pressure must have full penetration. Welding shall conform to IS 9595. The requirement of post weld heat treatment of tank/stress relieving shall be based on recommendation of IS 10801.

11.1.7 The welded joint shall be provided with flanges suitable for repeated welding. The joint shall be provided with a suitable gasket to prevent weld splatter inside the tank. Proper tank shielding shall be done to prevent excessive temperature rise at the joint.

11.1.8 Tank stiffeners shall be provided for general rigidity and welded to the tank continuously along its ends and sides (Intermittent welds will not be accepted). These shall be designed to prevent retention of water. Sharp edges on stiffeners should be avoided for better paint adhesion.

11.1.9 Tank MS plates of thickness $\geq 12$ mm should undergo Ultrasonic Test (UT) to check lamination defect, internal impurities in line with ASTM 435 & ASTM 577.

11.1.10 After fabrication of tank and before painting, Non-destructive test (dye penetration test) is mandatory on the load bearing members such as base plate joints, jacking pads and lifting devices etc.

11.1.11 Suitable guides shall be provided for positioning the various parts during assembly or dismantling. Adequate space shall be provided between the covers & windings and the bottom of the tank for collection of any sediment.

11.1.12 Tank should be provided with adequately sized inspection covers, either in circular shape or in rectangular shape, preferably at diagonally opposite sides of the tank to access the active part and one at each end of the tank cover for easy access of the lower end of the bushings, earthing connections and tap changers etc. for inspection. Inspection covers shall be bolted type and shall not weigh more than 25 kgs. Handles shall be provided on the inspection cover to facilitate its lifting.

11.1.13 The tank cover shall be provided with pockets for oil and winding temperature indicators. The location of pockets (for OTI, WTI & RTDs including two spare pockets) shall be in the position where oil reaches maximum temperature. Further, it shall be possible to remove bulbs/probes of OTI/WTI/RTD without lowering the oil in the tank. The thermometer shall be fitted with a captive screw to prevent the ingress of water.

11.1.14 It should be possible to inspect Buchholz relay or Oil surge relay, standing on tank cover or suitable arrangement shall be made to access Buchholz relay safely.

11.1.15 The tank cover shall be designed to prevent retention of rain water Bushing turrets, covers of inspection openings, thermometer pockets etc. shall be designed to prevent ingress of water into or leakage of oil from the tank.

11.1.16 Minimum four symmetrically placed lifting lugs of adequate size shall be provided so
that it will be possible to lift the complete transformer/reactor when filled with oil &
without structural damage to any part of the transformer/reactor. The factor of safety at
any lug shall not be less than 2. Suitable haulage holes shall also be provided.

11.1.17 A minimum of four jacking pads (not fouling with rail, rollers or other accessories) shall
be provided in accessible position to enable the transformer complete with oil to be raised
or lowered using hydraulic jacks. The location shall be such that it should not interfere
with loading & unloading from trailer.

11.1.18 Each jacking pad shall be designed with an adequate factor of safety to support at least
half of the total mass of the transformer filled with oil in addition to maximum possible
misalignment of the jacking force to the centre of the working surface.

11.1.19 The tank shall be provided with suitable valves as specified in Clause: “Valves” and
Clause: “Fittings and accessories” of this section. Location of valves shall be finalized dur-
ing design review.

11.1.20 The tank cover and bushing turret shall be fixed to the transformer using copper links in
such a way that good electrical contact is maintained around the perimeter of the tank and
turrets.

11.1.21 The transformer shall be provided with a suitable diameter pipe flange, butterfly valve,
bolted blanking plate and gasket at the highest point of the transformer for maintaining
vacuum in the tank.

11.1.22 Gas venting: The transformer cover and generally the internal spaces of the transformer
and all pipe connections shall be designed so as to provide efficient venting of any gas
in any part of the transformer to the Buchholz relay. The space created under inspection
/manhole covers shall be filled with suitable material to avoid inadvertent gas pockets.
The Covers shall be vented at least at both longitudinal ends. The design for gas venting
shall take into accounts the slopes of the plinth (if any) on which the transformer is be-
ing mounted.

11.2 Gasket for tank & cover

All gasketed joints shall be designed, manufactured and assembled to ensure long-term leak proof
and maintenance free operation. All gasketed joints shall preferably be O-ring and designed with
gasket-in-groove arrangement. If gasket/O-rings is compressible, metallic stops/other suitable means
shall be provided to prevent over- compression. All bolted connections shall be fitted with weather
proof, hot oil resistant, resilient gasket in between for complete oil tightness. All matching flanges of
gasket sealing joints should be machined (except curb joints). Gasket with intermediate stops are not
acceptable. To the extent possible, the seamless gasket should be used for openings on tank/cover such
as turrets, bushing, inspection covers etc. All tank gaskets/O-rings used shall be of NBR (Acrylonitrile
Butadiene Rubber) suitable for temperature conditions expected to be encountered during operation.
The gasket material and additives should be fully compatible with transformer insulating fluid/oil.
The gasket should not contain oil soluble sulphur compounds. The properties of all the above gaskets/O-Rings shall comply with the requirements of type-IV rubber of IS-11149. Gaskets and O-rings shall be replaced every time whenever the joints are opened.

11.3 Foundation, Roller Assembly and Anti Earthquake Clamping Device

11.3.1 Transformer shall be placed on foundation either directly or on roller assembly.

11.3.2 For transformer to be placed directly on foundation, one set of rollers shall be provided for movement within the yard. The rollers for transformer are to be provided with flanged bi-directional wheels and axles. This set of wheels and axles shall be suitable for fixing to the under carriage of transformer to facilitate its movement on rail track. Suitable locking arrangement along with foundation bolts shall be provided for the wheels to prevent accidental movement of transformer.

11.3.3 The rail track gauge shall be 1676 mm. 3-Phase auto transformers of 400kV class shall have four (4) rails and other voltage class transformers shall have two (2) rails.

11.3.4 To prevent movement during earthquake, suitable clamping devices shall be provided for fixing the transformer to the foundation.

11.3.5 In case rail is not required for smaller rating transformers, arrangement of unidirectional roller mounted on channel shall be provided and channel shall be locked with the plinth suitably.

11.3.6 For foundation of separately mounted cooler bank of transformer, fixing of cooler support shall be through Anchor Fastener with chemical grouting and no pockets for bolting shall be provided.

11.3.7 For support of cooler pipes, Buchholz pipe (if required) and fire-fighting pipe pylon supports, Pre-fabricated metallic support from pit shall be provided which shall be further encased with concrete to prevent rusting.

11.3.8 All control cubicles shall be mounted at least one meter above Finished Ground Level (FGL) to take care of water logging during flooding. Suitable arrangement (ladder and platform) shall be provided for safe access to control cubicles.

11.4 Conservator

11.4.1 The conservator of main tank shall have air cell type constant oil pressure system to prevent oxidation and contamination of oil due to contact with moisture. Conservator shall be fitted with magnetic oil level gauge with potential free high and low oil level alarm contacts and prismatic oil level gauge.
11.4.2 The conservator shall preferably be on the left side of the tank while viewing from HV side.

11.4.3 Conservator tank shall have adequate capacity with highest and lowest visible-levels to meet the requirements of expansion of total cold oil volume in the transformer and cooling equipment from minimum ambient temperature to top oil temperature of **110 deg C**. The capacity of the conservator tank shall be such that the transformer shall be able to carry the specified overload without overflowing of oil.

11.4.4 The conservator shall be fitted with lifting lugs in such a position so that it can be removed for cleaning purposes. Suitable provision shall be kept to replace air cell and cleaning of the conservator as applicable.

11.4.5 The conservator shall be positioned so as not to obstruct any electrical connection to transformer.

11.4.6 Contact of the oil with atmosphere is prohibited by using a flexible air cell of nitrile rubber reinforced with nylon cloth. The temperature of oil in the conservator is likely to rise up to **110 Deg C** during operation. As such air cell used shall be suitable for operating continuously at this temperature.

11.4.7 The connection of air cell to the top of the conservator is by air proof seal preventing entrance of air into the conservator. The main conservator tank shall be stenciled on its underside with the words “Caution: Air cell fitted”. Lettering of at least 150 mm size shall be used in such a way to ensure clear legibility from ground level when the transformer/reactor is fully installed. To prevent oil filling into the air cell, the oil filling aperture shall be clearly marked. The transformer rating and diagram plate shall bear a warning statement that the “Main conservator is fitted with an air cell”.

11.4.8 The transformer manual shall give clear instructions on the operation, maintenance, testing and replacement of the air cell. It shall also indicate shelf life, life expectancy in operation, and the recommended replacement intervals.

11.4.9 The conservator tank and piping shall be designed for complete vacuum/ filling of the main tank and conservator tank. Provision must be made for equalizing the pressure in the conservator tank and the air cell during vacuum/ filling operations to prevent rupturing of the air cell.

11.4.10 The contractor shall furnish the leakage rates of the rubber bag/ air cell for oxygen and moisture. It is preferred that the leakage rate for oxygen from the air cell into the oil will be low enough so that the oil will not generally become saturated with oxygen. Air cells with well proven long life characteristics shall be preferred.

11.4.11 OLTC shall have conventional type conservator (without air cell) with magnetic oil level gauge with potential free oil level alarm contact and prismatic oil level gauge.
11.4.12 Conservator Protection Relay (CPR)/Air cell puncture detection relay shall be externally installed on the top of conservator to give alarm in the event of lowering of oil in the conservator due to puncture of air cell in service.

11.5 Piping works for conservator

11.5.1 Pipe work connections shall be of adequate size preferably short and direct. Only radiused elbows shall be used.

11.5.2 The feed pipe to the transformer tank shall enter the cover plate at its highest point and shall be straight for a distance not less than five times its internal diameter on the transformer side of the Buchholz relay, and straight for not less than three times that diameter on the conservator side of the relay. This pipe shall rise towards the oil conservator, through the Buchholz relay, at an angle of not less than 5 degrees. The feed pipe diameter for the main conservator shall be not less than 80mm. The Gas-venting pipes shall be connected to the final rising pipe between the transformer and Buchholz relay as near as possible in an axial direction and preferably not less than five times pipe diameters from the Buchholz relay.

11.5.3 No metal corrugated bellow (Flexible metal system) should be used in the feed pipe connecting main tank to conservator.

11.5.4 A double flange valve of preferably 50 mm and 25 mm size shall be provided to fully drain the oil from the main tank conservator and OLTC conservator tank respectively.

11.5.5 Pipe work shall neither obstruct the removal of tap changers for maintenance or the opening of inspection or manhole covers.

11.6 Dehydrating Silica gel Filter Breather

Conservator of Main Tank and OLTC shall be fitted with dehydrating silica gel filter breathers of adequate size. Connection shall be made to a point in the oil conservator not less than 50 mm above the maximum working oil level by means of a pipe with a minimum diameter of 25 mm. Breathers and connecting pipes shall be securely clamped and supported to the transformer, or other structure supplied by the manufacturer, in such a manner so as to eliminate undesirable vibration and noise. The design shall be such that:

a) Passage of air is through silica gel.
b) Silica gel is isolated from atmosphere by an oil seal.
c) Moisture absorption indicated by a change in color of the crystals.
d) Breather is mounted approximately 1200 mm above rail top level.
e) To minimize the ingress of moisture three breathers (of identical size) for 220kV and above voltage class transformer and two breathers (of identical size) for below 220kV class transformer shall be connected in series for main tank conservator. Manufacturer shall provide flexible connection pipes to be used during replacement of any silica gel breather.
f) To minimize the ingress of moisture, two breathers in series of identical size shall be connected to OLTC Conservator. Manufacturer shall provide flexible connection pipes to be used during replacement of any silica gel breather.

11.7 Pressure Relief Device (PRD)

One PRD of 150 mm Diameter is required for every 30000 Litres of oil. However, at least two numbers PRDs shall be provided. Its mounting should be either in vertical or horizontal orientation, preferably close to bushing turret or cover. PRD operating pressure selected shall be verified during design review.

PRD shall be provided with special shroud to direct the hot oil in case of fault condition. It shall be provided with an outlet pipe which shall be taken right up to the soak pit of the transformer/reactor. The size (Diameter) of shroud shall be such that it should not restrict rapid release of any pressure that may be generated in the tank, which may result in damage to equipment. Oil shroud should be kept away from control cubicle and clear of any operating position to avoid injury to personnel in the event of PRD operation.

The device shall maintain its oil tightness under static oil pressure equal to the static operating head of oil plus 20 kPa. It shall be capable of withstanding full internal vacuum at mean sea level. It shall be mounted directly on the tank. Suitable canopy shall be provided to prevent ingress of rain water. One set of potential free contacts (with plug & socket type arrangement) per device shall be provided for tripping. Following routine tests shall be conducted on PRD:

- a) Air pressure test
- b) Liquid pressure test
- c) Leakage test
- d) Contact operation test
- e) Dielectric test on contact terminals

11.8 Sudden Pressure Relay/ Rapid Pressure Rise Relay (for 220kV and above transformer)

One number of Sudden Pressure Relay/ Rapid Pressure Rise Relay with alarm or trip contact (Terminal connection plug & socket type arrangement) shall be provided on tank of transformer. Operating features and size shall be reviewed during design review. Suitable canopy shall be provided to prevent ingress of rain water. Pressurized water ingress test for Terminal Box (routine tests) shall be conducted on Sudden Pressure Relay/ Rapid Pressure Rise Relay.

11.9 Buchholz Relay

Double float, reed type Buchholz relay complying with IS:3637 shall be connected through pipe between the oil conservator and the transformer tank with minimum distance of five times pipe diameters between them. Any gas evolved in the transformer shall be collected in this relay. The relay shall be provided with a test cock suitable for a flexible pipe connection for checking its operation and taking gas sample. A copper tube shall be connected from the gas collector to a valve.
located about 1200 mm above ground level to facilitate sampling while the transformer in service. Suitable canopy shall be provided to prevent ingress of rain water. It shall be provided with two potential free contacts (Plug & socket type arrangement), one for alarm/trip on gas accumulation and the other for tripping on sudden rise of pressure.

The Buchholz relay shall not operate during starting/stopping of the transformer oil circulation under any oil temperature conditions. The pipe or relay aperture baffles shall not be used to decrease the sensitivity of the relay. The relay shall not mal-operate for through fault conditions or be influenced by the magnetic fields around the transformer during the external fault conditions. Pressurized water ingress test for Terminal Box (routine tests) shall be conducted on Buchholz relay.

**11.10 Oil Temperature Indicator (OTI)**

The transformer shall be provided with a dial type thermometer of about 150mm diameter for top oil temperature indication with angular sweep of 270°. Range of temperature should be 0-150°C with accuracy of ±1.5% (or better) of full scale deflection. The instruments should be capable of withstanding high voltage of 2.5kV AC rms, 50Hz for 1 minute. The terminal provided for auxiliary wiring should be Press-fit type.

The thermometer shall have adjustable, potential free alarm and trip contacts besides that required for control of cooling equipment (if any), maximum reading pointer and resetting device, switch testing knob & anti-vibration mounting grommets (for projection mounting). Type of switch (NO/NC) shall be heavy duty micro switch of 5A at 240V AC/DC. Adjustable range shall be 20-90% of full scale range. The instruments case should be weather proof with epoxy coating at all sides. Instruments should meet degree of protection of IP55 as per IS/IEC- 60529. A temperature sensing bulb located in a thermometer pocket on tank cover should be provided to sense top oil. This shall be connected to the OTI instrument by means of flexible stainless steel armour to protect capillary tubing. Temperature indicator dials shall have linear gradations to clearly read at least every 2 deg C. The setting of alarm and tripping contacts shall be adjustable at site.

The OTI shall be so mounted that the dials are about 1200 mm from ground level. Glazed door of suitable size shall be provided for convenience of reading.

In addition to the above, the following accessories shall be provided for remote indication of oil temperature:

**Temperature transducer with PT100 sensor**

RTD shall be provided with PT100 temperature sensor having nominal resistance of 100 ohms at zero degree centigrade. The PT100 temperature sensor shall have three wire ungrounded system. The calibration shall be as per IS 2848 or equivalent. The PT100 sensor may be placed in the pocket containing temperature sensing element. RTD shall include image coil for OTI system and shall provide dual output 4-20mA for SCADA system. The transducer shall be installed in the Individual Marshalling Box. Any special cable required for shielding purpose, for connection between PT100 temperature sensor and transducer, shall be in the scope of manufacturer. 4-20mA signal shall be wired to Digital RTCC panel/BCU for further transfer data to SCADA through IS/IEC 61850 compliant communications.

**11.11 Winding Temperature Indicator (WTI)**
The transformer shall be provided with a dial type hot spot indicator of about 150mm diameter for measuring the hot spot temperature of each winding [HV, IV & Tertiary (if applicable)]. It shall have angular sweep of 270°. Range of temperature should be 0-150°C with accuracy of ±1.5% (or better) of full scale deflection. The instruments should be capable of withstanding high voltage of 2.5kV AC rms, 50Hz for 1 minute. The terminal provided for auxiliary wiring should be Press-fit type.

The thermometer shall have adjustable, potential free alarm, trip contacts besides that required for control of cooling equipment, if any. Instrument should be provided with maximum reading pointer and resetting device, switch testing knob & anti-vibration mounting grommets (for projection mounting). Type of switch (NO/NC) shall be heavy duty micro switch of 5A at 240V AC/DC. Adjustable range shall be 20-90% of full scale range. The instruments case should be weather proof and epoxy coating at all sides. Instruments should meet degree of protection of IP55 as per IEC60529. A temperature sensing bulb located in a thermometer pocket on tank cover should be provided to sense top oil. This shall be connected to the WTI instrument by means of flexible stainless steel armour to protect capillary tubing. WTI shall have image coil and auxiliary CTs, if required to match the image coil mounted in local control box. The setting of alarm and tripping contacts shall be adjustable at site.

The WTI shall be so mounted that the dials are about 1200 mm from ground level. Glazed door of suitable size shall be provided for convenience of reading.

In addition to the above, the following accessories shall be provided for remote indication of winding temperature:

**Temperature transducer with PT100 sensor for each winding**

RTD shall be provided with PT100 temperature sensor having nominal resistance of 100 ohms at zero degree centigrade. The PT100 temperature sensor shall have three wire ungrounded system. The calibration shall be as per IS 2848 or equivalent. The PT100 sensor may be placed in the pocket containing temperature sensing element. RTD shall include image coil, Auxiliary CTs, if required to match the image coil, for WTI system and shall provide dual output 4-20mA for remote WTI and SCADA system individually. The transducer and Auxiliary CT shall be installed in the Individual Marshaling Box. Any special cable required for shielding purpose, for connection between PT100 temperature sensor and transducer, shall be in the scope of Contractor. 4-20mA signal shall be wired to Digital RTCC / BCU panel for further transfer data to SCADA through IS/IEC 61850 compliant communications.

**11.12 Earthing Terminals**

11.12.1 Two (2) earthing pads (each complete with two (2) nos. holes, M16 bolts, plain and spring washers) suitable for connection to 75 x 12 mm galvanized steel grounding flat shall be provided each at position close to earth of the two (2) diagonally opposite bottom corners of the tank.
11.12.2 Two earthing terminals suitable for connection to 75 x 12 mm galvanized steel flat shall also be provided on each cooler, individual/common marshalling box and any other equipment mounted separately. For the tank-mounted equipment like online drying/Online DGA/Optical Sensor Box etc., (if provided), double earthing shall be provided through the tank for which provision shall be made through tank and connected through two flexible insulated copper link.

11.12.3 Equipotential flexible copper links of suitable size shall be provided between turret & tank, between tank & cover or between Bell & lower tank. Other components like - pipes, conservator support etc. connected to tank may also be provided with equipotential flexible copper link.

11.12.4 Each transformer unit should have provision for earthing and connection to grounding mat when not in service.

11.13 Core

11.13.1 The core shall be constructed from non-ageing, cold rolled high permeability grade or better grain oriented silicon steel laminations. Indian transformer manufacturers shall use core material as per above specification with BIS certification.

11.13.2 The design of the magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earthed clamping structure and production of flux component at right angles to the plane of laminations which may cause local heating. The step-lap construction arrangement is preferred for better performance in respect of noise, no-load current and no-load loss.

11.13.3 The hot spot temperature and surface temperatures in the core shall be calculated for over voltage conditions specified in the document and it shall not exceed 125 deg C and 120 deg C respectively.

11.13.4 Core and winding shall be capable of withstanding the shock during transport, installation and service. Adequate provision shall be made to prevent movement of core and winding relative to tank during these conditions.

11.13.5 All steel sections used for supporting the core shall be thoroughly sand/shot blasted after cutting, drilling and welding.

Each core lamination shall be insulated with a material that will not deteriorate due to pressure and hot oil.

11.13.6 The supporting frame work of the core shall be so designed as to avoid presence of pockets which would prevent complete emptying of tank through drain valve or cause trapping of air during oil filling.

11.13.7 Adequate lifting lugs shall be provided to enable lifting of active part (core & winding).
11.13.8 Core assembly shall be manufactured in such a way that lamination shall remain flat and finally assembled core shall be free from distortion.

11.13.9 Single point core earthing should be ensured to avoid circulating current. Core earth should be brought separately on the top of the tank to facilitate testing after installation on all transformers. The removable links shall have adequate section to carry ground fault current. Separate identification name plate/labels shall be provided for the ‘Core’ and ‘Core clamp’. Cross section of Core earthing connection shall be of minimum size 80 sq.mm copper with exception of the connections inserted between laminations which may be reduced to a cross- sectional area of 20 sq. mm tinned copper where they are clamped between the laminations.

11.13.10 In case core laminations are divided into sections by insulating barriers or cooling ducts parallel to the plane of the lamination, tinned copper bridging strips shall be inserted to maintain electrical continuity between sections.

11.13.11 Insulation of core to clamp/frame shall be tested at 2.5 kV DC for 1 minute without breakdown after the transformer is filled with liquid and insulation resistance should be at least 1 giga ohm for new transformer.

11.14 Windings

11.14.1 The manufacturer shall ensure that windings of all transformers are made in clean, dust proof (Clean room class ISO 9 or better as per ISO 14644-1), humidity controlled environment with positive atmospheric pressure.

11.14.2 The conductors shall be of electrolytic grade copper free from scales and burrs. Oxygen content shall be as per IS 12444. Epoxy bonded Continuously Transposed Conductor (CTC) shall be used in main winding for rated current of 400 A or more.

11.14.3 The conductor shall be transposed at sufficient intervals in order to minimize eddy currents and to equalize the distribution of currents and temperature along the winding.

11.14.4 The conductor insulation shall be made from high-density (at least 0.75 gm /cc) paper having high mechanical strength. The characteristics for the paper will be reviewed at the time of design review.

11.14.5 The insulation of transformer windings and connections shall be free from insulating compounds which are liable to soften, ooze out, shrink or collapse and shall be non-catalytic and chemically inactive in transformer oil during service.

11.14.6 Coil assembly and insulating spacers shall be so arranged as to ensure free circulation of
oil and to reduce the hot spot of the winding.

11.14.7 The coils would be made up, shaped and braced to provide for expansion and contraction due to temperature changes.

11.14.8 The windings shall be designed to withstand the dielectric tests specified. The type of winding used shall be of time tested. An analysis shall be made of the transient voltage distribution in the windings, and the clearances used to withstand the various voltages. Margins shall be used in recognition of manufacturing tolerances and considering the fact that the system will not always be in the new factory condition.

11.14.9 The barrier insulation including spacers shall be made from high-density precompressed pressboard (1.15 gm/cc minimum for load bearing and 0.95 gm/cc minimum for non-load bearing) to minimize dimensional changes. Kraft insulating paper used on conductor should have density of >0.75 g/cc.

11.14.10 Wherever required, electrostatic shield, made from material that will withstand the mechanical forces, will be used to shield the high voltage windings from the magnetic circuit.

11.14.11 All insulating materials and structures shall be protected from contamination and the effects of humidity during and after fabrication, and after receipt, by storing them in a separate, climate-controlled area. All blocks shall be installed such that the grain is oriented in the horizontal direction, perpendicular to the winding compressive forces. Aspect ratio of selected conductor shall be chosen suitably based on manufacturer experience to result in stable winding under normal and abnormal service condition after assembly.

11.14.12 All winding insulation shall be processed to ensure that there will be no detrimental shrinkage after assembly. All windings shall be pre-sized before being clamped.

11.14.13 Winding paper moisture shall be less than 0.5%.

11.14.14 Windings shall be provided with clamping arrangements which will distribute the clamping forces evenly over the ends of the winding.

11.14.15 Either brazing/crimping type of connections are permitted for joints. It shall be time proven and safely withstand the cumulative effect of stress which may occur during handling, transportation, installation and service including line to line and line to ground faults /Short circuits. Manufacturer shall have system which allows only qualified personnel to make brazing or crimping joints.

11.15 Current carrying connections
The mating faces of bolted connections shall be appropriately finished and prepared for achieving good long lasting, electrically stable and effective contacts. All lugs for crimping shall be of the correct size for the conductors. Connections shall be carefully designed to limit hot spots due to circulating eddy currents.

11.16 Winding terminations into bushings

11.16.1 Winding termination interfaces with bushings shall be designed to allow for repeatable and safe connection under site conditions to ensure the integrity of the transformer in service.

11.16.2 The winding end termination, insulation system and transport fixings shall be so designed that the integrity of the insulation system generally remains intact during repeated work in this area.

11.16.3 Allowances shall be made on the winding ends for accommodating tolerances on the axial dimensions of the set of bushings and also for the fact that bushings may have to be rotated to get oil level inspection gauges to face in a direction for ease of inspection from ground level. In particular, rotation or straining of insulated connections shall be avoided during the fastening of conductor pads (or other methods) on the winding ends onto the termination surfaces of the bushing.

11.16.4 Suitable inspection and access facilities into the tank in the bushing oil-end area shall be provided to minimize the possibility of creating faults during the installation of bushings.

12.0 PAINT SYSTEM AND PROCEDURES

The typical painting details for transformer main tank, pipes, conservator tank, radiator, control cabinet/ marshalling box / oil storage tank etc. shall be as given in Annexure–H. The proposed paint system shall generally be similar or better than this. The quality of paint should be such that its color does not fade during drying process and shall be able to withstand temperature up to 120 deg C. The detailed painting procedure shall be finalized during award of the contract.

13.0 INSULATING OIL

The insulating oil shall be unused inhibited (Type A, High Grade) Transformer Oil conforming to IEC-60296-2020 & all parameters specified at Annexure–I, while tested at oil supplier's premises. The contractor shall furnish test certificates from the supplier against the acceptance norms as mentioned at Annexure–I, prior to despatch of oil from refinery to site. Under no circumstances,
poor quality oil shall be filled into the transformer and thereafter be brought up to the specified parameter by circulation within the transformer. The Unused Insulating Oil parameters including parameters of oil used at manufacturer’s works, processed oil, oil after filtration and settling are attached at Annexure–I. The oil test results shall form part of equipment test report.

A minimum of **10% (Ten percent)** of the oil quantity shall be supplied as spare (in addition to first filling) for maintaining required oil level in case of leakage in tank, radiators, conservator etc.

Oil used for first filling, testing and impregnation of active parts at manufacturer's works shall be of same type of oil which shall be supplied at site and shall meet parameters as per specification.

### 13.1 Particles in the oil (For 400 kV voltage class transformer)

The particle analysis shall be carried out in an oil sample taken before carrying out FAT at manufacturer’s works and after completion of the oil filtration at site. The procedure and interpretation shall be in accordance with the recommendation of CIGRE report WG-12.17- “Effect of particles on transformer dielectric strength”. Particle limit as shown below shall be ensured by manufacturer, implying low contamination, as per CIGRE Brochure 157, Table 8. After filtration the oil is to be flushed and particle count to be measured.

Limiting value for the particle count are 1000 particle/100 ml with size ≥ 5 μm; 130 particle/100 ml with size ≥ 15 μm.

### 14.0 BUSHINGS

#### 14.0 For various voltage class of transformer, type of bushings shall be as follows:

<table>
<thead>
<tr>
<th>Voltage Rating</th>
<th>Bushing Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>245 kV and 420 kV bushings for 400 kV and below voltage class transformers</td>
<td>RIP/RIS</td>
</tr>
<tr>
<td>Bushings of 36 kV and below</td>
<td>Solid porcelain or oil communicating type</td>
</tr>
<tr>
<td></td>
<td>OIP (For high current requirement)</td>
</tr>
<tr>
<td>Bushings of other rating</td>
<td>OIP/RIP/RIS</td>
</tr>
</tbody>
</table>

*OIP: Oil Impregnated Paper (with porcelain/polymer housing); RIP: Resin Impregnated Paper (with polymer housing); RIS: Resin Impregnated Synthetic (with polymer housing)*
14.1 Bushings shall be robust and designed for adequate cantilever strength to meet the requirement of seismic condition, substation layout and movement along with the spare transformer/reactor with bushing erected and provided with proper support from one foundation to another foundation within the substation area. The electrical and mechanical characteristics of bushings shall be in accordance with IS/IEC: 60137. All details of the bushing shall be submitted for approval and design review.

14.2 Oil filled condenser type bushing shall be provided with at least following fittings:

a) Oil level gauge  
b) Tap for capacitance and tan delta test. Test taps relying on pressure contacts against the outer earth layer of the bushing is not acceptable  
c) Oil filling plug & drain valve (if not hermetically sealed)

14.3 Porcelain used in bushing manufacture shall be homogenous, free from lamination, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture.

14.4 Bushing shall be provided with tap for capacitance and tan delta test. Test taps relying on pressure contacts against the outer earth layer of the bushing is not acceptable.

14.5 Where current transformers are specified, the bushings shall be removable without disturbing the current transformers.

14.6 **Bushings of identical rating of different makes shall be interchangeable to optimize the requirement of spares.**

14.7 Polymer insulator shall be seamless sheath of a silicone rubber compound. The housing & weather sheds should have silicon content of minimum 30% by weight. It should protect the bushing against environmental influences, external pollution and humidity. The interface between the housing and the core must be uniform and without voids. The strength of the bond shall be greater than the tearing strength of the polymer. The manufacturer shall follow non-destructive technique (N.D.T.) to check the quality of jointing of the housing interface with the core. The technique being followed with detailed procedure and sampling shall be finalized during finalization of MQP. The weather sheds of the insulators shall be of alternate shed profile as per IS 16683-3/IEC 60815-3. The weather sheds shall be vulcanized to the sheath (extrusion process) or moulded as part of the sheath (injection moulding process) and free from imperfections. The vulcanization for extrusion process shall be at high temperature and for injection moulding shall be at high temperature & high pressure. Any seams/burr protruding axially along the insulator, resulting from the injection moulding process shall be removed completely without causing any damage to the housing. The track resistance of housing and shed material shall be class 1A4.5 according to IS 9947. The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer. The polymer insulator shall be capable of high pressure washing.

14.8 End fittings shall be free from cracks, seams, shrinks, air holes and rough edges. End fittings should be effectively, sealed to prevent moisture ingress, effectiveness of sealing system must
be supported by test documents. All surfaces of the metal parts shall be perfectly smooth with the projecting points or irregularities which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.

14.9 The hollow silicone composite insulators shall comply with the requirements of IEC-61462 and the relevant parts of IEC-62217. The design of the composite insulators shall be tested and verified according to IEC-61462 (Type & Routine test).

14.10 Clamps and fittings shall be of hot dip galvanized/stainless steel.

14.11 Bushing turrets shall be provided with vent pipes, to route any gas collection through the Buchholz relay.

14.12 No arcing horns shall be provided on the bushings.

14.13 Corona shield, wherever required, shall be provided at bushing terminal (air end) to minimize corona.

14.14 Bushing shall be specially packed to avoid any damage during transit and suitable for long storage, with non-returnable packing wooden boxes with hinged type cover. Without any gap between wooden planks. Packing Box opening cover with nails/screws type packing arrangement shall not be acceptable. Manufacturer shall submit drawing/documents of packing for approval during detail engineering. Detail method for storage of bushing including accessories shall be brought out in the instruction manual.

14.15 Oil end portion of RIP/RIS type bushings shall be fitted with metal housing with positive dry air pressure and a suitable pressure monitoring device shall be fitted on the metal housing during storage to avoid direct contact with moisture with epoxy. The pressure of dry air need to be maintained in case of leakage.

14.16 The terminal marking and their physical position shall be as per IS 2026.

14.17 Tan delta measurement at variable frequency (in the range of 20 Hz to 350 Hz) shall be carried out on each condenser type bushing (OIP & RIP/RIS) at Transformer manufacturing works as routine test before despatch and the result shall be compared at site during commissioning to verify the healthiness of the bushing.

14.18 Tan δ value of RIP/RIS condenser bushing shall be 0.005 (max.) in the temperature range of 20°C to 90°C. The measured Tan δ value at site of in service bushing should not exceed by 0.001 w.r.t factory results (measured at approx. similar temperature conditions) during warranty period. No temperature correction shall be allowed.
14.19 Tan δ value of OIP bushing shall be 0.004 (max.) measured at ambient temperature. The measured Tan δ value at site of in service bushing should not exceed by 0.001 w.r.t factory results. No temperature correction shall be allowed.

15 NEUTRAL FORMATION AND EARTHING ARRANGEMENT

15.0 For 3-Phase Unit

The neutral of the transformer shall be brought out through bushing. The neutral terminal of transformer shall be brought to the ground level by a brass/tinned copper grounding bar, supported from the tank by using porcelain insulators. The end of the brass/tinned copper bar shall be brought to a convenient location at the bottom of the tank, for making connection (using bimetallic strip of adequate size) to grounding mat through separate earth pits using two (2) numbers 75 x 12 mm galvanized steel flats. Aluminium clamps & connectors of suitable size shall be provided for connection with neutral of the transformer.

16 COOLING EQUIPMENT AND ITS CONTROL

16.0 Radiator based cooling for Power/Auto transformer

The transformer shall be designed with cooler system as specified in Annexure-A and with following provisions, as applicable:

16.0.1 The cooler shall be designed using separately mounted radiator banks or tank mounted radiators. Design of cooling system shall satisfy the performance requirements.

16.0.2 In case of separately mounted radiator bank arrangement, radiator bank shall generally be placed on left side of the tank while watching from HV side of the transformer. However, the main tank shall have provision such that cooler banks can be placed on either side of the main tank by simple reconnection without the need of any extra member/pipe maintaining the electrical clearances.

16.0.3 The radiator shall be of sheet steel complying with IS 513 and minimum thickness 1.2 mm. Each radiator bank shall be provided with the following accessories:

(a) Cooling Fans, Oil Pumps, Oil Flow Indicator (as applicable)
(b) Top and bottom shut off valve of at least 80mm size
(c) Drain Valve and sampling valve
(d) Top and bottom oil filling valves
(e) Air release plug at top
(f) Two grounding terminals suitable for termination of two (2) Nos. 75x12 mm galvanized steel flats.
(g) Thermometer pockets fitted with captive screw caps at cooler inlet and outlet.

(h) Lifting lugs

16.0.4 Each radiator bank shall be detachable and shall be provided with flanged inlet and outlet branches. Expansion joint (for separately/ground mounted cooler banks) shall be provided on top and bottom cooler pipe connection.

16.0.5 One number standby fan shall be provided with each radiator bank.

16.0.6 Cooling fans shall not be directly mounted on radiator. The supporting frames for the cooling fans shall be fixed preferably on separate support or to the main tank in such a manner that the fan vibration does not affect the performance of the radiators and its valves. Fans shall be located so as to prevent ingress of rain water. Each fan shall be suitably protected by galvanized wire guard. The exhaust air flow from cooling fan shall not be directed towards the main tank in any case.

16.0.7 Two (2) nos., 100% centrifugal or axial in line oil pumps, if applicable, (out of which one pump shall be standby) shall be provided with each radiator bank. Measures shall be taken to prevent mal-operation of Buchholz relay when all oil pumps are simultaneously put into service. The pump shall be so designed that upon failure of power supply to the pump motor, the pump impeller will not limit the natural circulation of oil.

16.0.8 The changeover to standby oil pump in case of failure of service oil pump shall be automatic.

16.0.9 An oil flow indicator shall be provided for the confirmation of the oil flow direction. An indication in the flow indicator and potential free contacts for remote alarm shall be provided.

16.0.10 Valves shall be provided across the pump and oil flow indicator to avoid oil drain and long outage during maintenance / replacement of pump and oil flow indicator.

16.0.11 Cooling fans and oil pump motors shall be suitable for operation from 415 volts, three phase 50 Hz power supply and shall be of premium efficiency class IE3 conforming to IS: 12615. Each cooling fan and oil pump motors shall be provided with starter, thermal overload and short circuit protection. The motor winding insulation shall be conventional class 'B' type. Motors shall have hose proof enclosure equivalent to IP: 55 as per IS/IEC 60034-5.

16.0.12 The cooler pipes, support structure including radiators and its accessories shall be hot dip galvanized or corrosion resistant paint should be applied to external surface of it.

16.0.13 Air release device and oil plug shall be provided on oil pipe connections. Drain valves shall be provided in order that each section of pipe work can be drained independently.
16.0.14 Automatic operation control of fans/pumps shall be provided (with temperature change) from contacts of winding temperature indicator. The manufacturer shall recommend the setting of WTI for automatic changeover of cooler control over entire operating range depending on types of cooling system like ONAN/ONAF/OFAF (or ODAF) or ONAN/ONAF1/ONAF2. The setting shall be such that hunting i.e. frequent start-up operations for small temperature differential do not occur.

16.0.15 Suitable manual control facility for cooler fans and oil pumps shall be provided. Selector switches and push buttons shall also be provided in the cooler control cabinet to disconnect the automatic control and start/stop the fans and pump manually.

16.0.16 Following lamp indications shall be provided in cooler control cabinet:

a) Cooler Supply failure (main)
b) Cooler supply changeover
c) Cooler Supply failure (standby)
d) Control Supply failure
e) Cooling fan supply failure for each bank
f) Cooling pump supply failure for each pump
g) Common thermal overload trip
h) Thermal overload trip for each fan/pump
i) No oil flow/reverse flow for pumps
j) Stand by fan/pump ON

One potential free initiating contact for all the above conditions shall be wired independently to the terminal blocks of cooler control cabinet and for single phase unit connection shall be extended further to Common Marshalling Box.

16.0.17 The Cooler Control Cabinet/ Individual Marshalling Box shall have all necessary devices meant for cooler control and local temperature indicators. All the contacts of various protective devices mounted on the transformer and all the secondary terminals of the bushing CTs shall also be wired up to the terminal board in the Cooler Control Cabinet/Individual Marshalling Box. All the CT secondary terminals in the Cooler Control Cabinet shall have provision for shorting to avoid CT open circuit while it is not in use.

16.0.18 All the necessary terminations for remote connection to Purchaser's panel shall be wired upto the Common Marshalling Box (in case of 1- Ph unit) or Marshalling Box (3-Ph unit).

16.0.19 AC power for Cooler Control Circuitry shall be derived from the AC feeder. In case auxiliary power supply requirement for Cooler Control Mechanism is different than station auxiliary AC supply, then all necessary converters shall be provided.

17 VALVES

17.0 Type of valves shall be used for transformer as per following table. The location and size of
valves for other application shall be finalized during design review. DTL may specify any other valve required for some other applications.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description of Valve</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Drain Valve</td>
<td>Gate</td>
</tr>
<tr>
<td>2</td>
<td>Filter valve</td>
<td>Gate</td>
</tr>
<tr>
<td>3</td>
<td>Sampling Valve</td>
<td>Globe</td>
</tr>
<tr>
<td>4</td>
<td>Radiator isolation valve</td>
<td>Butterfly</td>
</tr>
<tr>
<td>5</td>
<td>Buchholz relay isolation valve</td>
<td>Gate</td>
</tr>
<tr>
<td>6</td>
<td>Sudden pressure relay</td>
<td>Gate</td>
</tr>
<tr>
<td>7</td>
<td>OLTC- tank equalizing valve</td>
<td>Gate / Needle</td>
</tr>
<tr>
<td>8</td>
<td>OLTC Drain cum filling valve</td>
<td>Gate</td>
</tr>
<tr>
<td>9</td>
<td>Valve for vacuum application on Tank</td>
<td>Gate</td>
</tr>
<tr>
<td>10</td>
<td>Conservator Drain valve</td>
<td>Gate</td>
</tr>
<tr>
<td>11</td>
<td>Aircell equalizing valve</td>
<td>Gate/Globe/Ball</td>
</tr>
<tr>
<td>12</td>
<td>Valve for Conservator vacuum (top)</td>
<td>Gate</td>
</tr>
<tr>
<td>13</td>
<td>Filter valve for Cooler Bank (Header)</td>
<td>Gate</td>
</tr>
<tr>
<td>14</td>
<td>Cooler Bank isolation valve</td>
<td>Butterfly</td>
</tr>
<tr>
<td>15</td>
<td>Pump Isolation valve</td>
<td>Butterfly</td>
</tr>
<tr>
<td>16</td>
<td>Valve for N2 injection (NIFPS)</td>
<td>Gate</td>
</tr>
<tr>
<td>17</td>
<td>Valve for NIFPS Drain</td>
<td>Gate</td>
</tr>
<tr>
<td>18</td>
<td>Valve for UHF Sensors (applicable for 400kV voltage class Transformer only)</td>
<td>Gate</td>
</tr>
</tbody>
</table>

17.1 All valves up to and including 50 mm shall be of gun metal or of cast steel. Larger valves may be of gun metal or may have cast iron bodies with gun metal fittings. They shall be of full way type with internal screw and shall open when turned counter clock wise when facing the hand wheel.

17.2 Suitable means shall be provided for locking the valves in the open and close positions. Provision is not required for locking individual radiator valves.
17.3 Each valve shall be provided with the indicator to show clearly the position (open/close) of the valve.

17.4 Gland packing/gasket material shall be of “O” ring of nitrile rubber for all the valve’s flanges. All the flanges shall be machined.

17.5 Drain valves/plugs shall be provided in order that each section of pipe work can be drained independently.

17.6 All valves in oil line shall be suitable for continuous operation with transformer oil at 115 deg C.

17.7 After testing, inside surface of all cast iron valves coming in contact with oil shall be applied with one coat of oil resisting paint/varnish with two coats of red oxide zinc chromate primer followed by two coats of fully glossy finishing paint conforming to IS: 2932 and of a shade (Preferably red or yellow) distinct and different from that of main tank surface. Outside surface except gasket setting surface of butterfly valves shall be painted with two coats of red oxide zinc chromate conforming to IS: 2074 followed by two coats of fully glossy finishing paint.

17.8 The oil sampling point for main tank shall have two identical valves put in series. Oil sampling valve shall have provision to fix rubber hose of 10 mm size to facilitate oil sampling.

17.9 Valves or other suitable means shall be provided to fix various on line condition monitoring systems, if specified, to facilitate continuous monitoring. The location & size of the same shall be finalized during detail design review.

17.10 All hardware used shall be hot dip galvanized/stainless steel.

17.11 Flow sensitive conservator Isolation valve

   a) In order to restrict the supply of oil in case of a fire in transformer, flow sensitive valve shall be provided to isolate the conservator oil from the main tank. The valve shall be flow sensitive and shut off when the flow in the pipe is more than the flow expected in the permissible normal operating conditions. It shall not operate when oil pumps are switched on or off. This valve shall be located in the piping between the conservator and the buchholz relay and shall not affect the flow of oil from and to the conservator in normal conditions.

   b) When the flow from conservator to main tank is more than the normal operating conditions, the valve shall shut off by itself and will have to be reset manually. It shall be provided with valve open/close position indicator along with alarm contact indication in control room during closing operation of valve. This valve shall be provided with locking arrangement for normal position and oil filling / filtration position. A suitable platform or ladder shall be provided to approach the valve for manual reset.

18 CABLING

18.0 All interconnecting control and power cables emanating from various parts of transformer like turret CT, MBs, Fans, pumps, Buchholz, PRD etc. shall be routed through covered cable tray
or GI conduit and shall be properly dressed. All cables shall be armoured type. Un-armoured cables (if provided) in any circuitry, shall be through GI conduit and no part shall be exposed. Cable terminations shall be through stud type TB and ring type lugs. Type tested cables from approved sources shall be provided. Both ends of all the wires (control & power) shall be provided with proper ferrule numbers for tracing and maintenance. Further, any special cables (if required) shall also be considered included in the scope. All cable accessories such as glands, lugs, cable tags/ numbers etc. as required shall be considered included in the scope of supply. Typical technical specification for cables is attached at Annexure-K. The cross section of “control cable” shall be 1.5 sq.mm (minimum) except for CT circuits which should be 2.5 sq.mm (minimum).

18.1 Cabling of spare unit of transformer with isolator switching arrangement shall be in such a way that spare unit can be brought into service in case of failure/ outage of a healthy unit without physically shifting. All control, protection, indication signals of spare unit shall be brought to the Common Marshalling Box (CMB) of all the banks. From CMB all the control, protection and indication signals of R, Y, B and Spare units shall be transferred to Purchaser’s Control panels/SCADA. Change-over of spare unit signals with faulty unit shall be done through Purchaser’s C & R panels / SCADA level. Changeover of RTCC signals shall be carried out in CMB. Plug & socket arrangement shall be provided for quicker transition of faulty unit to spare unit to avoid interconnection errors.

19 TAP CHANGING EQUIPMENT

The transformer shall be provided with On Load Tap changing equipment as specified in Annexure-A and shall comply with IS 8468-1/IEC 60214-1.

19.0 On Load Tap Changing (OLTC) Equipment

19.0.1 Main OLTC Gear Mechanism
19.0.2 Three phase transformer as specified in Annexure-A shall be provided with voltage control equipment of the tap changing type for varying its effective transformation ratio whilst the transformers are on load. The OLTC shall conform to IS 8468/IEC 60214 (Part 1 & 2). The requirement of voltage regulation (on HV or LV sides), location (physical and electrical) of tap winding (end of common/ series winding or at neutral end), range of voltage variation, no. of steps etc. shall be as given in Annexure-A.
19.0.3 The OLTC shall be of high speed transition resistor type. OLTC shall be motor operated suitable for local as well as remote operation. The diverter switch or arcing switch shall be designed so as to ensure that its operation once commenced shall be completed independently of the control relays or switches, failure of auxiliary supplies etc. To meet any contingency which may result in incomplete operation of the diverter switch, adequate means shall be provided to safeguard the transformer and its ancillary equipment. The current diverting contacts shall be housed in a separate oil chamber not communicating with the oil in main tank of the transformer and the chamber shall be designed to withstand the vacuum. The contacts shall be accessible for inspection without lowering oil level in the main tank and the contacts shall be replaceable.
19.0.5 The voltage class, maximum tapping current, step voltage of OLTC shall have adequate design
margin for safe & reliable service life of both OLTC and transformer. OLTC shall have long contact life, quick & easy to disassemble diverter switch inserts, simple to adjust & control and easy to replace diverter’s contacts etc.

19.0.6 Necessary safeguards shall be provided to avoid harmful arcing at the current diverting contacts in the event of operation of the OLTC gear under overload conditions of the transformer.

19.0.7 The OLTC oil chamber shall have oil filling and drain valve, oil sampling valve, relief vent and level glass. Oil sampling valve, accessible from ground, shall be provided to take sample of oil from the OLTC chamber. It shall also be fitted with an oil surge relay which shall be connected between OLTC oil chamber and OLTC conservator tank. Provision of a suitable device like tie-in-resistor has to be made, wherever required, to limit the recovery voltage to a safe value. The use of tie-in-resistor (if used) shall be clearly marked in rating and diagram plate of the transformer. The whole of the driving mechanism shall be of robust design and capable of giving satisfactory service without undue maintenance.

19.0.8 Tap changer shall be so mounted that bell cover of transformer can be lifted without removing connections between windings and tap changer.

19.0.9 Local OLTC Control Cabinet (Drive Mechanism Box)

19.0.8.1 OLTC shall be suitable for manual (handle operated) and electrical (motor operated) operation. For local manual operation from Local OLTC Control cabinet (Drive Mechanism Box), an external handle shall be provided.

19.0.8.2 OLTC’s Local control cabinet shall be mounted on the tank in accessible position. The cranking device/handle for manual operation for OLTC gear shall be removable and suitable for operation by a man standing at ground level (preferably at a height less than 1800mm). The mechanism shall be complete with the following:

(a) Mechanical tap position indicator, which shall be clearly visible near the transformer.

(b) A mechanical operation counter of at least five digits shall be fitted to indicate the number of operations completed and shall have no provision for resetting.

(c) Mechanical stops to prevent over-cranking of the mechanism beyond the extreme tap positions.

(d) The manual control, considered as back up to the motor operated on load tap changer control, shall be interlocked with the motor to block motor start-up during manual operation.

(e) The manual operating mechanism shall be labelled to show the direction of operation for raising the voltage and vice-versa.

(f) An electrical interlock to cut-off a counter impulse for reverse step change being initiated during a progressing tap change, until the mechanism comes to rest and resets circuits for a fresh position.

19.0.8.3 For electrical operation from local as well as remote, motor operated mechanism shall be provided. It shall not be possible to operate the electric drive when the manual operating gear is in use. It shall not be possible for any two controls to be in operation at the same time. Transfer of source in the event of failure of operating AC supply shall not affect the
tap changer. Thermal device or other means shall be provided to protect the motor and control circuit.

19.0.8.4 The Local OLTC Drive Mechanism Box shall house all necessary devices meant for OLTC control and indication. It shall be complete with the following:

(g) A circuit breaker/contactor with thermal overload devices for controlling the AC Auxiliary supply to the OLTC motor
(h) Emergency Push Button to stop OLTC operation
(i) Cubicle light with door switch
(j) Anti-condensation metal clad heaters to prevent condensation of moisture
(k) Padlocking arrangement (or locking arrangement suitable for long term operation) for hinged door of cabinet
(l) All contactors relay coils and other parts shall be protected against corrosion, deterioration due to condensation, fungi etc.
(m) The cabinet shall be tested at least IP 55 protection class.

19.0.8.5 In case auxiliary power supply requirement for OLTC Drive Mechanism (DM) Box is different than station auxiliary AC supply, then all necessary converters shall be provided.

19.0.8.6 Operating mechanism for on load tap changer shall be designed to go through one step of tap change per command only, until the control switch is returned to the off position between successive operations/ repeat commands.

19.0.8.7 Limit switches shall be provided to prevent overrunning of the mechanism and shall be directly connected in the control circuit of the operating motor provided that a mechanical de-clutching mechanism is incorporated. In addition, a mechanical stop shall be provided to prevent over-running of the mechanism under any condition. An interlock to cut-out electrical control when it tends to operate the gear beyond either of the extreme tap positions.

19.0.8.8 OLTC local control cabinet shall be provided with tap position indication for the transformer. Drive Mechanism shall be equipped with a fixed resistor network capable of providing discrete voltage steps or provide 4-20mA transducer outputs for tap position indication and input to digital RTCC/relevant BCU (as applicable)/SCADA system. The tap position indicator shall also be provided in control room.

19.0.8.9 Local-remote selector switch shall be provided in the local OLTC control cabinet. In Local mode, all electrical commands from remote (i.e. from CMB, digital RTCC, SCADA, SAS etc.) shall be cut-off/blocked. Electrical operations to change tap positions shall be possible by using raise/lower push buttons under local mode from Driving Mechanism (DM) Box. In remote mode electrical commands from CMB/digital RTCC/SCADA/SAS etc. shall be executed. The remote-local selector switch shall be having at-least two spare con-
tacts per position.

19.0.8.10 For 3-phase transformer, the following minimum LED indications shall be provided in DM box:

(n) INCOMPLETE STEP
(o) OLTC motor overload protection operated
(p) Supply to DM Motor fail
(q) OLTC IN PROGRESS
(r) Local / Remote Selector switch positions of DM
(s) OLTC upper/lower limits reached
(t) 415V Main AC supply ON
(u) 415V Standby AC supply ON

19.0.8.11 The following minimum contacts shall be available in DM Box. For three phase unit, and these contacts shall be further wired to digital RTCC panel/relevant BCU (as applicable):

(v) INCOMPLETE STEP which shall not operate for momentary loss of auxiliary power.
(w) OLTC motor overload protection
(x) Supply to DM Motor fail
(y) OLTC IN PROGRESS
(z) Local/Remote Selector switch position
(aa) OLTC upper/lower limits reached

19.0.8.12 All relays, switches, fuses etc. shall be mounted in the OLTC local control cabinet and shall be clearly marked/labelled for the purpose of identification. Both ends of all the wires (control & power) connected to Drive Mechanism Box must be provided with proper ferrule nos. for tracing and maintenance.

19.0.8.13 A permanently legible lubrication chart and control circuit drawing shall be fitted within the OLTC local control cabinet.

19.0.10 Remote Control & Monitoring of OLTC (through Bay Control Unit/Digital RTCC Relay, as applicable)

Requirement of digital RTCC relays may be specified by DTL for existing conventional substations. For substations having Substation Automation System, Control & monitoring of OLTC shall be carried out through Substation Automation System. All the functionalities specified for digital RTCC shall be realized in soft logic in Substation Automation System. All hardwire signals from/to OLTC shall be wired to Bay Control Units (BCUs) provided by DTL/contractor, as applicable. Wherever, digital RTCC relay is required following specification may be followed.

a) The digital RTCC relay shall have Automatic Tap Changer control and monitoring relay with
Automatic Voltage Regulating features to remotely control and monitor OLTC.

b) Each digital RTCC relay shall be used to control 1 bank of transformers (i.e. 1 No. 3-Phase unit). No. of relays including spare relay, if any, shall be specified by the utility as per requirement.

c) All digital relays can be housed in a single digital RTCC panel in control room or in the BCU panel in kiosks located in the switchyard.

d) For existing substations, the requirement of digital RTCC panel and relays shall be specified. However, availability of existing RTCC schemes / Digital RTCC relays need to be specified to finalize matching digital RTCC relays. The Digital RTCC relays envisaged for existing transformers shall be integrated for parallel operations. All required cables for the same shall be deemed to be included in the scope.

e) Digital RTCC relay shall be microprocessor based adopting the latest state of the art design & technology with in-built large LCD (or better) display for ease of programming and viewing. The unit supplied shall be field programmable so that in the event of change in transformer/location, it could be customized to suit site conditions without sending back to works. The programming shall be menu driven and easily configurable. If it is designed with draw out type modules, it should take care of shorting all CT inputs automatically while drawing out. The CT/VT ratio shall be field programmable and Relay shall display the actual HV Voltage and current considering suitable multiplying factors. The system shall be self-sufficient and shall not require any additional devices like parallel balancing module etc.

f) It shall be possible to communicate/integrate with all digital RTCC relays of different make located at different locations in the substation by making hardware and using IS/IEC 61850 communication link. The integration of existing conventional RTCC panel with digital RTCC panel of different make shall also be possible.

g) The digital RTCC relay shall have Raise/Lower push buttons, Manual/ Automatic mode selection feature, Local/Remote selection feature, Master / Follower/ Independent/ Off mode selection feature for control of OLTC. Touch screen option in the relay (instead of electrical push button/switch) is also acceptable.

h) The digital RTCC Relay shall have multiple selectable set point voltages and it shall be possible to select these set points from SCADA/ SAS, with a facility to have the possibility of additional set points command from SCADA/ SAS.

i) **In Manual Mode:** In this mode, power system voltage based automatic control from digital RTCC relay shall be blocked and commands shall be executed manually by raise/lower push buttons.

j) **In Auto Mode:** In Auto mode, digital RTCC relay shall automatically control OLTC taps based on power system voltage and voltage set points. An interlock shall be provided to cut off electrical control automatically upon recourse being taken to the manual control in emergency.

k) **Master/Follower/Independent/Off mode :** Master/Follower/Independent/Off mode is required in Digital RTCC relay for parallel/group operation of transformers. Master-follower scheme implies that controlled decision shall be taken by the Master and control actions (Raise/Lower tap position) shall be executed simultaneously by Master & Follower units. Same logic needs to be implemented in digital RTCC relays.

l) **Master Position:** If the digital RTCC relay is in master position, it shall be possible to control the OLTC units of other parallel operating transformers in the follower mode by operation from the master unit.

m) **Follower Position:** If the digital RTCC relay is in Follower position, control of OLTC shall be possible only from panel where master mode is selected.

n) **Independent Position:** In independent position of selector switch, control of OLTC shall be possible only from the panel where independent mode is selected.

o) Suitable interlock arrangement shall be provided to avoid unwanted/inconsistent operation of
OLTC of the transformer

p) **Raise/Lower control:** The remote OLTC scheme offered shall have provision to raise or lower taps for the complete bank of three 1-phase transformers / 3-Phase Transformers. Individual 1-phase OLTC operation shall not be possible from the remote control panel.

q) Digital RTCC relays shall communicate with SCADA using IS/IEC 61850 through fibre optic port to monitor, parameterise and control the OLTC. Any software required for this purpose shall be supplied. The supplied software shall not have restriction in loading on multiple computers for downloading and analyzing the data. Software shall indicate the current overview of all measured parameters of the connected transformer in real time.

r) Communication between the Digital RTCC relays to execute the commands for parallel operation shall be implemented using required communication protocol. Suitable communication hardware shall be provided to communicate up to distance of 1 km between digital RTCC relays. Scope shall also include communication cables between digital RTCC relays. Cables as required for parallel operation of OLTCs of all transformers (including existing transformers wherever required) from Digital RTCC relays shall be considered included in the scope.

s) The Digital RTCC relay shall have additional programmable Binary Inputs (minimum 7 Nos.) and Binary outputs (minimum 7 Nos.) for future use. It shall be possible to have additional module for Binary Input / output as well as Analogue input module depending upon requirement.

t) The relays shall ensure completion of lowering/raising of the OLTC tap, once the command is issued from the relay. "Step-by-Step" operation shall be ensured so that only one tap change from each tap changing pulse shall be effected. If the command remains in the "operate" position, lock-out of the mechanism is to be ensured.

u) The relay shall incorporate an under voltage / over voltage blocking facility which shall make the control inoperative if voltage falls/ rises by percentage value of set point value with automatic restoration of control when nominal voltage rises / falls to value.

v) The relay shall have facility to monitor operating hours of tap changer and register the tap changer statistics. In the statistics mode, the relay shall display the no. of tap changing operations occurred on each tap.

w) The relay shall have self-check of power on and shall continually monitor all functions and the validity of all input values to make sure the control system is in a healthy condition. Any monitoring system problem shall initiate the alarm.

x) Following minimum indications/alarm shall be provided in Digital RTCC relay either through relay display panel or through relay LEDs:
   - INCOMPLETE STEP alarm
   - OLTC motor overload protection alarm
   - Supply to DM Motor fail alarm
   - OLTC IN PROGRESS alarm
   - Local / Remote Selector switch positions in DM Box
   - OLTC upper/lower limits reached alarm
   - OLTC Tap position indications for transformer units
   - Independent-combined-remote selector switch positions of CMB (in case of single phase transformer)
   - 415V, AC Mail Supply Fail.
   - 415V, AC Standby Supply Fail
**20.0 SCADA INTEGRATION (if applicable)**

All the online monitoring equipment i.e. Optical Temperature Sensors & Measuring Unit, Online Dissolved Gas (Multi-gas) and Moisture Analyzer, On-line insulating oil drying system (Cartridge type) etc. provided for individual transformer unit including spare unit (if any), shall be IS/IEC 61850 compliant (either directly or through a Gateway). These monitoring equipment are required to be integrated with SAS through managed Ethernet switch conforming to IS/IEC 61850. This Ethernet switch shall be provided in IMB (for 3-Ph unit) / CMB (for 1-Ph unit). The switch shall be powered by redundant DC supply (as per available Station DC supply). Ethernet switch shall be suitable for operation at ambient temperature of 50 Deg C. All required power & control cables including optical cable, patch chord (if any) up to IMB (for 3-Ph unit) / CMB (for 1-Ph unit), all the cables from RTCC to DM and any special cable between IMB (for 3-Ph unit) / CMB (for 1-Ph unit) to switchyard panel room/control room shall be in the scope.

However, fiber optic cable, power cable, control cables, as applicable, between IMB (for 3-Ph unit) / CMB (for 1-Ph unit) to switchyard panel room/control room and power supply (AC & DC) to MB and integration of above said IS/IEC-61850 compliant equipment with Substation Automation System may be a part of sub-station contract.

Cooling and OLTC of transformers shall also be monitored and controlled from SCADA. List of Signal exchange between Transformer and SCADA may be mutually agreed between the owner and manufacturer. Owner/contractor, as applicable, shall ensure provision of adequate number of redundant Bay control Units (BCUs).

**21.0 CONSTRUCTIONAL FEATURES OF COOLER CONTROL CABINET/ INDIVIDUAL MARSHALLING BOX/ COMMON MARSHALLING BOX/ OUTDOOR CUBE/ DIGITAL RTCC PANEL**

21.1 Each transformer unit shall be provided with local OLTC Drive Mechanism Box (DMB), Cooler Control Cabinet/Individual Marshalling Box, Digital RTCC panel (as applicable). Each reactor unit shall be provided with Individual Marshalling Box.

21.2 Individual Marshalling Box (IMB) and Cooler Control Box shall be tank mounted or ground mounted. All cabinets shall be tank mounted. All separately mounted cabinets and panels shall be free standing floor mounted type and have domed or sloping roof for outdoor application. The gland plate shall be at least 450 mm above ground level.

21.3 The Cooler Control Cabinet (CCC)/Individual Marshalling Box (IMB), Common Marshalling Box (CMB), and all other outdoor cubicles (except OLTC Drive Mechanism box) shall be made of stainless steel sheet of minimum Grade SS 304 and of minimum thickness of 1.6 mm. Digital RTCC panel shall be made of CRCA sheet of minimum thickness of 2.0 mm and shall be painted suitably as per Annexure– K.
21.4 The degree of protection shall be IP: 55 for outdoor and IP: 43 for indoor in accordance with IS/IEC: 60947.

21.5 All doors, removable covers and plates shall be gasketed all around with suitably profiled. All gasketed surfaces shall be smooth straight and reinforced if necessary to minimize distortion to make a tight seal. For Control cubicle/Marshalling Boxes etc. which are outdoor type, all the sealing gaskets shall be of EPDM rubber or any other (approved) material of better quality, whereas for all indoor control cabinets/Digital RTCC panel, the sealing gaskets shall be of neoprene rubber or any other (approved) material of better quality. The gaskets shall be tested in accordance with approved quality plan and IS: 3400.

21.6 All the contacts of various protective devices mounted on the transformer and all the secondary terminals of the bushing CTs shall also be wired up to the terminal board in the Marshalling Box. All the CT secondary terminals in the Marshalling Box shall have provision for shorting to avoid CT open circuit while it is not in use. All the necessary terminations for remote connection to Purchaser’s panel shall be wired up to the Common Marshalling Box.

21.7 Ventilating Louvers, if provided, shall have screen and filters. The screen shall be fine wire mesh of brass. All the control cabinets shall be provided with suitable lifting arrangement. Thermostat controlled space heater and cubicle lighting with ON-OFF switch shall be provided in each panel.

22.0 AUXILIARY POWER SUPPLY FOR OLTC, COOLER CONTROL AND POWER CIRCUIT

22.1 For Three Phase Transformer

22.1.1 Two auxiliary power supplies of 415 volt, three phase four (4) wire shall be provided by the Purchaser at Cooler Control Cabinet / Marshalling Box. All loads shall be fed by one of the two sources through an electrically interlocked automatic transfer scheme housed in the Cooler Control Cabinet/Marshalling Box.

22.1.2 For each circuit, suitably rated power contactors, MCBs/MCCBs as required for entire auxiliary power supply distribution scheme including distribution to DM boxes, Online Gases and moisture monitoring system, Online drying system and Fibre optic sensor Box etc. (as applicable), shall be provided in cooler control cabinet/ Marshalling Box.

22.1.3 Auxiliary power supply distribution scheme shall be submitted for approval. Supply and laying of Power, Control and special cables from marshalling box to all accessories is in the scope of the manufacturer/contractor (as applicable). Further any special cable (if required) from MB to Owner’s Control Panels/Digital RTCC panels is also in the scope of the manufacturer/contractor (as applicable).

22.1.4 All relays and operating devices shall operate correctly at any voltage within the limits
specified below:

<table>
<thead>
<tr>
<th>Normal Voltage</th>
<th>Variation in voltage</th>
<th>Frequency (in Hz)</th>
<th>Phase/Wire</th>
<th>Neutral connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>415 V</td>
<td>±10%</td>
<td>50±5%</td>
<td>3 Phase 4Wire</td>
<td>Solidly earthed</td>
</tr>
<tr>
<td>240 V</td>
<td>±10%</td>
<td>50±5%</td>
<td>1 Phase 2 Wire</td>
<td>Solidly earthed</td>
</tr>
<tr>
<td>220 V</td>
<td>190 V to 240 V</td>
<td>DC</td>
<td>Isolated 2 wire system</td>
<td>--</td>
</tr>
<tr>
<td>110 V</td>
<td>95 V to 120 V</td>
<td>DC</td>
<td>Isolated 2 wire system</td>
<td>--</td>
</tr>
<tr>
<td>48 V</td>
<td>--</td>
<td>DC</td>
<td>2 wire system (+) earthed</td>
<td>--</td>
</tr>
</tbody>
</table>

Combine variation of voltage and frequency shall be limited to ±10%.

22.1.5 Design features of the transfer scheme shall include the following:

a) Provision for the selection of one of the feeder as normal source and other as standby.
b) Upon failure of the normal source, the loads shall be automatically transferred after an adjustable time delay to standby sources.
c) Indication to be provided at cooler control cabinet/Individual Marshalling Box/Common Marshalling Box for failure of normal source and for transfer to standby source and also for failure to transfer.
d) Automatic re-transfer to normal source without any intentional time delay following re-energization of the normal source.
e) Both the transfer and the re-transfers shall be dead transfers and AC feeders shall not be paralleled at any time.

22.1.6 For spare unit which is not connected through isolator switching arrangement, 415 volt, three phase four (4) wire AC supply shall be provided for heater, On line drying system, On line DGA etc. as applicable.

23.0 BUSHING CURRENT TRANSFORMER AND NEUTRAL CURRENT TRANSFORMER

23.1 Current transformers shall comply with IS 16227 (Part 1 & 2)/IEC 61869 (part 1 & 2).

23.2 It shall be possible to remove the turret mounted current transformers from the Transformer tank without removing the tank cover. Necessary precautions shall be taken to minimize eddy currents and local heat generated in the turret.
23.3 Current transformer secondary leads shall be brought out to a weather proof terminal box near each bushing. These terminals shall be wired out to common marshalling box using separate cables for each core.

23.4 Technical Parameters of Bushing CTs and Neutral CTs are provided at Annexure–B. The CTs used for REF protection must have the identical parameters in order to limit the circulating current under normal condition for stability of protection. Bushing Current Transformer parameters indicated in this specification are tentative and liable to change within reasonable limits. DTL's approval shall be obtained before proceeding with the design of bushing current transformers.

23.5 Secondary resistance and magnetizing current characteristics of PS class (protection) CT of same rating shall be similar. This is applicable for Neutral CT (outdoor) also and shall be reviewed during detail engineering.

24.0 TOOLS & TACKLES
Each transformer shall be supplied with a full kit of tools & spanners of required sizes; bushing handling & lifting tools with nylon rope/belt, with a rack for holding them; required numbers of hydraulic jacks for lifting the transformers, and for changing the plane of rotation of wheels. All spanners shall be single ended and case hardened. Tirfors with wire rope and slings with grippers etc. for hauling the transformer to the plinth are to be supplied along with each transformer.

25.0 FITTINGS & ACCESSORIES
The following fittings & accessories shall be provided with each transformer covered in this specification. The fittings listed below are not exhaustive and other fittings which are required for satisfactory operation of the equipment are deemed to be included.

For Transformer

(a) Conservator for main tank with air cell, oil filling hole and cap, isolating valves, drain valve, magnetic oil level gauge, prismatic oil level gauge and dehydrating silica gel filter breather with flexible connection pipes to be used during replacement of any silica gel breather.

(b) Conservator for OLTC (for transformer) with drain valve, oil surge relay, filling hole with cap, magnetic oil level gauge, prismatic oil level gauge and dehydrating breather (for transformer only) with flexible connection pipes to be used during replacement of any silica gel breather.

(c) Pressure relief devices with special shroud to direct the hot oil

(d) Sudden pressure relief relay (for 220 kV and above Transformer)

(e) Buchholz relay (double float, reed type) with isolating valves on both sides, bleeding pipe with pet cock at the end to collect gases and alarm/trip contacts.

(f) Conservator air cell rupture detection relay
Air release plug

Inspection openings and covers

Bushing of each type with metal parts and gaskets to suit the termination arrangement

Winding & Oil temperature indicators (local & remote)

Cover lifting eyes, transformer/reactor lifting lugs, jacking pads, towing holes and core and winding lifting lugs

Protected type alcohol in glass thermometer or magnetic or micro-switch type dial type temperature indicator as applicable (mercury should not be used)

Rating and diagram plates (in English & Hindi or as specified by the utility) on transformers and auxiliary apparatus

Roller Assembly (flanged bi-directional wheels)

One complete set of all metal blanking plates & covers

On load tap changing gear, OLTC DM Box, individual marshalling box/Common Marshalling Box, Cooler control cabinet, and Digital RTCC Panel as applicable.

Cooling equipment including fans & pumps (as applicable)

Bushing current transformers, Neutral CT (as applicable)

Oil/water flow indicators (as applicable)

Terminal marking plates

Valves schedule plate

Bottom oil sampling valve, Drain valves (provided to drain each section of pipe work independently), Filter valves at top and bottom with threaded male adaptors, Shut off valves on the pipe connection between radiator bank & the main tank, Shut off valves on both sides of Buchholz relay, Sampling gas collectors for Buchholz relay at accessible height, Valves for Radiators, Valve for vacuum application, Valves for cable box (if applicable), Valve for on line DGA (if applicable), valves for Drying out system (if applicable), water inlet and outlet valves (applicable for water cooled transformers), Flow sensitive Conservator Isolation Valve (if applicable), Gate Valve (4 Nos. of min. 50 NB) for UHF sensors for PD Measurements (applicable for 400kV and above voltage class Transformer only), valves for firefighting system (as applicable) and other valves as specified in the specification.
Ladder (suitably placed to avoid fouling with bushing or piping) to climb up to the transformer tank cover with suitable locking arrangement to prevent climbing during charged condition. Additional ladder for conservator in case it is not tank mounted.

Suitable platform for safe access of flow sensitive non-return valve and buchholz relay shall be provided, in case these are not accessible from transformer/reactor top.

Haulage/lifting lugs

Suitable terminal connectors on bushings

Suitable neutral bus connection

Suitable terminal connectors of surge arrester

Brass/tinned copper grounding bar supported from the tank by using porcelain insulator and flexible conductor for earthing of neutral, HV & IV terminals as per specification.

On line insulating oil drying system (in 400 kV and above level Transformers) if given in BPS. (Annexure-P)

Oil Sampling Bottle & Oil Syringe (if specified) (Annexure-M)

NIFPES system as per scope and in line with specifications of DTL.

26.0 Quality Assurance Programme, Inspection and Testing

The manufacturer shall draw up and carry out a comprehensive inspection and testing programme in the form of detailed quality plan duly approved by DTL for necessary implementation during manufacture of the equipment. The Quality Assurance programme shall be generally in line with latest ISO-9001 (Quality Management System), ISO-14001 (Environmental Management System) and OHSAS 18001 (Occupational Health and Safety Management System). The manufacturer shall use state-of-the-art technology and dirt, dust and humidity controlled environment during various processes of manufacturing and testing to ensure that end product is of good quality and will provide uninterrupted service for intended life period. An indicative list for facilities needed to be available at manufacturer’s works has been provided at Annexure-E.

26.1 Inspection and Testing

The inspection envisaged by the purchaser is given below. However, the manufacturer shall draw up and carry out a comprehensive inspection and testing programme in the form of detailed quality plan duly approved by Purchaser for necessary implementation during manufacture of the equipment. All accessories and components of transformer shall be purchased from source, approved by the purchaser. All process tests, critical raw material tests and witness/inspection of these testing shall be carried out as per approved Manufacturing Quality Plan (MQP) by the purchaser.
26.2 Factory Tests

a) The manufacturer shall carry out all type & routine tests specified in “Annexure-D”. All tests shall be done in line with latest IS: 2026/IEC 60076 or as per procedure specified in this document. Complete test report shall be submitted to purchaser after proper scrutiny and signing on each page by the test engineer of the manufacturer.

b) The manufacturer shall be fully equipped to perform all the required tests as specified. He shall confirm the capabilities of the proposed manufacturing plant in this regard. Any limitations shall be clearly stated.

c) The manufacturer shall bear all additional costs related to tests which are not possible to carry out at his own works.

d) In case, any failure observed during factory testing involving winding/ winding shield/ static shield ring, then affected winding of all phases shall be replaced by new one mutually agreed between manufacturer & DTL.

26.3 Tank Tests

(A) Oil Leakage Test

All tanks and oil filled compartments shall be completely filled with air or oil of a viscosity not greater than that of insulating oil conforming to IEC 60296 at the ambient temperature and subjected to a pressure equal to normal head of oil plus 35 kN/sq.m (5 psi) measured at the base of the tank. This pressure shall be maintained for a period of not less than 12 hours for oil and 1 hour for air during which no leakage shall occur.

(B) Vacuum Test

All transformer tanks shall be subjected to the specified vacuum. The tank designed for full vacuum (760 mm of mercury at sea level) shall be tested at an internal pressure of 3.33 KN/Sq.m absolute (25 torr) for one hour. The permanent deflection of flat plate after the vacuum has been released shall not exceed the values specified below:

<table>
<thead>
<tr>
<th>Horizontal Length of flat plate (in mm)</th>
<th>Permanent deflection (in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to And including 750</td>
<td>5.0</td>
</tr>
<tr>
<td>751 To 1250</td>
<td>6.5</td>
</tr>
<tr>
<td>1251 To 1750</td>
<td>8.0</td>
</tr>
<tr>
<td>1751 To 2000</td>
<td>9.5</td>
</tr>
<tr>
<td>2001 To 2250</td>
<td>11.0</td>
</tr>
<tr>
<td>2251 To 2500</td>
<td>12.5</td>
</tr>
<tr>
<td>2501 to 3000</td>
<td>16.0</td>
</tr>
<tr>
<td>Above 3000</td>
<td>19.0</td>
</tr>
</tbody>
</table>
(C) **Pressure Test**

All transformer tanks, its radiator, conservator and other fittings together or separately shall be subjected to a pressure corresponding to twice the normal head of oil or normal oil head pressure plus 35 KN/ sq.m whichever is lower, measured at the base of the tank and maintained for eight hours. The permanent deflection of flat plates after the excess pressure has been released shall not exceed the figure specified above for vacuum test.

### 26.4 Stage Inspection

- **a)** Stage inspection will be carried out by the Inspector on Core, Winding, core-coil assembly & Tank during the manufacturing stages of the transformer. The manufacturer will have to call for the stage inspection and shall arrange the inspection at manufacturer’s premises or manufacturer’s sub-supplier’s premises, as applicable, free of cost.

- **b)** **Stage inspection shall be carried out on all the Transformers to be supplied**. Final decision to waive of any of stage inspection on any of the transformers to be supplied shall be with DTL and not with the bidder. On the basis of satisfactory stage inspection, manufacturer will proceed further.

- **c)** The manufacturer will offer the core for stage inspection and get approval from purchaser during manufacturing stage. The BIS certified prime core materials are only to be used. The manufacturer has to produce following documents at the time of stage inspection for confirmation of use of prime core materials.
  - Invoice of supplier
  - Mill’s approved test certificates
  - Packing list
  - Bill of lading
  - Bill of entry certificate by customs
  - Description of material, electrical analysis, physical inspection, certificate for surface defects, chemical composition certificate, thickness and width of the materials.
  - Place of cutting of core materials.

To avoid any possibility of mixing of ‘Prime material’ with any other second grade/ defective material, the imported packed slit coils of CRGO materials shall be opened in the presence of the Inspector. Only after the inspection and approval from DTL, the core material will be cut in-house or sent to external agency for cutting individual laminations. In case the core is sent to external agency for cutting, the Inspector will have full access to visit such agency for the inspection of the cutting of core. Core material shall be directly procured either from the manufacturer or through their accredited marketing organization of repute and not through any agent.

### 26.5 Type Tests on fittings

Following fittings shall conform to type tests and the type test reports shall be furnished along with drawing of the equipment/fittings.
a) Bushing (Type test as per IS/IEC:60137) (Seismic withstand test for 400 kV and above voltage class)
b) OLTC (Test as per IS 8468/IEC:60214 and degree of protection test for IP-55 on Driving mechanism box)
c) Buchholz relay
d) OTI and WTI
e) Pressure Relief Device (including degree of protection test for IP 55 in terminal box)
f) Sudden Pressure Relay (including degree of protection test for IP 55 in terminal box)
g) Magnetic Oil Level gauge & Terminal Box degree of protection test for IP-55.
h) Air Cell (Flexible air separator) - Oil side coating, Air side under Coating, Air side outer coating and coated fabric as per IS: 3400/ BS: 903/ IS: 7016
i) Marshalling & common marshalling box and other outdoor cubicle (IP-55 test)
j) Bus post Insulators
k) Oil pump
l) Cooling fan & motor assembly
m) RTCC Panel (IP-43 test)

26.6 Pre-Shipment Checks at Manufacturer's Works

The following pre-shipment checks shall be done at manufacturer’s works:

- Check for inter-changeability of components of similar transformers for mounting dimensions.
- Check for proper packing and preservation of accessories like radiators, bushings, dehydrating breather, rollers, Buchholz relay, fans, control cubicle, connecting pipes, conservator etc.
- Ensure following setting of impact recorder at the time of installation with transformer unit before despatch from factory:
  1g: Start recording
  2g: Warning
  3g: Alarm

Further, drop-out setting shall be 1g and threshold setting shall be in the range of 5g to 10g.
- Check for proper provision for bracing to arrest the movement of core and winding assembly inside the tank.
- Gas tightness test to confirm tightness and record of dew point of dry air inside the tank. Derivation of leakage rate and ensure the adequate reserve dry air capacity.
- Due security arrangements to be ensured during transportation to avoid pilferage and tempering with the valves and other accessories used while dry air filling.

27.0 DRAWINGS/DOCUMENTS/CALCULATIONS

The list of drawing/documents/calculations to be submitted by the manufacturer is given in Annexure-H.
28.0 RATING & DIAGRAM PLATE

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

Information to be provided on the plate for Transformer:

<table>
<thead>
<tr>
<th>Manufacturer's name, country and city where the transformer was assembled</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>MVA Rating, Voltage ratio, Type of transformer (for example 315MVA 400/220/33kV Auto Transformer)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type of Cooling</th>
<th>Applicable Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Power at different cooling</td>
<td>Rated frequency Hz</td>
</tr>
<tr>
<td>HV/IV</td>
<td>MVA (\frac{--}{--} ) Number of phases</td>
</tr>
<tr>
<td>LV</td>
<td>MVA % Impedance / Ohmic Impedance</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>(a) HV-IV</td>
</tr>
<tr>
<td>HV</td>
<td>kV Min. tap %</td>
</tr>
<tr>
<td>IV</td>
<td>kV Principal Tap %</td>
</tr>
<tr>
<td>LV</td>
<td>kV Max. Tap %</td>
</tr>
<tr>
<td>Rated Current</td>
<td>(b) HV-LV %</td>
</tr>
<tr>
<td>HV</td>
<td>A (c) IV-LV %</td>
</tr>
<tr>
<td>IV</td>
<td>A Vector Group</td>
</tr>
<tr>
<td>LV</td>
<td>A Core mass kg</td>
</tr>
<tr>
<td>Rated Short Circuit withstand capability</td>
<td>Copper Mass</td>
</tr>
<tr>
<td>HV</td>
<td>kA (sec)</td>
</tr>
<tr>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>LV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) HV</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Basic Insulation Level</td>
<td>kg</td>
</tr>
<tr>
<td>(Lightening Impulse/Switching</td>
<td>kVp/</td>
</tr>
<tr>
<td>Impulse/Power Frequency</td>
<td>kVp/</td>
</tr>
<tr>
<td>Withstand Voltage)</td>
<td>s</td>
</tr>
<tr>
<td>HV</td>
<td></td>
</tr>
<tr>
<td>kVp/</td>
<td></td>
</tr>
<tr>
<td>kVp/</td>
<td></td>
</tr>
<tr>
<td>kVrm s</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>kVp/</td>
<td></td>
</tr>
<tr>
<td>kVp/</td>
<td></td>
</tr>
<tr>
<td>kVrm s</td>
<td></td>
</tr>
<tr>
<td>LV</td>
<td></td>
</tr>
<tr>
<td>kVp/</td>
<td></td>
</tr>
<tr>
<td>kVp/</td>
<td></td>
</tr>
<tr>
<td>kVrm s</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
</tr>
<tr>
<td>kVp/</td>
<td></td>
</tr>
<tr>
<td>kVp/</td>
<td></td>
</tr>
<tr>
<td>kVrm s</td>
<td></td>
</tr>
<tr>
<td>Guaranteed Temperature rise</td>
<td>kg</td>
</tr>
<tr>
<td>over ambient temperature of 50</td>
<td></td>
</tr>
<tr>
<td>Deg. C</td>
<td></td>
</tr>
<tr>
<td>(a) Top Oil</td>
<td>0C</td>
</tr>
<tr>
<td>(b) Winding</td>
<td>0C</td>
</tr>
<tr>
<td>Vacuum withstand Capability of</td>
<td>mm</td>
</tr>
<tr>
<td>the tank</td>
<td>of Hg</td>
</tr>
<tr>
<td>(current &amp; Voltage class)</td>
<td></td>
</tr>
<tr>
<td>OLTC make and rating</td>
<td></td>
</tr>
<tr>
<td>(Quantity of oil in OLTC)</td>
<td></td>
</tr>
<tr>
<td>Total mass</td>
<td></td>
</tr>
<tr>
<td>kg</td>
<td></td>
</tr>
<tr>
<td>Noise level at rated voltage and at principal tap</td>
<td>dB</td>
</tr>
<tr>
<td>Tan delta of winding</td>
<td></td>
</tr>
<tr>
<td>Moisture content</td>
<td>ppm</td>
</tr>
<tr>
<td>Manufacturer’s Serial number</td>
<td></td>
</tr>
<tr>
<td>Year of Manufacture</td>
<td></td>
</tr>
<tr>
<td>Work Order No.</td>
<td></td>
</tr>
<tr>
<td>Purchaser’s Order No. &amp; Date</td>
<td></td>
</tr>
<tr>
<td>OGA Drg. No.</td>
<td></td>
</tr>
</tbody>
</table>

Vector Group Diagram

(Conversion between all windings including tap windings, ratings of built-in current transformers, etc. shall be presented on the diagram)

Table giving details of OLTC like tap position Nos. and corresponding tapping voltage, tapping current & connection between terminals for different tap positions etc.

Details of Current Transformers (e.g. Bushing CTs, CT for WTI) installed in transformer like the location, core Nos., ratio(s), accuracy class, rated output (VA burden), knee point voltage, magnetizing current, maximum CT secondary resistance, terminal marking and application of the current transformer

Warning: “Main conservator is fitted with an air cell”

Tie-in-resistor has been used in OLTC (if applicable)

**Purchaser’s Name**
Plates with identification and characteristics of auxiliary equipment according to standards for such components (bushings, tap-changers, current transformers, cooling equipment etc.) shall be provided on the components themselves.

29.0 RESPONSIBILITIES OF MANUFACTURER DURING WARRANTY PERIOD OF TRANSFORMER:

29.1 The long term performance of transformer depends on design/technology, quality of material used, robustness & consistency of manufacturing process, installation, operation and maintenance etc. The erection, testing and commissioning of transformer shall be performed under strict supervision of representative of OEM and DTL in line with the provisions specified in Annexure-O.

29.2 When failures or operational problems occur within the warranty period, the manufacturer must take all necessary measures to help minimize operational difficulties and outages whenever possible. The following abnormalities, if occurs, will be brought to the notice of manufacturer and the manufacturer shall respond/attend immediately, investigate and rectify the problem to avoid undue outage in the DTL network.

a) Fault inside the transformer and OLTC (including oil migration) involving a shutdown of transformer at site after commissioning is to be attended by manufacturer immediately. It is the responsibility of the OEM to take immediate necessary action (e.g. any replacement/repair of component required with co-ordination from any third party, if required) for bringing back the transformer into service. The root cause analysis shall be undertaken by OEM and details shall be shared with DTL for the benefit of both user and OEM.

b) In case of DGA Status 3 (as per IEEE-C57.104) i.e. the concentration of any fault gas is exceeding the values in Table -2 of IEEE-C57.104 or the abnormal trend in variation of key fault gases is observed.

c) In case, the winding tan delta goes beyond 0.005 or increases more than 0.001 per annum w.r.t. pre-commissioning values.

d) In case, the tan delta of bushing(s) goes beyond 0.005 or increases more than 0.001 per annum w.r.t. pre-commissioning values.

e) In case, the moisture content goes above 10 ppm at any temperature during operation including full load.

f) Any major deviation in Sweep Frequency Response Analysis (SFRA).

g) Leakage of Oil from transformer shall be construed as a serious quality lapse on the part of the
Original Equipment Manufacturer (OEM). No leakage of oil is expected during the operating life of the transformer and that should be ensured accordingly by OEM during design & construction of tank & other gasketed joints. In case of any leakage of oil during warranty period, the same shall be reported in writing to the OEM immediately and OEM shall have to attend and rectify the leakage within a period of 30 days from the date of notice, at the cost of the OEM.

30.0 LIST OF CODES/ STANDARDS/ REGULATIONS/ PUBLICATIONS

The list of Codes/Standards/Regulations/Publications which are generally used for manufacturing, testing, installation, maintenance, operation etc. of transformer is given at Annexure-Q.

31.0  Transportation, Erection, Testing and Commissioning:

The details of transportation, erection at site, testing and commissioning are detailed in Annexure-O.

*******
### Annexure-A

**SPECIFIC TECHNICAL REQUIREMENT OF TRANSFORMERS**

#### 1.0 500MVA, 400/220/33 kV 3-Ph Auto Transformer

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Technical Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Voltage ratio (Line-to-Line)</td>
<td>kV</td>
<td>(a) 400/220/33</td>
</tr>
<tr>
<td>2.</td>
<td>Rated Capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HV</td>
<td>MVA</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>MVA</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>LV (Tertiary)</td>
<td>MVA</td>
<td>5 MVA active loading</td>
</tr>
<tr>
<td>3.</td>
<td>No of phases</td>
<td></td>
<td>3-phase</td>
</tr>
<tr>
<td>4.</td>
<td>Vector Group</td>
<td></td>
<td>YNaOn11</td>
</tr>
<tr>
<td>5.</td>
<td>Type of Transformer</td>
<td></td>
<td>Auto Transformer</td>
</tr>
<tr>
<td>6.</td>
<td>Applicable Standard</td>
<td></td>
<td>IEC 60076 / IS 2026</td>
</tr>
<tr>
<td>7.</td>
<td>Cooling</td>
<td></td>
<td>ONAN / ONAF / OFAF or ONAN / ONAF / ODAF or ONAN / ONAF1 / ONAF2</td>
</tr>
<tr>
<td>8.</td>
<td>Rating at different cooling</td>
<td>%</td>
<td>60 / 80 / 100</td>
</tr>
<tr>
<td>9.</td>
<td>Cooler Bank Arrangement</td>
<td></td>
<td>2 X 50%</td>
</tr>
<tr>
<td>10.</td>
<td>Frequency</td>
<td>Hz</td>
<td>50</td>
</tr>
<tr>
<td>11.</td>
<td>Tap Changer (OLTC)</td>
<td></td>
<td>+10% to -10% in 1.25% steps on common end of series winding for 400kV side voltage variation</td>
</tr>
<tr>
<td>12.</td>
<td>Impedance at 75°C, at highest MVA base</td>
<td></td>
<td>Constant Ohmic type</td>
</tr>
<tr>
<td></td>
<td>i) HV – IV</td>
<td>%</td>
<td>10.3</td>
</tr>
<tr>
<td></td>
<td>Max. Voltage tap</td>
<td></td>
<td>10.3</td>
</tr>
<tr>
<td></td>
<td>Principal tap</td>
<td>%</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td>Min. Voltage tap</td>
<td>%</td>
<td>15.4</td>
</tr>
<tr>
<td></td>
<td>ii) HV – LV</td>
<td>%</td>
<td>60.0 (minimum)</td>
</tr>
<tr>
<td></td>
<td>At principal tap</td>
<td></td>
<td>60.0 (minimum)</td>
</tr>
<tr>
<td></td>
<td>iii) IV – LV</td>
<td>%</td>
<td>45.0 (minimum)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>45.0 (minimum)</td>
</tr>
<tr>
<td>13.</td>
<td>Tolerance on Impedance</td>
<td>%</td>
<td>As per IEC, unless specified Otherwise</td>
</tr>
<tr>
<td>14.</td>
<td>Service</td>
<td></td>
<td>Outdoor</td>
</tr>
<tr>
<td>15.</td>
<td>Duty</td>
<td></td>
<td>Continuous</td>
</tr>
<tr>
<td>16.</td>
<td>Overload Capacity</td>
<td></td>
<td>IEC-60076-7</td>
</tr>
<tr>
<td>17.</td>
<td>Temperature rise over</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Top oil measured by thermometer</td>
<td>O°C</td>
<td>45</td>
</tr>
<tr>
<td>ii)</td>
<td>Average winding measured resistance method</td>
<td>O°C</td>
<td>50</td>
</tr>
<tr>
<td>18.</td>
<td>Winding hot spot rise over yearly weighted temperature of 32 °C</td>
<td>O°C</td>
<td>61</td>
</tr>
<tr>
<td>19.</td>
<td>Tank Hotspot Temperature</td>
<td>O°C</td>
<td>110</td>
</tr>
<tr>
<td>20.</td>
<td>Maximum design ambient temperature</td>
<td>O°C</td>
<td>50</td>
</tr>
<tr>
<td>21.</td>
<td>Windings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Lightning Impulse withstand Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HV kVp</td>
<td>1300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IV kVp</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LV kVp</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Neutral kVp</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>Chopped Wave Lightning Impulse Withstand Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HV kVp</td>
<td>1430</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IV kVp</td>
<td>1045</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LV kVp</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>Switching Impulse withstand Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HV kVp</td>
<td>1050</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IV kVp</td>
<td>850</td>
<td></td>
</tr>
<tr>
<td>iv)</td>
<td>One Minute Power Frequency withstand Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HV kVrms</td>
<td>570</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IV kVrms</td>
<td>395</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LV kVrms</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td></td>
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<td>IV</td>
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<thead>
<tr>
<th></th>
<th>Max. No Load Loss at rated voltage and frequency kW</th>
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<td></td>
<td>ii) Max. Load Loss at rated current and at 75°C for HV and IV windings, at principal tap position</td>
<td>kW</td>
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<td>---</td>
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<tr>
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<td>375</td>
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<td>iv) Max. Auxiliary Loss at</td>
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### 2.0 315 MVA, 400/220/33kV 3-Ph Auto Transformer

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<td>MVA</td>
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<td>MVA</td>
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<td>5 MVA active loading</td>
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<td>Type of Transformer</td>
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<td>Auto Transformer</td>
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<td>6.</td>
<td>Applicable Standard</td>
<td></td>
<td>IEC 60076 / IS 2026</td>
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<td>7.</td>
<td>Cooling</td>
<td></td>
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<td>8.</td>
<td>Rating at different cooling</td>
<td>%</td>
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<td>9.</td>
<td>Cooler Bank Arrangement</td>
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<td>Frequency</td>
<td>Hz</td>
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<td>11.</td>
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<td>+10% to -10% in 1.25% steps on common end of series winding for 400kV side voltage variation</td>
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<td>12.</td>
<td>Impedance at 75°C at highest MVA base</td>
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<td>Constant Ohmic type</td>
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<td>i)</td>
<td>HV – IV</td>
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<td>Max. Voltage tap</td>
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<td>Principal tap</td>
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<td>At principal tap</td>
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<td>IV – LV</td>
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<td></td>
<td>%</td>
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<td>Temperature rise over 50°C ambient temp</td>
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<td></td>
<td>i) Top oil measured by thermometer</td>
<td>OC</td>
<td>45</td>
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<td>ii) Average winding measured by resistance method</td>
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<td>Winding hot spot rise over yearly weighted temperature of 32°C</td>
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<td>kVp</td>
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<td></td>
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<td>kVp</td>
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<td>kVp</td>
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<td>kVrms</td>
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<td>IV</td>
<td>kVrms</td>
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<td>v) Neutral Grounding</td>
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<td>vi) Insulation</td>
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<td></td>
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<td>kV</td>
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### Rated Current

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#### Lightning Impulse Withstand Voltage

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#### Switching Impulse Withstand Voltage

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#### One Minute Power Frequency Withstand Voltage

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#### Tan Delta of Bushing at Ambient Temperature

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#### Minimum Total Creepage Distances

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<td>7595</td>
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<td>LV</td>
<td>1612</td>
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#### Maximum Partial Discharge Level at $U_m$

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<td>IV</td>
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<tr>
<td>LV</td>
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#### Maximum Partial Discharge Level at $1.58 \times U_r / \sqrt{3}$

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#### Maximum Noise Level at Rated Voltage, at Principal Tap & No Load and All Cooling Active

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#### Maximum Permissible Losses of Transformers

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<td>Max. Load Loss at rated current and at 75°C for HV and IV windings, at principal tap position</td>
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<td>---</td>
</tr>
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<td>iii)</td>
<td>Max. I^2R loss at rated current and at 75°C for HV and IV at principal tap position</td>
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<td>iv)</td>
<td>Max. Auxiliary Loss at rated voltage and frequency</td>
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### 3.0 160 MVA, 220/66/11 kV 3-ph Power Transformer

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<th>TECHNICAL PARAMETERS</th>
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<td>IEC 60076 /IS 2026</td>
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<tr>
<td>7.</td>
<td>Cooling type</td>
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<td>8.</td>
<td>Rating at different cooling</td>
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<td>60 / 80 / 100</td>
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<td>Frequency</td>
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<td>Tap changer</td>
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<td>On load tap changer (CFVV)</td>
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<td>ii)</td>
<td>Tapping range and steps</td>
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<td>–15% to +5% in steps of 1.25% for HV variation</td>
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<td>iii)</td>
<td>Location of tapping</td>
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<td>at Neutral end of HV</td>
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<td>12.</td>
<td>HV-IV Impedance at 75°C, at highest MVA base</td>
<td>%</td>
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<td></td>
<td></td>
<td>%</td>
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<td>iv)</td>
<td>Tolerance on Impedance</td>
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13. Service
   Outdoor

14. Duty
   Continuous

15. Overload Capacity
   IEC 60076-7

16. Temperature rise over 50°C ambient Temp

   i) Top oil measured by thermometer
      O C 45

   ii) Average winding measured
       O C 50

17. Winding hot spot rise over yearly weighted temperature of 32 °C
    O C 61

18. Tank Hotspot Temperature
    O C 110

19. Maximum design ambient temperature
    O C 50

20. Windings

   i) Lightning Impulse withstand Voltage

      HV kVp 950
      IV kVp 325
      LV kVp 170
      Neutral kVp 170

   ii) Chopped Wave Lightning Impulse Withstand Voltage

      HV kVp 1045
      IV kVp 358
      LV kVp 187

   iii) Switching Impulse withstand Voltage
### Table: Transformer Specifications

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### Technical Parameters

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<td>Max. Load Loss at rated current and at 75°C for HV and IV windings at</td>
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<tr>
<td>Max. I^2R Loss at rated current and at 75°C for HV and IV windings at</td>
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<td>Max. Auxiliary Loss at rated voltage and frequency</td>
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#### 4.0 100 MVA, 220/33/11 kV 3-ph Power Transformer

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<td>IV</td>
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<td>iii) Location of tap changer</td>
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<td>Impedance at 75°C, at highest MVA Base</td>
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<td>HV-LV (At principal tap)</td>
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<td>iii)</td>
<td>IV-LV</td>
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<td>Tolerance on Impedance</td>
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<td>Temperature rise over 50°C ambient Temp</td>
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<td>i) Top oil measured by thermometer</td>
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<td>ii) Average winding measured by resistance method</td>
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### iii) Lightning Impulse withstand Voltage

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### iv) Switching Impulse withstand Voltage

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### v) One Minute Power Frequency withstand Voltage

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### vi) Tan delta of bushing at ambient Temperature

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<td>As per clause no.14.17 and 14.18 of this specification</td>
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### vii) Minimum total creepage distances

<table>
<thead>
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<th>Mm</th>
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<tbody>
<tr>
<td>HV bushing</td>
<td>7595</td>
<td>31mm/kV corresponding to the line to line highest system voltage</td>
</tr>
<tr>
<td>IV bushing</td>
<td>1116</td>
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<tr>
<td>LV</td>
<td>1116</td>
<td></td>
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<tr>
<td>Neutral</td>
<td>1116</td>
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### viii) Maximum Partial discharge level at Um

|        | pC   |     |
|        | 10   |     |

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<td>10</td>
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<td>LV</td>
<td>10</td>
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<td>22.67U&lt;sub&gt;r&lt;/sub&gt; / \sqrt{3}</td>
<td>100</td>
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</table>
23. Maximum Noise level at rated voltage, at principal tap & no load and all cooling active | dB | 80

24. Maximum Permissible Losses of Transformers

i) Max. No Load Loss at rated voltage and frequency | kW | 43

ii) Max. Load Loss at rated current and at 75°C for HV and LV windings at principal tap position | kW | 245

iii) Max. I²R Loss at rated current and at 75°C for HV and LV windings at principal tap position | kW | 200

iv) Max. Auxiliary Loss at rated voltage and frequency | kW | 5

5.0 160 MVA, 220/66kV 3-ph Power Transformer

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Unit</th>
<th>TECHNICAL PARAMETERS</th>
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<tbody>
<tr>
<td>1.</td>
<td>Voltage ratio (Line to Line)</td>
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<td>220/66</td>
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<td>2.</td>
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<td>MVA</td>
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<td>MVA</td>
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<td>4.</td>
<td>Vector Group</td>
<td></td>
<td>YNyn0</td>
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<tr>
<td>5.</td>
<td>Type of Transformer</td>
<td></td>
<td>Power Transformer</td>
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<tr>
<td>6.</td>
<td>Applicable Standard</td>
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<td>IEC 60076 /IS 2026</td>
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<td>7.</td>
<td>Cooling type</td>
<td></td>
<td>ONAN / ONAF / OFAF or ONAN / ONAF / ODAF or ONAN / ONAF1 / ONAF2</td>
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<tr>
<td>8.</td>
<td>Rating at different cooling</td>
<td>%</td>
<td>60 / 80 / 100</td>
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<td>9.</td>
<td>Frequency</td>
<td>Hz</td>
<td>50</td>
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10. Cooler Bank Arrangement | 2 X 50%

11. Tap changer
   i) Type | On load tap changer (CFVV)
   ii) Tapping range and steps | –15% to +5% in steps of 1.25% for HV variation
   iii) Location of tapping | at Neutral end of HV

12. HV-LV Impedance at 75°C, at highest MVA base %
   i) Max. Voltage tap | % 16.2
   Principal tap | % 15.0
   Min. Voltage tap | % 14.0
   iv) Tolerance on Impedance | % As per IEC

13. Service | Outdoor

14. Duty | Continuous

15. Overload Capacity | IEC 60076-7

16. Temperature rise over 50°C ambient Temp
   i) Top oil measured by thermometer | O C 45
   ii) Average winding measured | O C 50

17. Winding hot spot rise over yearly weighted temperature of 32 °C | O C 61

18. Tank Hotspot Temperature | O C 110

19. Maximum design ambient temperature | O C 50

20. Windings
   i) Lightning Impulse withstand Voltage
      HV | kV<sub>p</sub> 950
      LV | kV<sub>p</sub> 325
      HV-Neutral | kV<sub>p</sub> 170
      LV-Neutral | kV<sub>p</sub> 170
   ii) Chopped Wave Lightning Impulse Withstand Voltage
<p>| | | |</p>
<table>
<thead>
<tr>
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<td>v) Neutral Grounding</td>
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<tr>
<td>LV</td>
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<td>Solidly grounded</td>
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<tr>
<td>vi) Insulation</td>
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<td></td>
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<td>Graded</td>
<td></td>
</tr>
<tr>
<td>LV</td>
<td>Graded</td>
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<td>vii) Tertiary Connection</td>
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<td>Ungrounded Delta</td>
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<tr>
<td>viii) Tan delta of winding</td>
<td>%</td>
<td>≤0.5%</td>
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<td>21.</td>
<td>Bushings</td>
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<tr>
<td>LV Neutral</td>
<td>kV</td>
<td>36</td>
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<td>ii) Rated current</td>
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<td>A</td>
<td>3150</td>
</tr>
<tr>
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<td>3150</td>
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<td></td>
<td>Lightning Impulse withstand Voltage</td>
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<tr>
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<tr>
<td></td>
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<td><strong>LV</strong></td>
<td>kVp</td>
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<td><strong>HV Neutral</strong></td>
<td>kVp</td>
</tr>
<tr>
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<td><strong>LV Neutral</strong></td>
<td>kVp</td>
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<td>iv)</td>
<td>Switching Impulse withstand Voltage</td>
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<tr>
<td></td>
<td><strong>HV</strong></td>
<td>kVp</td>
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<td>v)</td>
<td>One Minute Power Frequency withstand Voltage</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>HV</strong></td>
<td>kVRms</td>
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<td><strong>LV</strong></td>
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<td><strong>HV Neutral</strong></td>
<td>kVRms</td>
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<td><strong>LV Neutral</strong></td>
<td>kVRms</td>
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<td>vi)</td>
<td>Tan delta of bushing at ambient Temperature</td>
<td>%</td>
</tr>
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<td>vii)</td>
<td>Minimum total creepage distances</td>
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</tr>
<tr>
<td></td>
<td><strong>LV</strong></td>
<td>Mm</td>
</tr>
<tr>
<td></td>
<td><strong>Neutral</strong></td>
<td>Mm</td>
</tr>
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<td>viii)</td>
<td>Maximum Partial discharge level at Um</td>
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</tr>
<tr>
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<td><strong>IV</strong></td>
<td>pC</td>
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<tr>
<td></td>
<td><strong>LV</strong></td>
<td>pC</td>
</tr>
<tr>
<td></td>
<td>*<em>Maximum Partial discharge level at 1.58 <em>Ur/√3</em></em></td>
<td>pC</td>
</tr>
</tbody>
</table>
23. Maximum Noise level at rated voltage, at principal tap & no load and all cooling active dB 75

24. **Maximum Permissible Losses of Transformers**

i) Max. No Load Loss at rated voltage and frequency kW 60

ii) Max. Load Loss at rated current and at 75°C for HV and LV windings at principal tap position kW 320

iii) Max. I²R Loss at rated current and at 75°C for HV and LV windings at principal tap position kW 265

iv) Max. Auxiliary Loss at rated voltage and frequency kW 8

### 6.0 100 MVA, 220/33 kV 3-ph Power Transformer

<table>
<thead>
<tr>
<th>Cl. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Technical Parameters</th>
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<tbody>
<tr>
<td>1.</td>
<td>Voltage ratio (Line-to-Line)</td>
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<td>MVA</td>
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<td>LV</td>
<td>MVA</td>
<td>100</td>
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<td>No of phases</td>
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<td>3 (Three)</td>
</tr>
<tr>
<td>4.</td>
<td>Vector Group</td>
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</tr>
<tr>
<td>5.</td>
<td>Type of transformer</td>
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<td>Power transformer</td>
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<tr>
<td>6.</td>
<td>Applicable Standard</td>
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<td>IEC 60076 / IS 2026</td>
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<tr>
<td>7.</td>
<td>Cooling type</td>
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<td>ONAN / ONAF / ODAF or ONAN/ONAF1/ONAF2</td>
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<td>Rating at different cooling</td>
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<td>60 / 80 / 100</td>
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<td>Hz</td>
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<tr>
<td>10.</td>
<td>Cooler Bank Arrangement</td>
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<tr>
<td>11.</td>
<td>Tap Changer</td>
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</tr>
<tr>
<td>i)</td>
<td>Type</td>
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<td>On-load tap changer</td>
</tr>
<tr>
<td>ii)</td>
<td>Tap range and steps</td>
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<td>-15% to +5% in steps of 1.25%</td>
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</tbody>
</table>
### iii) Location of tap changer
- On HV neutral end

### 12. Impedance at 75°C, at highest MVA Base

<table>
<thead>
<tr>
<th>i) Max. Voltage tap %</th>
<th>16.2</th>
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<tbody>
<tr>
<td>ii) Principal tap %</td>
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<tr>
<td>iii) Min. Voltage tap %</td>
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</tr>
<tr>
<td>iv) Tolerance on Impedance</td>
<td>As per IEC</td>
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</tbody>
</table>

### 13. Service
- Outdoor

### 14. Duty
- Continuous

### 15. Overload Capacity
- IEC-60076-7

### 16. Temperature rise over 50°C ambient Temp

| i) Top oil measured by thermometer OC | 45 |
| ii) Average winding measured by resistance method OC | 50 |

### 17. Winding hot spot rise over yearly weighted temperature of 32°C OC
- 61

### 18. Tank Hotspot Temperature OC
- 110

### 19. Maximum design ambient temperature OC
- 50

### 20. Windings

#### i) Lightning Impulse withstand Voltage
- **HV** kVp 950
- **LV** kVp 170
- **HV Neutral** kVp 170
- **LV neutral** kVp 170

#### ii) Chopped Wave Lightning Impulse Withstand Voltage
- **HV** kVp 1045
- **LV** kVp 187

#### iii) Switching Impulse withstand Voltage
- **HV** kVp 850

#### iv) One Minute Power Frequency withstand Voltage
- **HV** kVrms 395
- **LV** kVrms 70
- **HV Neutral** kVrms 70
- **LV Neutral** kVrms 70

#### v) Neutral Grounding (HV & LV)
- Solidly grounded

#### vi) Insulation
- **HV** Graded
- **LV** Uniform

#### vii) Tan delta of winding %
- ≤ 0.5
### 21. Bushing

<table>
<thead>
<tr>
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</tr>
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<tr>
<td></td>
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<tr>
<td></td>
<td></td>
<td><strong>HV Neutral</strong></td>
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<tr>
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<td></td>
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<td></td>
<td><strong>HV Neutral</strong></td>
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<tr>
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<table>
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<tr>
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<td></td>
<td></td>
<td><strong>HV Neutral</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>LV Neutral</strong></td>
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<table>
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<tr>
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<th>One Minute Power Frequency withstand Voltage</th>
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<td></td>
<td></td>
<td><strong>HV Neutral</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>LV Neutral</strong></td>
</tr>
</tbody>
</table>

|   |   | Tan delta of bushing at ambient Temperature | % |
|---|---|---------------------------------------------|
|   |   | As per clause no.14.17 and 14.18 of this specification |

<table>
<thead>
<tr>
<th></th>
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<th>Minimum total creepage distances</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>(Specific creepage distance: 31mm/kV corresponding to the line to line highest system voltage)</td>
</tr>
</tbody>
</table>

|   |   | **HV bushing** | mm | 7595 |
|---|---|---------------|
|   |   | **LV bushing** | mm | 1116 |
|   |   | **HV Neutral** | mm | 1116 |
|   |   | **LV Neutral** | Mm | 1116 |

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Maximum Partial discharge level at Um</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td><strong>LV</strong></td>
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<table>
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<th>Maximum Partial discharge level at 1.58 * U&lt;sub&gt;r&lt;/sub&gt; / √3</th>
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<td><strong>pC</strong></td>
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</table>
23. Maximum Noise level at rated voltage, at principal tap & no load and all cooling active dB 80

24. Maximum Permissible Losses of Transformers

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Max. No Load Loss at rated voltage and frequency</td>
<td>kW</td>
<td>43</td>
</tr>
<tr>
<td>ii) Max. Load Loss at rated current and at 75°C for HV and LV windings at principal tap position</td>
<td>kW</td>
<td>245</td>
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<tr>
<td>iii) Max. I²R Loss at rated current and at 75°C for HV and LV windings at principal tap position</td>
<td>kW</td>
<td>200</td>
</tr>
<tr>
<td>iv) Max. Auxiliary Loss at rated voltage and frequency</td>
<td>kW</td>
<td>5</td>
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7.0 31.5 MVA, 66/11 kV 3-ph Power Transformer

<table>
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<th>S. No.</th>
<th>Description</th>
<th>Unit</th>
<th>TECHNICAL PARAMETERS</th>
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<tbody>
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<td>66/11</td>
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<td>2.</td>
<td>Rated Capacity (HV and LV)</td>
<td>MVA</td>
<td>31.5</td>
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<td>Power Transformer</td>
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<td>6.</td>
<td>Applicable Standard</td>
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<td>IEC 60076 / IS 2026</td>
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<td>7.</td>
<td>Frequency</td>
<td>Hz</td>
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<tr>
<td>8.</td>
<td>Cooling type</td>
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<tr>
<td>9.</td>
<td>Tap Changer</td>
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<tr>
<td>i)</td>
<td>Type</td>
<td></td>
<td>On-load tap changer (CFVV)</td>
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### ii) Tap Range and no. of steps

<table>
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<tr>
<td>Tap Range and no. of steps</td>
<td>-5% to +15% of HV variation in the step of 1.25%</td>
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### iii) Location of Tap changer

- On HV neutral end

### 10. HV-LV Impedance at 75°C

<table>
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<tr>
<th>Tap Type</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Max. Voltage Tap</td>
<td>11.2</td>
</tr>
<tr>
<td>Principal Tap</td>
<td>10</td>
</tr>
<tr>
<td>Min. Voltage Tap</td>
<td>9</td>
</tr>
</tbody>
</table>

### 11. Tolerance

- As per IEC

### 12. Service

- Outdoor

### 13. Duty

- Continuous

### 14. Overload Capacity

- IEC 60076-7

### 15. Temperature rise over 50°C Ambient Temp

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Top oil measured by thermometer</td>
<td>O°C  45</td>
</tr>
<tr>
<td>ii) Average winding measured by resistance method</td>
<td>O°C  50</td>
</tr>
</tbody>
</table>

### 16. Winding hot spot rise over yearly weighted temperature of 32 °C

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>O°C</td>
<td>61</td>
</tr>
</tbody>
</table>

### 17. Tank Hotspot Temperature

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>O°C</td>
<td>110</td>
</tr>
</tbody>
</table>

### 18. Maximum design ambient Temperature

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>O°C</td>
<td>50</td>
</tr>
</tbody>
</table>

### 19. Windings

#### i) Lightning Impulse withstand Voltage

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV</td>
<td>kVp  325</td>
</tr>
<tr>
<td>LV &amp; LV Neutral</td>
<td>kVp  75</td>
</tr>
</tbody>
</table>

#### ii) Chopped Wave Lightning Impulse Withstand Voltage

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV</td>
<td>kVp  358</td>
</tr>
<tr>
<td>LV</td>
<td>kVp  83</td>
</tr>
</tbody>
</table>

#### iii) One Minute Power Frequency withstand Voltage

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV</td>
<td>kVrms 140</td>
</tr>
<tr>
<td>LV &amp; LV Neutral</td>
<td>kVrms 28</td>
</tr>
</tbody>
</table>

#### iv) Insulation

- Solidly grounded
  - HV: Uniform
  - LV: Uniform

#### v) Tan delta of winding

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>≤0.5</td>
</tr>
</tbody>
</table>

### 20. Bushings

#### i) Rated voltage

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV</td>
<td>kV  72.5</td>
</tr>
<tr>
<td>LV &amp; LV Neutral</td>
<td>kV  17.5</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ii) Rated current</td>
<td></td>
</tr>
<tr>
<td>HV</td>
<td>A</td>
</tr>
<tr>
<td>LV &amp; LV neutral</td>
<td>A</td>
</tr>
<tr>
<td>iii) Lightning Impulse withstand Voltage</td>
<td></td>
</tr>
<tr>
<td>HV</td>
<td>kVp</td>
</tr>
<tr>
<td>LV &amp; LV Neutral</td>
<td>kVp</td>
</tr>
<tr>
<td>iv) One Minute Power Frequency withstand Voltage</td>
<td></td>
</tr>
<tr>
<td>HV</td>
<td>kVrms</td>
</tr>
<tr>
<td>LV &amp; LV Neutral</td>
<td>kVrms</td>
</tr>
<tr>
<td>v) Tan delta of bushing at ambient Temperature</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>As per clause no.14.17 and 14.18 of this specification</td>
</tr>
<tr>
<td>vi) Minimum total creepage distances</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Specific creepage distance: 31mm/kV corresponding to the line to line highest system voltage)</td>
</tr>
<tr>
<td>HV</td>
<td>mm</td>
</tr>
<tr>
<td>LV &amp; LV Neutral</td>
<td>mm</td>
</tr>
<tr>
<td>vii) Maximum Partial discharge level on HV bushing at Um</td>
<td>pC</td>
</tr>
<tr>
<td>21. Maximum Partial discharge level at 1.58*Ur/√3</td>
<td>pC</td>
</tr>
<tr>
<td>22. Maximum Noise level at rated voltage, at principal tap &amp; no load and all cooling active</td>
<td>dB</td>
</tr>
<tr>
<td>23. Maximum Permissible Losses of Transformers</td>
<td>31.5 MVA</td>
</tr>
<tr>
<td>i) Max. No Load Loss at rated voltage and frequency</td>
<td>kW</td>
</tr>
<tr>
<td>ii) Max. Load Loss at rated current and frequency and at 75°C, at principal tap position</td>
<td>kW</td>
</tr>
<tr>
<td>iii) Max. I²R Loss at rated current and frequency and at 75°C, at principal tap position</td>
<td>kW</td>
</tr>
</tbody>
</table>

**Notes: (for all transformers ratings)**

1. For parallel operation with existing transformer, percentage impedance, OLTC connection and range, vector group and the winding configuration (if necessary) are to be matched.
2. No external or internal Transformers/Reactors are to be used to achieve the specified HV/IV, HV/LV and IV/LV impedance

3. Tan delta of windings shall be measured at ambient temperature. No temperature correction factor shall be allowed.

4. External minimum clearance in air for phase to phase and phase to earth shall be provided as per IS 2026 (part-03)/IEC 60076-03.

5. All parameters as detailed above shall be in line with relevant IS/IEC and will be approved during design review and detailed engineering.

******
# TECHNICAL PARAMETERS OF BUSHING CURRENT TRANSFORMERS & NEUTRAL CURRENT TRANSFORMERS

## 1.0 Parameters of Current Transformer for (a) 500MVA (3-ph), 400/220/33 kV;

<table>
<thead>
<tr>
<th>Description</th>
<th>Current Transformer Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HV Side</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Ratio

<table>
<thead>
<tr>
<th>CORE 1</th>
<th>1600/1</th>
<th>1600/1</th>
<th>1600/1</th>
<th>1600/1</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORE 2</td>
<td>1000/1</td>
<td>1600/1</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Minimum knee point voltage or burden and accuracy class

<table>
<thead>
<tr>
<th>CORE 1</th>
<th>1600V, PX/PS</th>
<th>1600V, PX/PS</th>
<th>1600V, PX/PS</th>
<th>1600V, PX/PS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORE 2</td>
<td>0.2S Class 20VA ISF&lt;5</td>
<td>0.2S Class 20VA ISF&lt;5</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Maximum CT Secondary Resistance

<table>
<thead>
<tr>
<th>CORE 1</th>
<th>4.0 Ohm</th>
<th>4.0 Ohm</th>
<th>4.0 Ohm</th>
<th>4.0 Ohm</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORE 2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Application

<table>
<thead>
<tr>
<th>CORE 1</th>
<th>Restricted Earth Fault (REF)</th>
<th>REF</th>
<th>REF</th>
<th>REF (high Impedance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORE 2</td>
<td>Metering</td>
<td>Metering</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Maximum magnetization current (at knee point voltage)

<table>
<thead>
<tr>
<th>CORE 1</th>
<th>25 mA</th>
<th>25 mA</th>
<th>25 mA</th>
<th>25 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORE 2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Notes:
1. Parameters of WTI CT for each winding shall be provided by the manufacturer / contractor.
2. The CTs used for REF protection must have the identical parameters in order to limit the circulating current under normal condition for stability of protection.
3. Parameters to be approved and finalized during design review and detailed engineering.

2.0 Parameters of Current Transformer for (a) 315 MVA(3-ph), 400/220/33kV

<table>
<thead>
<tr>
<th>Description</th>
<th>Current Transformer Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HV Side</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio</td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>1000/1</td>
</tr>
<tr>
<td>CORE 2</td>
<td>600/1</td>
</tr>
<tr>
<td>Minimum knee point voltage or burden and accuracy class</td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>1000V, PX/PS</td>
</tr>
<tr>
<td>CORE 2</td>
<td>0.2S Class 20VA ISF&lt;5</td>
</tr>
<tr>
<td>Maximum CT Secondary Resistance</td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>2.5 Ohm</td>
</tr>
<tr>
<td>CORE 2</td>
<td>-</td>
</tr>
<tr>
<td>Application</td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>Restricted Earth Fault (REF)</td>
</tr>
<tr>
<td>CORE 2</td>
<td>Metering</td>
</tr>
<tr>
<td>a) Maximum magnetization current (at knee point voltage)</td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>60 mA</td>
</tr>
<tr>
<td>CORE 2</td>
<td>-</td>
</tr>
</tbody>
</table>

Notes:
1. Parameters of WTI CT for each winding shall be provided by the manufacturer / contractor.
2. The CTs used for REF protection must have the identical parameters in order to limit the circulating current under normal condition for stability of protection.

circulating current under normal condition for stability of protection.

3. Parameters to be approved and finalized during design review and detailed engineering.

### 3.0 Parameters of Current Transformer for 160 MVA (3-Ph), 220/66/11 kV and 160MVA, 220/66kV Transformers

<table>
<thead>
<tr>
<th>Description</th>
<th>Current Transformer Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HV Side</td>
</tr>
<tr>
<td><strong>Ratio</strong></td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>600/1</td>
</tr>
<tr>
<td>CORE 2</td>
<td>600/1</td>
</tr>
<tr>
<td><strong>Minimum knee point voltage or burden and accuracy class</strong></td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>600V, PX/PS</td>
</tr>
<tr>
<td>CORE 2</td>
<td>0.2S Class 20VA ISF≤5</td>
</tr>
<tr>
<td><strong>Maximum CT Secondary Resistance</strong></td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>1.5 Ohm</td>
</tr>
<tr>
<td>CORE 2</td>
<td>-</td>
</tr>
<tr>
<td><strong>Application</strong></td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>Restricted Earth Fault (REF)</td>
</tr>
<tr>
<td>CORE 2</td>
<td>Metering</td>
</tr>
<tr>
<td><strong>Maximum magnetization current (at knee point voltage)</strong></td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>100 mA</td>
</tr>
<tr>
<td>CORE 2</td>
<td>-</td>
</tr>
</tbody>
</table>

**Notes:**
1. Parameters of WTI CT for each winding shall be provided by the manufacturer / contractor.
2. The CTs used for REF protection must have the identical parameters in order to limit the circulating current under normal condition for stability of protection.
3. Parameters to be approved and finalized during design review and detailed engineering.
### 4.0 Parameters of Current Transformer for 100MVA (3-ph), 220/33/11 kV and 100MVA 220/33kV Transformers

<table>
<thead>
<tr>
<th>Description</th>
<th>Current Transformer Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV Side</td>
<td>HV Neutral Side</td>
</tr>
<tr>
<td>Ratio</td>
<td>600/1</td>
</tr>
<tr>
<td>CORE 1</td>
<td>600/1</td>
</tr>
<tr>
<td>CORE 2</td>
<td>600/1</td>
</tr>
</tbody>
</table>

**Minimum knee point voltage or burden and accuracy class**

| CORE 1 | 600V, PX/PS | 600V, PX/PS | 2000V, PX/PS | 2000V, PX/PS |
| CORE 2 | 0.2S Class 15VA | ISF ≤ 5 | - | - |

**Maximum CT Secondary Resistance**

| CORE 1 | 1.5 Ohm | 1.5 Ohm | 4 Ohm | 4 Ohm |
| CORE 2 | - | - | - | - |

**Application**

| CORE 1 | Restricted Earth Fault (REF) | REF | REF | REF |
| CORE 2 | Metering | - | - | - |

**Maximum magnetization current (at knee point voltage)**

| CORE 1 | 100 mA | 100 mA | 25 mA | 25 mA |
| CORE 2 | - | - | - | - |

**Notes:**

1. Parameters of WTI CT for each winding shall be provided by the manufacturer / contractor.
2. The CTs used for REF protection must have the identical parameters in order to limit the circulating current under normal condition for stability of protection.
3. Parameters to be approved and finalized during design review and detailed engineering.
5.0 Parameters of Current Transformer for 31.5MVA (3-ph), 66/11 kV Transformers

<table>
<thead>
<tr>
<th>Description</th>
<th>Current Transformer Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>HV Side</strong></td>
</tr>
<tr>
<td>Ratio</td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>400/1</td>
</tr>
<tr>
<td>CORE 2</td>
<td>400/1</td>
</tr>
<tr>
<td>Minimum knee point voltage or burden and accuracy class</td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>400V, PX/PS</td>
</tr>
<tr>
<td>CORE 2</td>
<td>0.2S Class 15VA ISF &lt; 5</td>
</tr>
<tr>
<td>Maximum CT Secondary Resistance</td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>1.5 Ohm</td>
</tr>
<tr>
<td>CORE 2</td>
<td>-</td>
</tr>
<tr>
<td>Application</td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>Protection</td>
</tr>
<tr>
<td>CORE 2</td>
<td>Metering</td>
</tr>
<tr>
<td>Maximum magnetization current (at knee point voltage)</td>
<td></td>
</tr>
<tr>
<td>CORE 1</td>
<td>100 mA</td>
</tr>
<tr>
<td>CORE 2</td>
<td>-</td>
</tr>
</tbody>
</table>

Notes:
1. Parameters of WTI CT for each winding shall be provided by the manufacturer / contractor.
2. The CTs used for REF protection must have the identical parameters in order to limit the circulating current under normal condition for stability of protection.
3. Parameters to be approved and finalized during design review and detailed engineering.

******
Annexure-C

Guaranteed and other technical Particulars
(To be filled by the manufacturer)

A. GENERAL

<table>
<thead>
<tr>
<th>S. No</th>
<th>DESCRIPTION</th>
<th>Unit</th>
<th>Specified by Buyer</th>
<th>Offered by manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>General Information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Supplier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Name of Manufacturer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Place of Manufacture (Country &amp; City)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iv) Type of transformer (Core/Shell)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Applications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Indoor/Outdoor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) 2wdg/3wdg/Auto</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) GT/Step-down/ICT/Station Start-up/ Auxiliary/ Rail Trackside Supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Corrosion Level at Site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Light</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Heavy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iv) Very Heavy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Site altitude above mean sea level</td>
<td></td>
<td></td>
<td>m</td>
</tr>
<tr>
<td>5.</td>
<td>Seismic zone and ground acceleration at site (both in horizontal &amp; vertical direction)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Maximum and minimum ambient temperature at site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Applicable Standards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) IEC: 60076</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) IS : 2026</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Any other, please specify</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Rated Capacity / Full load rating (HV/IV/LV)</td>
<td></td>
<td></td>
<td>MVA</td>
</tr>
<tr>
<td>9.</td>
<td>3-Phase/Bank of Three Single Phase (A,B,C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Rated No Load Voltages (HV/IV/LV)</td>
<td></td>
<td></td>
<td>kV</td>
</tr>
<tr>
<td>11.</td>
<td>Currents at normal tap (HV/IV/LV)</td>
<td></td>
<td></td>
<td>Amp</td>
</tr>
<tr>
<td>12.</td>
<td>Rated Frequency</td>
<td></td>
<td></td>
<td>Hz</td>
</tr>
<tr>
<td>13.</td>
<td>Connections and phase displacement symbols (Vector Group)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Weight Schedules (Minimum with no nega-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Units</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------</td>
<td>-------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Active part (Core + coil)</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Insulating Oil (excluding mass of extra oil)</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Tank and Fittings</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv) Total weight</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v) Overall dimensions L x B x H</td>
<td>Mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi) Size of heaviest package L x B x H</td>
<td>Mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vii) Weight of heaviest package</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>viii) Weight of 5% extra oil</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ix) Weight of core</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x) Weight of copper (HV/IV/LV/Regulating)</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xi) Insulating Oil volume (excluding 5% extra oil)</td>
<td>Ltrs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xii) Quantity of oil in OLTC</td>
<td>Ltrs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. Transport limitation

16. LV Winding
   i) Stabilizing tertiary (Yes/No)
   ii) Loaded (Yes/No)

17. Tappings
   i) Type (OLTC/OCTC) and make of tap changer
   ii) Position of Tapping on the winding
   iii) Variation on 
   iv) Range of variation 
   v) No. of Steps
   vi) Whether control suitable for :
       - Remote/local operation
       - Auto/manual operation
       - Parallel Operation Requirements

18. Impedance and Losses
   i) Guaranteed No load loss at rated voltage and frequency kW
      Tolerance (to be considered for loss evaluation) %
   ii) Guaranteed I²R Loss at rated current & frequency (at 75°C) at principal tap
      kW
      Tolerance (to be considered for loss evaluation) %
<table>
<thead>
<tr>
<th>IV</th>
<th>Description</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>iii)</td>
<td>Eddy current and stray loss at rated current &amp; frequency (at 75°C) at principal tap</td>
<td>kW</td>
</tr>
<tr>
<td>iv)</td>
<td>Load Loss(P+R+Eddy and Stray) at rated current &amp; frequency (at 75°C) at principal tap</td>
<td>kW</td>
</tr>
<tr>
<td>v)</td>
<td>Guaranteed Auxiliary loss at rated voltage and frequency</td>
<td>kW</td>
</tr>
<tr>
<td></td>
<td>Tolerance (to be considered for loss evaluation)</td>
<td>%</td>
</tr>
<tr>
<td>vi)</td>
<td>Calculated Fan Loss</td>
<td>kW</td>
</tr>
<tr>
<td>vii)</td>
<td>Calculated Pump Loss</td>
<td>kW</td>
</tr>
<tr>
<td>viii)</td>
<td>Air core reactance of HV winding</td>
<td>%</td>
</tr>
<tr>
<td>ix)</td>
<td>Guaranteed Impedance (at Highest MVA base)</td>
<td>%</td>
</tr>
<tr>
<td>a)</td>
<td>HV-IV (at Principal tap)</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>HV-LV (at Principal tap)</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>IV-LV (at Principal tap)</td>
<td></td>
</tr>
<tr>
<td>x)</td>
<td>Impedance at extreme tappings at Highest MVA base [for HV-IV for 3 winding transformer (or) HV-LV for two winding transformer]</td>
<td>%</td>
</tr>
<tr>
<td>a)</td>
<td>Max. Voltage tap</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Min. Voltage tap</td>
<td></td>
</tr>
<tr>
<td>xi)</td>
<td>Zero sequence impedance at principal tap (for 3-phase transformers)</td>
<td>%</td>
</tr>
<tr>
<td>19.</td>
<td>Capacitance to earth for HV/IV/LV</td>
<td>pF</td>
</tr>
<tr>
<td>20.</td>
<td>Regulation at full load at 75 °C winding temperature at:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) upf</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) 0.8 pf</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Guaranteed maximum Magnetizing Current at rated Voltage</td>
<td>%</td>
</tr>
</tbody>
</table>
22. Efficiency:
   At 100% load upf
   0.8 lead
   0.8 lag
   At 75% load upf
   0.8 lead
   0.8 lag
   At 50% load upf
   0.8 lead
   0.8 lag

23. Load at Maximum efficiency

24. Any limitations in carrying out the required test?
   If Yes, State limitations

25. Fault level of system (in kA) and its duration (in sec)
   kA (sec)

26. Calculated short Circuit current (in kA) withstand capability for 2 seconds (3 seconds for generator transformers) without exceeding temperature limit (i.e. Thermal ability to withstand SC current)
   kA

27. Test current (in kA) and duration (in ms) for short Circuit current test (i.e. Dynamic ability to withstand SC)
   kA & msec

28. Over fluxing withstand time (due to combined voltage & frequency fluctuations):
   110%
   125%
   140%
   150%
   170%
   msec

29. Free space required above the tank top for removal of core

30. Maximum Partial discharge level at 1.58 Ur/√3
   pC

B. MAGNETIC SYSTEM

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Specified by Buyer</th>
<th>Offered by manufacturer</th>
</tr>
</thead>
</table>

TS/Power/Auto transformer/rev:03/18.08.2023  Page 80
1. **Core Type:**
   i) 3 Phase 3 Limb (3 wound limbs)
   ii) 3 Phase 5 Limb (3 wound limbs)
   iii) 1 Phase 2 Limb (2 wound limbs)
   iv) 1 Phase 3 Limb (1 wound limb)
   v) 1 Phase 4 Limb (2 wound limbs)
   vi) 1 Phase 5 Limb (3 wound Limbs)

2. **Type of Core Joint:**
   i) Mitred
   ii) Step Lap

3. **CRGO:**
   i) Make & Country of Origin
   ii) Thickness, mm
   iii) Max. Specific loss at 1.7 T, 50Hz, in Watts/kg
   iv) Grade of core as per BIS
   v) Insulation between core lamination
   vi) BIS certified (Yes/No)

4. **Minimum Gross & Net Area of:**
   i) Core
   ii) Limb
   iii) Yoke
   iv) Unwound limb
   (May be verified during manufacturing stage – at the discretion of buyer)

5. **Stacking Factor**

6. **Voltage per turn**

7. **Apparent Core Density for Weight Calculation**

8. **Minimum Net Weight of Silicon Steel Lamination CRGO (may be verified during manufacturing stage by calculation)**

9. **Maximum Flux density at 90%, 100% and 110% voltage and frequency (may be verified during manufacturing stage by calculation)**

10. **W/kg at working flux density**

11. **Building Factor Considered**
<table>
<thead>
<tr>
<th>SL. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Offered by manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>HV</strong></td>
</tr>
<tr>
<td>1.</td>
<td>Type of Winding Helical/Disc/Layer/inter wound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Type of Conductor PICC/CTC/CTCE/CTCEN/BPI CC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Minimum Yield Strength of Conductor for 0.2% elongation</td>
<td>N/mm²</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Maximum Current density at CMR and conductor area at any tap:</td>
<td>A/mm² &amp; sq. mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) HV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) LV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Maximum current density under short circuit:</td>
<td>A/mm²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) HV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) LV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Bare Weight of copper without</td>
<td>Kg</td>
<td></td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Description</td>
<td>Unit</td>
<td>Specified by Buyer</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------------------------------------------</td>
<td>------</td>
<td>--------------------</td>
</tr>
<tr>
<td>1.</td>
<td>Type of Cooling [ONAN (or) ONAN/ONAF (or) ONAN / ONAF / OFAF (or) ONAN / ONAF/ ODAF (or) ONAN / ONAF1 / ONAF2 etc.]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Percentage Rating Corresponding to Cooling Stages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(HV/IV/LV)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. No. of Cooler banks (2x50% / 2x100% / 1x100% etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Temperature gradient between windings and oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Time in minutes for which the transformer can run at full load without exceeding maximum permissible temperature at temperature when supply to fans and / or pumps is cut off</td>
<td>min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Guaranteed Maximum Temperature rise at 1000 mts. altitude and at actual altitude at site at ambient temperature at cooling specified at sl. No. 1:</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Top Oil by thermometer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Average Winding by resistance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Winding hot spot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Type of Cooler:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Radiator Bank</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Oil to Air Heat Exchanger (Unit Cooler)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Oil to Water Cooler (Single Tube)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv) Oil to Water Cooler (Double Tube)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v) Tank Mounted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi) Header Mounted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vii) Separately Mounted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>viii) Degree of Protection of terminal box</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8. Cooling Fans:
   i) Type
   ii) Size
   iii) Rating (kW)
   iv) Supply voltage
   v) Quantity (Running + Stand-by) per cooler bank
   vi) Whether fans are suitable for continuous operation at 85% of their rated voltage calculated time constant:
      • natural cooling
      • forced air cooling
   vii) Degree of Protection of terminal box

9. Oil Pumps:
   i) Type
   ii) Size
   iii) Rating (lpm and kW)
   iv) Supply voltage
   v) Quantity (Running + Standby) per cooler bank
   vi) Efficiency of motor at full load
   vii) Temperature rise of motor at full load
   viii) BHP of driven equipment

10. Coolers (Oil to Air):
    i) Quantity (Running + Stand-by)
    ii) Type and Rating

11. Coolers (Oil to Water):
    i) Quantity (Running + Stand-by)
    ii) Type and Rating
    iii) Oil flow rate (lpm)
    iv) Water flow rate (lpm)
    v) Nominal Cooling rate (kW)
    vi) Material of tube
12. Radiators:
   i) Width of elements (mm)
   ii) Thickness (mm)
   iii) Length (mm)
   iv) Numbers

13. Cooler loss at rated output, normal ratio, rated voltage, rated frequency at ambient temperature of 50°C  kW

---

**E. DIELECTRIC SYSTEM**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Offered by manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Geometric Arrangement of winding with respect to core e.g: Core-LV-IV-HV-Reg Coarse-Reg Fine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Regulating Winding:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Body Tap</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Separate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>HV Line Exit point in winding:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Top</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Center</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Varistors used across Windings If yes, Details</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Insulation Levels of windings</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Lightning Impulse withstand voltage (1.2/50µs)</td>
<td>kV₀</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Chopped wave Lightning Impulse withstand voltage</td>
<td>kV₀</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Switching Impulse withstand voltage (250/2500µs)</td>
<td>kV₀</td>
<td></td>
</tr>
</tbody>
</table>
iv) Power frequency withstand voltage \( kV_{\text{rms}} \) 

<table>
<thead>
<tr>
<th>(one minute / 5 minutes)</th>
</tr>
</thead>
</table>

6. Tan delta of windings at ambient temperature \( \% \) 

---

### F. ACCESSORIES

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Offered by manufacturer</th>
<th>Specified by Buyer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Tap Changers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a-Manual</td>
<td>b-Automatic</td>
<td>c-Remote</td>
<td>d-Local</td>
</tr>
<tr>
<td></td>
<td>ii) Voltage Class and Current Rating of Tap Changers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Make and Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iv) Make and Type of Automatic Voltage Regulator (AVR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>v) Tie-in resistor requirement (to limit the recovery voltage to a safe value) and its value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>vi) OLTC control and monitoring to be carried out through Substation Automation System</td>
<td>Y/N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>vii) Power Supply for control motor (No. of Phases/Voltage/Frequency)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>viii) Rated Voltage for control circuit (No. of Phases/Voltage/Frequency)</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2. Tank</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>i) Tank Cover: Conventional/Bell/Bottom Plate</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>ii) Material of plate for tank</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Plate thickness : side, bot-mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv) Rail Gauge</td>
<td>mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>----</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v) Minimum Clearance height from rail for lifting Active Part</td>
<td>mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi) Wheels: Numbers/Plane/Flanged/Unidirectional/Bidirectional/Locking Details</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vii) Vacuum withstand Capability</td>
<td>mm of Hg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Tank</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Radiators/Conservator/Accessories</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>viii) High Pressure withstand Capability</td>
<td>mm of Hg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Tank</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Radiators/Conservator/Accessories</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ix) Radiator fins/conservator plate thickness</td>
<td>mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x) Tank Hot spot temperature</td>
<td>°C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Bushings:

<table>
<thead>
<tr>
<th>i) Termination Type</th>
<th>HV</th>
<th>IV</th>
<th>LV</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-Outdoor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b-Cable Box (oil/Air/SF$_6$) c-Plug in Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Type of Bushing: OIP/RIP/RIS/oil communicating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Bushing housing - Porcelain/polymer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv) Rated Voltage Class</td>
<td>kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v) Rated Current</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi) Lightning Impulse withstand voltage (1.2/50µs)</td>
<td>kV$_p$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vii) Switching Impulse withstand voltage (250/2500µs)</td>
<td>kV$_p$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>viii) One minute Power frequency withstand voltage (dry &amp; wet)</td>
<td>kV$_{rms}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ix) Minimum Creepage Distance</td>
<td>mm</td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td></td>
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<td>---</td>
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<td>---</td>
<td>---</td>
</tr>
<tr>
<td>x) Quantity of oil in bushing and specification of oil used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xi) Make and Model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xii) Tan delta of bushings</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>xiii) Max Partial discharge level at Um</td>
<td>pC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>xiv) Terminal Pad details</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xv) Weight of assembled bushings</td>
<td>kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>xvi) Whether terminal connector for all bushings included in the scope of supply</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Minimum clearances between bushings (for HV, IV and LV)
   (a) Phase to phase
   (b) Phase to ground

5. Indicator / Relay
   i) Winding temperature thermometer/indicator: Range Accuracy
   ii) Oil temperature thermometer/indicator: Range Accuracy
   iii) Temperature sensors by fiber optic (if provided)
   iv) Oil actuated/gas operated relay
   v) Oil level Indicators:
      Main Conservator OLTC Conservator
   vi) Oil Sight Window:
      Main Tank
      Main Conservator
      OLTC Conservator

6. Conservator:
   i) Total volume
   ii) Volume between highest and lowest visible oil levels

7. Conservator Bag (air cell)
   i) Material of air cell
   ii) Continuous temperature withstand capacity of air cell
8. Air cell rupture relay provided | Yes / No

9. Pressure Relief Device:
   i) Number of PRDs provided
   ii) Location on the tank
   iii) Operating pressure of relief device

10. Sudden Pressure Relay / Rapid Pressure rise relay provided; if yes,
    i) Location on the tank
    ii) Operating pressure

11. Dehydrating Breathers (Type & No. of breathers)
    (a) For main Conservator tank
    (b) For OLTC conservator

12. Flow sensitive Conservator Isolation Valve Provided | Y/N

13. Tap Changer protective device

14. Type and material of gaskets used at gasketed joints

15. Bushing CTs: (HV side and IV/LV side)
   i) Voltage class | kV
   ii) No. of cores
   iii) Ratio
   iv) Accuracy class
   v) Burden | VA
   vi) Accuracy limit factor
   vii) Maximum resistance of secondary winding | Ω
   viii) Knee point voltage | V
   ix) Current rating of secondaries

16. Neutral CTs:
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Voltage class</td>
<td></td>
<td>kV</td>
</tr>
<tr>
<td>ii) No. of cores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Ratio</td>
<td></td>
<td>VA</td>
</tr>
<tr>
<td>iv) Accuracy class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v) Burden</td>
<td></td>
<td>VA</td>
</tr>
<tr>
<td>vi) Accuracy limit factor</td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td>vii) Maximum resistance of secondary winding</td>
<td></td>
<td>VA</td>
</tr>
<tr>
<td>viii) Knee point voltage</td>
<td></td>
<td></td>
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<tr>
<td>ix) Current rating of secondaries</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>17. Transformer Oil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) IS 335 / IEC60296 / as per specification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Inhibited/ un-inhibited</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Mineral / Natural Ester / Synthetic Ester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv) Spare oil as percentage of first filling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v) Manufacturer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi) Quantity of oil (before filling and before commissioning)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vii) Moisture content (mg/L or ppm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>viii) Tan delta (Dielectric Dissipation Factor) at 90°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ix) Resistivity (Ω-cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>x) Breakdown Voltage (before and after treatment) (kV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>xi) Interfacial tension at 20 °C (N/m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>xii) Pour point (°C)</td>
<td>xii) Flash point(°C)</td>
<td></td>
</tr>
<tr>
<td>xiii) Acidity (mg KOH/gm)</td>
<td>xiv) Inhibitors (for inhibited oil) (%)</td>
<td></td>
</tr>
<tr>
<td>xv) Oxidation Stability</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>18. Press Board:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Make</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) type</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Conductor Insulating Paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Kraft paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Thermally upgraded Kraft paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Nomex</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Provision for fire protection system (as per spec), if yes, provide</td>
<td>Y/N</td>
<td></td>
</tr>
</tbody>
</table>
21. Insulation of core bolts, washers, end plates etc.

22. Weights and Dimensions:
   i) Weights:
      a. Core
      b. Windings
      c. Tank
      d. Fittings
      e. Oil
      f. Total weights of complete transformers with oil and fittings
   ii) Dimensions;
      a. Overall Height above track
      b. Overall length
      c. Overall breadth
      iii) Minimum bay width required for installation of the transformer
      iv) Weight of the heaviest package of the transformer arranged for transportation

23. Lifting Jacks
   i) Number of jacks included
   ii) Type and Make
   iii) Capacity
   iv) Pitch
   v) Lift
   vi) Height in close position

24. Rail Track gauges
   i) 2 Rails or 3 rails or 4 rails
   ii) Distance between adjacent rails on shorter axis
   iii) Distance between adjacent rails on longer axis

******
## TEST PLAN AND PROCEDURES

### Tests for Transformers

<table>
<thead>
<tr>
<th>No.</th>
<th>Test</th>
<th>Um ≤ 170kV</th>
<th>Um &gt; 170kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Measurement of winding resistance at all taps</td>
<td>Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>2.</td>
<td>Measurement of voltage ratio at all taps</td>
<td>Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>3.</td>
<td>Check of phase displacement and vector group</td>
<td>Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>4.</td>
<td>Measurement of no-load loss and current measurement at 90%, 100% &amp; 110% of rated voltage and rated frequency</td>
<td>Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>5.</td>
<td>Magnetic balance test (for three phase Transformer only) and measurement of magnetizing current</td>
<td>Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>6.</td>
<td>Short Circuit Impedance and load loss measurement at principal tap and extreme taps</td>
<td>Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>7.</td>
<td>Measurement of insulation resistance &amp; Polarization Index</td>
<td>Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>8.</td>
<td>Measurement of insulation power factor and capacitance between winding to earth and between windings</td>
<td>Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>9.</td>
<td>Measurement of insulation power factor and capacitance of bushings</td>
<td>Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>10.</td>
<td>Tan delta of bushing at variable frequency (Frequency Domain Spectroscopy)</td>
<td>Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>11.</td>
<td>Full wave lightning impulse test for the line terminals (LI)</td>
<td>Type</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(for Um≤ 72.5kV)</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(for Um&gt; 72.5kV)</td>
<td>Type</td>
<td>-</td>
</tr>
<tr>
<td>Test Description</td>
<td>Type</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
<td>--------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Chopped wave lightning impulse test for the line terminals (LIC)</td>
<td></td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Lightning impulse test for the neutral terminals (LIN)</td>
<td></td>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>Switching impulse test for the line terminal (SI) (Not applicable for Um ≤ 72.5 kV)</td>
<td></td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Applied voltage test (AV)</td>
<td></td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Line terminal AC withstand voltage test (LTAC) (Not applicable for Um ≤ 72.5 kV)</td>
<td></td>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>Induced voltage withstand test (IVW)</td>
<td>Routine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Induced voltage test with PD measurement (IVPD)</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Measurement of transferred surge on Tertiary due to HV lightning impulse and IV lighting impulse</td>
<td>-</td>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>Measurement of transferred surge on Tertiary due to HV Switching impulse and IV Switching impulse</td>
<td>-</td>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>Test on On-load tap changer (Tap changer fully assembled on the transformer)</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Measurement of dissolved gasses in dielectric liquid</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Check of core and frame insulation</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Leak testing with pressure for liquid immersed transformers (tightness test)</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Appearance, construction and dimension check</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Measurement of no load current &amp; Short circuit Impedance with 415 V, 50 Hz AC.</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Frequency Response analysis (Soft copy of test report to be submitted to site along with test reports)</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>High voltage withstand test on auxiliary equipment and wiring after assembly</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Tank vacuum test</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Tank pressure test</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Check of the ratio and polarity of built-in current transformers</td>
<td>Routine</td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>Temperature rise test</td>
<td>Type</td>
<td>Type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test Description</td>
<td>Routine Test</td>
<td>Type Test</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------------------------------------------</td>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>33</td>
<td>Overload testing in short-circuit method (applicable for 765 kV transformer only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Short duration heat run test (Not Applicable for unit on which temperature rise test is performed)</td>
<td>Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>35</td>
<td>Over excitation test (applicable for 765 kV transformer only)</td>
<td>-</td>
<td>Routine</td>
</tr>
<tr>
<td>36</td>
<td>Measurement of Zero seq. reactance (for three phase Transformer only)</td>
<td>Type</td>
<td>Type</td>
</tr>
<tr>
<td>37</td>
<td>Measurement of harmonic level in no load current</td>
<td>Type</td>
<td>Type</td>
</tr>
<tr>
<td>38</td>
<td>Determination of acoustic sound level</td>
<td>Type</td>
<td>Type</td>
</tr>
<tr>
<td>39</td>
<td>Measurement of power taken by fans and liquid pump motors (Not applicable for ONAN)</td>
<td>Type</td>
<td>Type</td>
</tr>
<tr>
<td>40</td>
<td>Dynamic Short circuit withstand test</td>
<td>as specified in this specification</td>
<td></td>
</tr>
</tbody>
</table>

*The requirements of the IVW test can be incorporated in the IVPD test so that only one test is required.

**Note:** All routine tests shall be carried out on all the units and type tests mentioned in above tables shall be conducted on one unit.

**Test Procedures (for Transformer)**

**General**

Tests shall be carried out as per following procedure. However, IS 2026/IEC 60076 (with latest amendments) shall be followed in general for other tests. Manufacturer shall offer the transformer unit for type testing with all major fittings including radiator bank, Marshalling Box, Common Marshalling Box, RTCC (as applicable) assembled.

**1. Core assembly dielectric and earthing continuity test**
After assembly each core shall be tested for 1 minute at 2000 Volts between all yoke clamps, side plates and structural steel work (core to frame, frame to tank & core to tank).

The insulation of core to tank, core to yoke clamp (frame) and yoke clamp (frame) to tank shall be able to withstand a voltage of 2 kV (DC) for 1 minute. Insulation resistance shall be minimum 1 GΩ for all cases mentioned above.

2. Measurement of winding resistance

After the transformer has been under liquid without excitation for at least 3 h, the average liquid temperature shall be determined and the temperature of the winding shall be deemed to be the same as the average liquid temperature. The average liquid temperature is taken as the mean of the top and bottom liquid temperatures. measurement of all the windings including compensating (in case terminal is available at outside) at normal and extreme taps.

In measuring the cold resistance for the purpose of temperature-rise determination, special efforts shall be made to determine the average winding temperature accurately. Thus, the difference in temperature between the top and bottom liquid shall not exceed 5 K. To obtain this result more rapidly, the liquid may be circulated by a pump.

3. No-load loss and current measurement

As per IEC 60076-1:2011 clause 11.5


The short-circuit impedance and load loss for a pair of windings shall be measured at rated current & frequency with voltage applied to the terminals of one winding, with the terminals of the other winding short-circuited, and with possible other windings open circuited. The difference in temperature between the top and bottom liquid shall not exceed 5 K. To obtain this result more rapidly, the liquid may be circulated by a pump. Loss measurement for all combinations (HV-IV, HV-LV, IV-LV and at Normal and extreme taps).
5. Short term heat run test (Not Applicable for unit on which temperature rise test is performed)

In addition to the type test for temperature rise conducted on one unit, each cooling combination shall routinely be subjected to a short term heat run test to confirm the performance of the cooling system and the absence of manufacturing defect such as major oil flow leaks that may bypass the windings or core.

DGA samples shall be taken at intervals to confirm the gas evolution.

For ODAF or OFAF cooling, the short term heat run test shall be done with the minimum number of pumps for full load operation in order to shorten the temperature build up. Each short term heat run test is nevertheless expected to take about 3 hours.

For ODAF or OFAF cooled transformers an appropriate cross check shall be performed to prove the effective oil flow through the windings. For this purpose the effect on the temperature decay by switching the pumps off/ on at the end of the heat run should demonstrate the effectiveness of the additional oil flow. Refer to SC 12, 1984 cigre 1984 SC12-13 paper by Dam, Felber, Preiniger et al.

Short term heat run test may be carried out with the following sequence:
- Heat run test with pumps running but oil not through coolers.
- Raise temperature to 5 deg less than the value measured during temperature rise test.
- Stop power input and pumps for 6 minutes and observe cooling down trend
- Restart pumps and observe increased cooling trend due to forced oil flow

This test is applicable for the Transformer without Pump also (ONAN or ONAF rating). For such type of transformer test may be carried out with the following sequence:

Arrangement shall be required with pump of suitable capacity (considering the oil velocity) without cooler bank.
- Raise the oil temperature 20-25 deg C above ambient.
- Stop power input and pumps for 6 minutes and observe cooling down trend.
- Restart pumps and observe increased cooling trend due to forced oil flow.
6. Over excitation test (for 765kV class transformer)

A routine over excitation test at 1.05 p.u voltage for 12 hours shall be done on the tap position giving the highest flux. This test shall be carried out immediately after the routine short-term heat run test on the transformer. The rate of gas development during the test shall be evaluated using IEEE/IEC/CIGRE guidelines.

7. Temp. Rise Test as per IEC: 60076

Headspace extraction and Gas chromatographic analysis on oil shall also be conducted before, during and after this test and the values shall be recorded in the test report. The sampling shall be in accordance with IEC 60567.

The temperature rise test shall be conducted at a tap for the worst combination of loading (3-Winding Loss) for the Top oil of the transformer.

3-Winding Loss = HV (Max MVA) + IV(Max MVA) + LV (Max MVA).

The Contractor before carrying out such test shall submit detailed calculations showing losses on various taps and for the three types of ratings of the transformer and shall recommend the combination that results in highest temperature rise for the test.

The Temperature rise type test results shall serve as a “finger print” for the units to be tested only with short term heat run test.

Headspace extraction and Gas chromatographic analysis on oil shall also be conducted before, during and after this test and the values shall be recorded in the test report. The sampling shall be in accordance with IEC 60567.

Oil sample shall be drawn before and after heat run test and shall be tested for dissolved gas analysis. Oil sampling to be done 2 hours prior to commencement of temperature rise test. Keep the pumps running for 2 hours before and after the heat run test. Take oil samples during this period. For
ONAN/ONAF cooled transformers, sample shall not be taken earlier than 2 hours after shut down. The acceptance norms with reference to various gas generation rates shall be as per IEC 61181.

The DGA results shall generally conform to IEC/IEEE/CIGRE guidelines.

i. **Test conditions for temperature rise test:**

- This test shall be generally carried out in accordance with IEC 60076-2
- For each cooling combination with cooler bank, tests shall be done on the maximum current tap for a minimum of 12 hours for ONAN/ONAF or ONAF1 and 24 hours for ODAF or OFAF or ONAF2 with saturated temperature for at least 4 hours while the appropriate power and current for core and load losses are supplied.
- The total testing time, including ONAN heating up period, steady period and winding resistance measurements is expected to be about 48 hours.
- DGA tests shall be performed before and after heat run test and DGA results shall generally conform to IEC/IEEE/CIGRE guidelines.

ii. **Test records:**

Full details of the test arrangements, procedures and conditions shall be furnished with the test certificates and shall include at least the following.

iii. **General:**

- Purchaser’s order number and transformer site designation.
- Manufacturer’s name and transformer serial number.
- Rating of transformer
- MVA
- Voltages and tapping range
- Number of phases
- Frequency
- Rated currents for each winding
- Vector Group
- Cooling Type
- Measured no-load losses and load losses at 75°C.
- Altitude of test bay.
- Designation of terminals supplied and terminals strapped.

iv. **Top oil temperature rise test:**

A log of the following quantities taken at a minimum of 30 minute intervals:
• time
• Voltage between phases
• Current in each phase and total power
• Power in each phase and total power
• Ambient temperature
• Top oil temperature
• Cooler inlet and outlet oil temperatures
• Hot spot temperatures (make use of probes) (if applicable)
• Colour photographs of the four sides and top of the transformer together with the corresponding series of thermal images (colour) during starting of the test then after every four hours till the temperature stabilised and finally during temperature stabilised for each rating (ONAN/ONAF/OFAF or ONAN/ONAF1/ONAF2).

Notes:
The probes may be left in position provided the reliability and integrity of unit will not be jeopardized during its long life expectancy.

v. **Winding temperature rise test**

• Record the ‘cold’ resistance of each winding and the simultaneous top oil and ambient air temperatures, together with the time required for the effect to disappear.
• Record the thermal time constant of the winding.
• Log the half-hourly readings of the quantities as for the top oil temperature rise test.
• Provide a table of readings, after shut-down of power, giving the following information;

  a) Time after shut-down:
  b) Time increment:
  c) Winding resistance: At least 20 minutes reading
  d) Resistance increment:
  e) X, where x is the time after shut-down divided by the thermal time constant of the winding:
  and
  f) Y, where Y = 100 ( 1-e –x )
  (Any graphical/computer method used to determine the temperature of a winding by extrapolation to the instant of power shut-down shall produce a linear curve.)

• Provide a record of all calculations, corrections and curves leading to the determination of the winding temperatures at the instant of shut-down of power.
• Record any action taken to remedy instability of the oil surge device during initiation of the oil circulating pumps.
Temperature measurements as per special probes or sensors (fibre optic) placed at various locations shall also be recorded.

8. **Overload testing in short-circuit method (for 765kV class transformer)**

The test shall be carried out on the tapping position that will cause the highest current under normal conditions. Hot spot temperature measurement shall be done by using temperature probes or sensors in approved locations.

The transformer shall be fully erected as for service with all cooling equipment.

i. **Testing option 1:**

Pre-load the unit with 100% of full load current for a period long enough to stabilise the top oil temperature with cooling as for service conditions.

- Increase the loading to 120% overload rating. Forced cooling shall be activated as per service conditions.
- Scan and record infra-red images of all four sides and the top of the transformer at the interval of every one hour.
- Hold the overload current for a period of 4 hours.
- Measure and record the hotspot temperatures.

ii. **Testing option 2:**

Pre-load the unit with 100% of full load current for a period long enough to stabilise the top oil temperature with 100% cooling as per service conditions.

- Increase the loading to 130% overload rating.
- Scan and record infra-red images of all four sides and the top of the transformer every 30 minutes.
- Hold the current at 130% for a period of 2 hours.
- Measure and record the hotspot temperature.

iii. **Acceptance criteria:**

Winding hotspot temperatures shall not exceed 130°C for option 1 and 135°C for option 2.
The temperature rise recorded by infra-red shall be not more than 10°K above top oil temperature or 15°K above the local oil temperature.

The rate of gas development as determined from oil samples shall be determined. Samples shall be taken before and after the test and acceptance criteria shall be in accordance with IEC/IEEE guidelines.

iv. Test records:

Full details of the test arrangements, procedures and conditions shall be supplied with the test certificates and shall include the following:

- Purchaser’s reference number and site designation
- Manufacturer’s name and transformer serial number
- MVA rating and voltage ratio
- Vector group
- Altitude of test bay
- Designation of terminals supplied and terminals strapped
- Colour photographs of the four sides and top of the transformer.

v. Overload test:

A log of the following quantities taken at a minimum of 30-minute intervals:

- time
- voltage between phases
- current in each phase
- power in each phase and total power
- ambient temperature
- top oil temperature
- cooler inlet and outlet temperatures
- average winding temperatures
- hot spot temperatures (make use of probes)

Notes:
Measurement methods for hot spots, their location and the number of sensors shall be agreed with Purchaser prior to the test. The probes may be left in position provided the reliability and integrity of the unit will not be jeopardized during its long life expectancy.
9. **Dielectric Tests**

Following Test shall be performed in the sequence given below as per IEC 60076-3:2013 clause 7.2.3 shall be followed:

a) Lightning impulse tests (LIC, LIN)

b) Switching impulse (SI)

c) Applied voltage test (AV)

d) Line terminal AC withstand test (LTAC)

e) Induced voltage test with partial discharge measurement (IVPD)

10. **Measurement of transferred surge on LV or Tertiary due to HV & IV Lightning impulse**

Following tests shall be carried out with applying 20% to 80% of rated Impulse & Switching impulse (up to 60% for IV, Sr. No. 7 & 8 of below table) voltage. Finally, measured value shall be extrapolated for 100% rated voltage.

Table for Transfer surge (Impulse) at Max, Nor. and Min. Voltage Tap

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Impulse Type</th>
<th>Voltage applied</th>
<th>Earthed Points</th>
<th>Open / not earthed point</th>
<th>Measurement Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FW</td>
<td>1.1</td>
<td>2.1, N &amp; 3.2</td>
<td>-</td>
<td>3.1</td>
</tr>
<tr>
<td>2</td>
<td>FW</td>
<td>1.1</td>
<td>2.1, N &amp; 3.1</td>
<td>-</td>
<td>3.2</td>
</tr>
<tr>
<td>3</td>
<td>SW</td>
<td>1.1</td>
<td>N &amp; 3.2</td>
<td>2.1</td>
<td>3.1</td>
</tr>
<tr>
<td>4</td>
<td>SW</td>
<td>1.1</td>
<td>N &amp; 3.1</td>
<td>2.1</td>
<td>3.1</td>
</tr>
<tr>
<td>5</td>
<td>FW</td>
<td>2.1</td>
<td>2.1, N &amp; 3.2</td>
<td>-</td>
<td>3.1</td>
</tr>
<tr>
<td>6</td>
<td>FW</td>
<td>2.1</td>
<td>1.1, N &amp; 3.1</td>
<td>-</td>
<td>3.2</td>
</tr>
<tr>
<td>7</td>
<td>SW</td>
<td>2.1</td>
<td>N &amp; 3.2</td>
<td>3.2</td>
<td>3.1</td>
</tr>
<tr>
<td>8</td>
<td>SW</td>
<td>2.1</td>
<td>N &amp; 3.1</td>
<td>3.1</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Similar tests to be conducted for switching surge transformer at Max, Nor. and Min. Voltage Tap.

Where 1.1 : HV Terminal

2.1 : IV Terminal

3.1 & 3.2 : LV or Tertiary Terminal

**Acceptance criteria**
Transfer surge at Tertiary should not exceed 250kVp at any conditions for 400kV Voltage class Transformer. For other transformer it shall be below the impulse level of LV winding.

11. **Chopped wave & full wave lightning impulse test for the line terminals (LIC & LI) and Switching impulse test**

Chopped wave lightning impulse and Switching impulse test shall be performed at normal and extreme taps on Unit-1, Unit-2 and Unit-3 respectively for 1-Ph unit, otherwise R ph, Y Ph and B Ph respectively for 3- Ph unit. All the parameters as per IEC shall be mentioned in the report.

12. **Measurement of power taken by fans and oil pumps (100 % cooler bank)**

Losses of each fan and pumps including spare shall be measured at rated voltage and frequency. Fans and Pumps shall be mounted with cooler bank as per approved drawing during measurement. Serial No, Applied voltage, measured current, frequency and make shall be furnished in the test report.

13. **Short duration (LTAC) AC withstand test (LTAC)**

For 765kv Class transformer, the IV terminal voltage shall be shall be raised to 570kVrms or below so that maximum HV voltage shall be shall be limited to 970kV rms. Test method shall be as per IEC.

14. **Dynamic short circuit withstand test**

The test shall be carried out as per IEC 60076-5. Dynamic short circuit test shall be carried out in HV-IV combination at nominal & extreme tap positions. For LV winding, dynamic short circuit shall be carried out either on HV-LV or IV-LV combination, whichever draws higher short circuit current as per calculation. Type tests shall be carried out before short circuit test. Following shall also be conducted before and after Short Circuit test:

i) Dissolved gas analysis
ii) Frequency response analysis
iii) All routine tests

Detail test procedure shall be submitted by contractor & shall be approved before short circuit test.

15. Routine test on bushings shall be done as per IEC 60137.

******
BASIC MANUFACTURING FACILITY & MANUFACTURING ENVIRONMENT

Customer/Purchaser always desires that transformer manufactured and delivered is of good quality and must perform trouble free service for its “Specified Design Life”. The consistency in quality of material used & manufacturing process are main cause for variation in quality of transformer. It is also equally very important that transformer is manufactured in a clean dust free and humidity controlled environment. Any compromise on this aspect will have adverse effect in expected design life of transformer/reactor, however good is the quality of material used. A broad list of facilities the transformer/reactor manufacturers should have are given below:

**Basic manufacturing facility**

Following manufacturing facility should be available for use with transformer manufacturer:

1. EOT Crane for main manufacturing bay and other shops (With LoadCell).
2. Vapor Phase Drying Oven (adequately sized to accommodate offered transformer and have facility to record temperature, vacuum, moisture etc.)
3. Air Casters for material handling
4. Core cutting line (if applicable)
5. Vacuum auto claves
6. Air oven
7. Adjustable Horizontal and vertical winding machine
8. Winding Mandrels
9. Hydraulic Press
10. Brazing equipment
11. Mechanical platform
12. Tools and fixtures
13. Mechanical power press
14. Welding machines
15. Crimping tools
16. Faraday’s cage
17. Motor Generator Set/ Static Power System Set
18. Testing transformer
19. Capacitor bank
20. Impulse voltage generator
21. Capacitance & Tan delta bridge
22. Power Analyzer
23. Current & Voltage transformer
24. Partial Discharge (PD) measuring kit (for all manufacturers) & PD Diagnostic Kit (for 400 kV & above voltage class Transformer manufacturer)
25. Temperature data logger
26. Noise measurement kit
27. Thermo vision camera
28. Loss measurement kit
29. Insulation tester
30. Winding resistance meter
31. Turn ratio meter
32. Transformer oil test lab
33. Dissolved Gas Analysis (DGA) test kit
34. Sweep Frequency Response Analyzer (SFRA) kit
35. Frequency Domain Spectroscopy (FDS) kit
36. NABL Accredited laboratory for testing
37. Oil Storage tanks
38. Oil filter plant with requisite level of vacuum and filter
39. Tensometer for Oil Surface tension
40. Particle Count Kit (for 400 kV & above Transformer)
41. Multimeters

Manufacturing environment (Clean, dust free and humidity controlled environment)

A. Transformer must be manufactured in a bay having positive pressure w.r.t. external environment. Winding shall be manufactured in a clean, dust free and humidity controlled environment. The dust particle shall be monitored regularly in the manufacturing areas. Further, there shall be positive atmospheric pressure, clean, dust free and humidity controlled environment for following:
1. Insulation storage
2. Core storage
3. Glue stacking area
4. Core cutting line
5. Winding manufacturing bay
6. Core building area
7. Core coil assembly area
8. Testing lab
9. Packing & dispatch area

B. Following accessories to be kept in clean and covered location:
1. Piping
2. Radiator
3. Tank
4. Bushing (as per manufacturer’s guideline)
5. Marshalling box
6. Turret
7. Conservator
8. Insulating oil

******
LIST OF DRAWINGS/DOCUMENTS TO BE SUBMITTED BY THE MANUFACTURER

1.0 Each drawing shall be identified by a drawing number and each subsequent resubmission/revision or addition to the drawing shall be identified by a revision number. All drawings shall be thoroughly checked for accuracy & completeness and signed. Any mistakes or errors in drawings shall not form a basis for seeking extension of delivery period.

2.0 In addition to any other drawings which the manufacturer may like to supply, the following drawings/calculations/documents/catalogues shall be submitted in hard and soft copy:

(a) Guaranteed Technical Particulars (GTPs) and other Technical particulars
(b) Rating and Diagram Plate giving details of terminal marking and connection diagram
(c) General Arrangement (GA) drawing (as built drawing) of transformer/reactor showing Plan, Elevation, End view (left side & right side view looking from HV side) and 3D view identifying various fittings & accessories, dimensions, weight, clearances, quantity of insulating oil, centre of gravity etc.
(d) View showing maximum lifting height of core-coil assembly and maximum clearance over tank top required for taking out the bushing.
(e) List of all accessories, description, make, weight and quantity
(f) Bill of Materials (BoM) with description, make & quantity
(g) Drawing relating to Neutral formation of 1-phase units of three phase bank
(h) Drawing relating to Delta formation of 1-phase units of 3-phase bank
(i) Foundation Plan (combined foundation drawing for 1-phase transformers) showing Rail gauge, fixing details of foundation bolts, clamping arrangement to restrict movement during earthquake & location of jacking pads and loading details
(j) Bushing Drawing showing dimensions, electrical & mechanical characteristics, mounting details and test tap details (as applicable)
  i) HV Bushing
  ii) IV Bushing
  iii) LV Bushing
  iv) Neutral Bushing
(k) Transport Dimension Drawing indicating transport weight, transport condition (oil filled/gas filled), lifting bollards, jacking pads, pulling eyes, quantity and location of impact recorder etc.
(l) General Arrangement Drawing of Cooler Control Cabinet, Marshalling box
(m) GA drawing for bus duct termination (if applicable) indicating position of bus duct mounting flanges
(n) General Arrangement Drawing of RTCC panel (if applicable)
(o) GA drawing for Junction Box (if applicable)
(p) GA drawing for Cable Box (if applicable)
(q) Cooler Control Scheme: Schematic wiring diagram of cooling arrangement along with write up on scheme
(r) Tap Changer Control Scheme (if applicable): Schematic wiring diagram of OLTC along with write up on scheme
(s) Mounting Arrangement and wiring diagram of remote WTI along with write up.
(t) Alarm/Trip Indication Scheme
(u) Valve Schedule Plate drawing showing all valves, air vents, drain plugs etc. with type, size, material and quantity of valves
(v) Technical literature of all fittings and accessories
(w) Calculation in support of thermal withstand capability of transformer due to short circuit
(x) Calculation of hot spot temperature
(y) Value of air core reactance with a typical write-up of calculation
(z) Magnetisation Characteristics of bushing CTs and neutral CTs
(aa) Hysteresis Characteristics of iron core (bb) Over fluxing withstand duration curve (cc) Typical heating and cooling curves
(dd) Drawing showing winding arrangement & geometrical sequence w.r.t core with winding ID/OD, height & separation distance between windings etc.
(ee) Twin bi-directional roller assembly drawing (ff) Oil Flow Diagram
(gg) List of spares
(hh) Connection diagram of all protective devices to marshalling box showing physical location
(ii) Insulating oil storage tank drawing (jj) Insulating oil storage tank drawing details
(kk) Customer inspection schedule
(ll) Test procedure of transformer
(mm) Manufacturer Quality Program (MQP) and Field Quality Plan (FQP)
nn) Field Welding Schedule for field welding activities (if applicable)
(oo) Type test reports
(pp) O&M manual (hard copy and soft copy) of transformer/reactor inter-alia including instructions for Aircell, Oil filling, Bushing removal and Core Coil Assembly un-tanking etc

*******
Short Circuit Test Requirement of Transformers.

The manufacturer shall be required to submit report on Dynamic Short Circuit Test carried out on the transformer of similar design as the one offered. (Criteria for similar design to be taken as per CEA guidelines). The validity of Dynamic Short Circuit test for transformer shall be as per CEA’s letter dated 26.06.2023 or further amendments in guidelines/regulations by CEA in this regard, whichever is latest. In case, if the dynamic short circuit test has not been carried out then the manufacturer shall submit an undertaking that in the event of order being awarded to him, he shall get Dynamic Short Circuit Test done on any one of the offered transformer at the works of CPRI or at the works of any Government approved agency at his own expense and will submit the report before its supply. If Dynamic Short Circuit Test on sample fails, the whole quantity of supplied transformers shall be replaced by manufacturer without any cost to DTL.

However, the requirement of conduction of Dynamic short circuit (DSC) test on 400kV 500MVA transformer shall be as per CEA letter dated 26.06.2023 or further amendments in guidelines/regulations by CEA in this regard, whichever is latest.

If required, DTL (Purchaser) have also the right to perform Dynamic Short Circuit Test on any of the transformer at the works of CPRI or at the works of any Government approved agency on randomly selected transformer at DTL’s own cost. If sample fails, the whole quantity of supplied equipments shall be replaced by manufacturer without any cost to DTL and the cost incurred by DTL on conducting of dynamic short circuit test shall also be recoverable from the supplier.

*******
## ANNEXURE –H

### PAINTING PROCEDURE

<table>
<thead>
<tr>
<th>PAINTING</th>
<th>Surface preparation</th>
<th>Primer coat</th>
<th>Intermediate undercoat</th>
<th>Finish coat</th>
<th>Total Dry Film Thickness (DFT)</th>
<th>Color shade</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External surfaces:</strong> Main tank, pipes, conservator tank, oil storage tank &amp; Driving Mechanism (DM) Box etc. ()</td>
<td>Shot Blast cleaning Sa 2 ½*</td>
<td>Epoxy base Zinc primer (30-40µm)</td>
<td>Epoxy high build Mica-ceous iron oxide (HB MIO) (75µm)</td>
<td>Aliphatic polyurethane (PU) (Minimum 50µm)</td>
<td>Minimum 155µm</td>
<td>RAL 7035</td>
</tr>
<tr>
<td><strong>Internal surfaces:</strong> Main tank, pipes (above 80 NB#), conservator tank, oil storage tank &amp; DM Box etc. ()</td>
<td>Shot Blast cleaning Sa 2 ½*</td>
<td>Hot oil resistant, non-corrosive paint, low viscosity varnish or epoxy</td>
<td>--</td>
<td>--</td>
<td>Minimum 30µm</td>
<td>Glossy white for paint</td>
</tr>
<tr>
<td>Radiator (external surfaces)</td>
<td>Chemical / Shot Blast cleaning Sa 2 ½*</td>
<td>Epoxy base Zinc primer (30-40µm)</td>
<td>Epoxy base Zinc primer (30-40µm)</td>
<td>PU paint (Minimum 50µm)</td>
<td>Min- imum 100µm</td>
<td>Matching shade of tank/ different shade aesthetic matching to tank</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
<td>------------------------</td>
<td>----------------</td>
<td>----------------------------------</td>
</tr>
</tbody>
</table>

**Manufacturer may also offer Radiators with hot dip galvanized (in place of painting) with minimum thickness of 40µm (min)**

<table>
<thead>
<tr>
<th>Radiator and pipes up to 80 NB (Internal surfaces)</th>
<th>Chemical cleaning, if required</th>
<th>Hot oil proof, low viscosity varnish or Hot oil resistant, non-corrosive Paint</th>
<th>--</th>
<th>--</th>
<th>--</th>
<th>--</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Digital RTCC Panel</th>
<th>Seven tank process as per IS:3618 &amp; IS:6005</th>
<th>Zinc chromate primer (two coats)</th>
<th>--</th>
<th>EPOXY paint with PU top coat or POWDER Coated</th>
<th>Minimum 80µm / for powder Coated</th>
<th>Minimum 100µm</th>
<th>RAL 7035 shade for exterior and Glossy white for interior</th>
</tr>
</thead>
</table>

Control cabinet / Marshalling Box - No painting is required.
Note:
*indicates Sa 2 ½ as per Swedish Standard SIS 055900 of ISO 8501 Part-1. #NB: Nominal Bore

******
# Annexure–I

## I. UNUSED INHIBITED HIGH GRADE INSULATING OIL PARAMETERS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Property</th>
<th>Test Method</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A Function</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1a.</td>
<td>Kinematic Viscosity at 40 °C</td>
<td>IS 1448 Part 25 or ISO 3104 or ASTM D7042</td>
<td>12 mm²/s (Max.)</td>
</tr>
<tr>
<td>1b.</td>
<td>Kinematic Viscosity at -30 °C</td>
<td></td>
<td>1800 mm²/s (Max.)</td>
</tr>
<tr>
<td>2.</td>
<td>Appearance</td>
<td>A representative sample of the oil shall be examined in a 100 mm thick layer, at ambient temperature</td>
<td>The oil shall be clear and bright, transparent and free from suspended matter or sediment</td>
</tr>
<tr>
<td>3.</td>
<td>Pour point</td>
<td>IS 1448 Part 10/Sec 2 or ISO 3016</td>
<td>-40 °C (Max.)</td>
</tr>
</tbody>
</table>
| 4. | Water content | a) for bulk supply  
                        b) for delivery in drums | IEC 60814  
                        30 mg/kg (Max.)  
                        40 mg/kg (Max.) |
| 5. | Electric strength (breakdown voltage) | IS 6792 or IEC 60156 | Minimum 30 kV (new unfiltered oil) / 70 kV (after treatment) |
| 6. | Density at 20 °C | IS 1448 Part 16 or ISO 12185 or ISO 3675 or ASTM D7042 | 895 kg/m³ (Max.) |
| 7. | Dielectric dissipation factor (tan delta) at 90 °C | IS 16086 or IEC60247 or IEC 61620 | 0.0025 (Max.) |
| 8. | Negative impulse testing KVp @ 25 °C | ASTM D3300 | 145 (Min.) |
| 9. | Carbon type composition (% of Aromatic, Paraffins and Naphthenic compounds) | IEC 60590 and IS 13155 or ASTM D2140 | Maximum Aromatic : 4 to 12%  
                        Paraffins : <50%  
                        & balance shall be Naphthenic compounds. |
| **B Refining/Stability** | | | |
| 1. | Colour | ISO 2049 | L0.5 (less than 0.5) |
### 2. Appearance
- Clear, free from sediment and suspended matter

### 3. Neutralization Value (Total Acidity)
- IEC 62021-1 or IEC 62021-2
- 0.01 mg KOH/g (Max.)

### 4. Interfacial tension at 27°C
- IEC 62961 or ASTM D971
- 0.043 N/m (Min.)

### 5. Total sulphur Content
- ISO 14596 or ISO 8754
- 0.05 % (Max.) (before oxidation test)

### 6. Corrosive sulphur
- DIN 51353
- Not Corrosive

### 7. Potentially corrosive sulphur
- IEC 62535
- Not Corrosive

### 8. Presence of oxidation inhibitor
- IS 13631 or IEC 60666
- 0.08% (Min.) to 0.4% (Max.)

### 9. DBDS
- IEC 62697-1
- Not detectable (<5 mg/kg)

### 10. Metal passivator Additives
- IEC 60666
- Not detectable (<5 mg/kg)

### 11. 2-Furfural and related compound Content
- IS 15668 or IEC 61198
- Not detectable (<0.05 mg/kg) for each individual Compound

### 12. Stray gassing under thermo-oxidative stress
- Procedure in Clause A.4 of IEC 60296-2020 (oil saturated with air) in the presence of copper
- Non stray gassing:
  - < 50 µl/l of hydrogen (H2) and < 50 µl/l methane (CH4) and < 50 µl/l ethane (C2H6)

### C Performance

<table>
<thead>
<tr>
<th>Test</th>
<th>Duration</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxidation stability</td>
<td>IEC 61125 (method c) Test duration: 500 hours</td>
<td></td>
</tr>
<tr>
<td>-Total acidity*</td>
<td>4.8.4 of IEC 61125:2018</td>
<td>0.3 mg KOH/g (Max.)</td>
</tr>
<tr>
<td>-Sludge*</td>
<td>4.8.1 of IEC 61125:2018</td>
<td>0.05 % (Max.)</td>
</tr>
<tr>
<td>-Dielectric Dissipation Factor* (tan delta) at 90 °C</td>
<td>4.8.5 of IEC 61125:2018</td>
<td>0.05 (Max.)</td>
</tr>
</tbody>
</table>

*values at the end of oxidation stability test

### D Health, safety and environment (HSE)
1. Flash point | IS 1448 Part 21 or ISO 2719 | 135 °C (Min.)
2. Poly Cyclic Aromatic (PCA) Content | IP 346 | <3%
3. Poly Chlorinated Biphenyl (PCB) content | IS 16082 or IEC 61619 | Not detectable (< 2 mg/kg)

Note: Supplier shall declare the chemical family and function of all additives and the concentrations in the cases of inhibitors, antioxidants and passivators.

II. Oil used for first filling, testing and impregnation of active parts at manufacturer's works shall meet parameters as mentioned below

<table>
<thead>
<tr>
<th></th>
<th>Break Down voltage (BDV)</th>
<th>-</th>
<th>70kV (Min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Moisture content</td>
<td>-</td>
<td>5 ppm (Max.)</td>
</tr>
<tr>
<td>3</td>
<td>Tan-delta at 90°C</td>
<td>-</td>
<td>0.005 (Max.)</td>
</tr>
<tr>
<td>4</td>
<td>Interfacial tension</td>
<td>-</td>
<td>0.04 N/m (Min.)</td>
</tr>
</tbody>
</table>

III. Each lot of the oil shall be tested prior to filling in main tank at site for the following:

<table>
<thead>
<tr>
<th></th>
<th>Break Down voltage (BDV)</th>
<th>-</th>
<th>70 kV (Min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Moisture content</td>
<td>-</td>
<td>5 ppm (Max.)</td>
</tr>
<tr>
<td>3</td>
<td>Tan-delta at 90°C</td>
<td>-</td>
<td>0.0025 (Max.)</td>
</tr>
<tr>
<td>4</td>
<td>Interfacial tension</td>
<td>-</td>
<td>0.04 N/m (Min.)</td>
</tr>
</tbody>
</table>

IV. After filtration & settling and prior to energization at site oil shall be tested for following:

<table>
<thead>
<tr>
<th></th>
<th>Break Down voltage (BDV)</th>
<th>-</th>
<th>70 kV (Min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Moisture content at hot Condition</td>
<td>-</td>
<td>5 ppm (Max.)</td>
</tr>
<tr>
<td>3</td>
<td>Tan-delta at 90°C</td>
<td>-</td>
<td>0.005 (Max.)</td>
</tr>
<tr>
<td>4</td>
<td>Interfacial tension</td>
<td>-</td>
<td>0.04 N/m (Min.)</td>
</tr>
<tr>
<td>5</td>
<td>*Oxidation Stability</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------</td>
<td>-----------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>a) Acidity</td>
<td></td>
<td>0.3 (mg KOH /g) (Max.) - For Inhibited Oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.2 mg KOH/g (Max.) - For Uninhibited Oil</td>
<td></td>
</tr>
<tr>
<td>b) Sludge</td>
<td></td>
<td>0.05 % (Max.) - For Inhibited Oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.8 % (Max.) - For Uninhibited Oil</td>
<td></td>
</tr>
<tr>
<td>c) Tan delta at 90 °C</td>
<td></td>
<td>0.05 (Max.) - For Inhibited Oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 (Max.) - For Uninhibited Oil</td>
<td></td>
</tr>
<tr>
<td>6 Total PCB content*</td>
<td></td>
<td>Not detectable (&lt; 2 mg/kg)</td>
<td></td>
</tr>
</tbody>
</table>

* Separate oil sample shall be taken and test results shall be submitted within 45 days after commissioning for approval of the utility
PHYSICAL INTERCHANGEABILITY OF TRANSFORMERS OF DIFFERENT MAKES

1.0 One of the objectives of standardization is to achieve physical interchangeability of transformers of different makes, procured by DTL, by standardizing the minimum foundation loading to be considered for civil foundation design of transformers. In case of failure of any transformer, outage time to replace a failed unit by a spare unit/new unit of different make would be minimized as it can be accommodated in the same space without/minor modification in existing foundation.

2.0 In general, the foundation layout & design of transformer depends on weight of the transformer (with oil and all fittings & accessories), design of soak pit (with or without remote oil collecting pit) with trans rack/grating & gravels and free space to be kept below the transformer/reactor to accommodate oil and water in case of fire. The number of rails, number & location of jacking pads of transformers are also equally important.

3.0 The foundation design should take into account the following points:

a) The foundations of transformer should be of block type foundation. Minimum reinforcement should be governed by IS: 456.

b) Transformer can be placed on foundation either directly or on roller assembly (with suitable locking arrangement) along with suitable anti Earthquake Clamping Device as specified in this specification.

c) The plinth height of transformer foundation may be kept from 300 mm to 500 mm above finished ground level of the substation/switchyard depending upon the size of the transformer. Pulling blocks should be provided for shifting of transformer for maintenance purposes.

d) The pedestal support should be provided for supporting the cooler bank, firefighting system etc. The RCC Rail-cum-road system integrated with the transformer foundation may be provided to enable installation and the replacement of any failed unit. The transfer track system should be suitable to permit the movement of any failed unit fully assembled (including OLTC, bushings) with oil.
This system should enable the removal of any failed unit from its foundation to the nearest road. If trench/drain crossings are required, then suitable R.C.C. culverts should be provided in accordance with I.R.C. standard/relevant IS.

e) Foundation of each transformer including oil conservator tank and cooler banks etc. should be placed in a self-sufficient pit surrounded by RCC retaining walls (Pit walls). The retaining wall of the pit from the transformer should be such that no part of transformer is outside the periphery of retaining wall.

f) An oil soak pit of adequate capacity should be provided below each oil filled transformer to accommodate at least 150% of full quantity of oil contained in the transformer and minimum 300 mm thick layer of gravels/pebbles of approximately 40 mm size (spread over a steel iron grating/trans rack) providing free space below the grating. Alternatively, an oil soak pit should be provided below each transformer to accommodate 1/3rd of total quantity of oil contained in the transformer and minimum 300 mm thick layer of gravels/pebbles of approximately 40 mm size (spread over a steel iron grating/trans rack) providing free space below the grating provided a common remote oil collecting pit of capacity at least equal to oil quantity in the largest size transformer is provided for a group of transformers. Bottom of the soak pit below the transformer should be connected to the common oil collecting pit with drain pipe (two or more Hume/concrete pipes) of minimum 150 mm diameter with a slope not less than 1/96 for fast draining of oil and water through gravity from soak pit to the burnt oil collecting pit, which is generally located away from transformers.

g) Every soak pit below a transformer should be suitably designed to contain oil dropping from any part of the transformer/reactor.

h) The common remote oil collecting pit and soak pit (when remote oil collecting pit is not provided) should be provided with suitable automatic pumping facility, to always keep the pit empty and available for an emergency.

i) The disposal of transformer oil should be carried out in an environmental friendly manner.

j) The minimum height of the retaining walls of pit should be 150 mm to 200 mm above the finished ground level to avoid outside water pouring inside the pit. The bottom of the pit is generally made of PCC M15 grade and should have a uniform slope towards the sump pit. While designing the oil collection pit, the movement of the transformer must be taken into account.

k) The grating shall be made of MS flat of size 30 mm x 5 mm at spacing of 30 mm and MS bar of 6 mm dia at spacing of 150 mm at right angle to each other. Maximum length & width of grating should be 2000 mm & 500 mm respectively. The gratings, supported on ISMB 150 mm, should be
placed at the formation level and will be covered with 300 mm thick layer of stone aggregate having size 40 mm (approximate). All steel work used for grating and supports should be painted with epoxy based zinc phosphate primer (two packs) confirming to IS: 13238-1991, thereafter with two or more coat of bituminous paint of approved quality should be applied.

l) In case of transformers with separately mounted cooler / radiator bank, the position of the cooler / radiator bank has been recommended on the left side of the transformer when viewing from HV side. However, transformer shall be designed in such a way that cooler / radiator bank can be positioned on either side of the main tank. Similarly the conservator shall be on the left side of the tank while viewing from HV side.

m) The separation wall(s) or fire barrier wall(s) of four hours fire withstand rating shall be provided between the transformers and/or reactors or between the transformer(s)/reactor(s) & the adjacent wall of a building if wall of the building do not have the capability to withstand fire for a duration of four (4) hours as per Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations.

n) Other requirement related to civil construction of foundation may be specified by DTL in line with relevant BIS standards and best practices.

4.0 It is a fact that maximum weight of transformer (with oil and all fittings & accessories) and outline dimension do not vary much from manufacturer to manufacturer for same rating. Hence a common foundation layout plan with soak pit (with oil and all fittings & accessories) with loading details would facilitate the interchangeability of transformers of different make of similar/same ratings. The DTL will strive to standardize the foundation plan for different rating of transformers so that transformers of different makes could be accommodated in the same space with minor modification/without any modification in the existing foundation resulting in reduction in the outage time of replacement of old transformer.

5.0 The rail track gauge shall be 1676 mm. 3-Phase auto transformers of 400kV class shall have four (4) rails and other voltage class transformers shall have two (2) rails.

6.0 The manufacturers have different arrangement of jacking and different spacing between jacking pads. Hence, it is difficult to standardize the civil foundation drawing based on jacking pad locations arrangement. Design of block foundation based on weight of transformer for a particular MVA/MVAR rating along with no. of rails as mentioned above and provision of suitable size of portable metal plate for jacking ([(400 mm x 400 mm x 32 mm thick)/(300 mm x
300 mm x 30 mm thick]) would facilitate the physical interchangeability of transformers of different make on same foundation block. One set of metal plates for jacking of transformer shall be provided by OEM/contractor. Minimum size of metal plates for jacking and minimum weight of transformer to be considered for design of foundation block shall be as follows:

<table>
<thead>
<tr>
<th>Rating of Transformer (MVA, Voltage ratio, no. of Phases)</th>
<th>Weight of transformer (in metric Tons)</th>
<th>Minimum size of removable metal plates for Jacking of transformer</th>
</tr>
</thead>
<tbody>
<tr>
<td>500MVA, 400/220/33kV 400/230/33kV, 3-Phase Auto Transformer</td>
<td>450</td>
<td>400 mm x 400 mm x 32 mm thick</td>
</tr>
<tr>
<td>315MVA, 400/220/33kV 400/230/33kV 3-Phase Auto Transformer</td>
<td>375</td>
<td>400 mm x 400 mm x 32 mm thick</td>
</tr>
<tr>
<td>315MVA, 400/132/33 kV 3-Phase Auto Transformer</td>
<td>375</td>
<td>400 mm x 400 mm x 32 mm thick</td>
</tr>
<tr>
<td>160MVA, 220/66kV, or 20/66kV, 3-Phase Power Transformer</td>
<td>225</td>
<td>400 mm x 400 mm x 32 mm thick</td>
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<tr>
<td>100MVA, 220/33kV or 230/33kV, 3-Phase Power Transformer</td>
<td>200</td>
<td>400 mm x 400 mm x 32 mm thick</td>
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<tr>
<td>31.5MVA, 132/33kV or 110/33kV, 3-Phase Power Transformer</td>
<td>100</td>
<td>300 mm x 300 mm x 30 mm thick</td>
</tr>
<tr>
<td>31.5MVA/20MVA/12.5MVA, 3-Phase</td>
<td>75</td>
<td>300 mm x 300 mm x 30 mm thick</td>
</tr>
</tbody>
</table>

******
1.1 Separate cables shall be used for AC & DC.

1.2 Separate cables shall be used for DC1 & DC2.

1.3 At least one (1) core shall be kept as spare in each copper control cable of 4C, 5C or 7C size whereas minimum no. of spare cores shall be two (2) for control cables of 10 core or higher size.

1.4 The Aluminium/Copper conductors used for manufacturing the cables shall be true circular in shape before stranding; shall be of good quality, free from defects and shall conform to IS 8130.

1.5 The fillers and inner sheath shall be of non-hygroscopic, fire retardant material, shall be softer than insulation and outer sheath shall be suitable for the operating temperature of the cable.

1.6 Progressive sequential marking of the length of cable in metres at every one metre shall be provided on the outer sheath of all cables.

1.7 Strip wire armouring method (a) mentioned in Table 5, Page-6 of IS: 1554 (Part 1) – 1988 shall not be accepted for any of the cables. For control cables only round wire armouring shall be used.

1.8 The cables shall have outer sheath of a material with an oxygen index of not less than 29 and a temperature index of not less than 250°C.

1.9 All the cables shall conform to fire resistance test as per IS: 1554 (Part - I).

1.10 The normal current rating of all PVC insulated cables shall be as per IS: 3961.

1.11 Repaired cables shall not be accepted.

1.12 Allowable tolerance on the overall diameter of the cables shall be ± 2 mm.
1.13 PVC Power Cables

1.13.1 The PVC insulated 1100V grade power cables shall be of Fire Retardant Low Smoke Halogen (FRLSH) type, C2 category, conforming to IS: 1554 (Part-I) and its amendments read along with this specification and shall be suitable for a steady conductor temperature of 85°C. The conductor shall be stranded aluminium of H2 grade conforming to IS 8130. The insulation shall be extruded PVC of type-C of IS: 5831. A distinct inner sheath shall be provided in all multi core cables. For multi core armoured cables, the inner sheath shall be of extruded PVC. The outer sheath shall be extruded PVC of Type ST-2 of IS: 5831 for all cables. The copper cable of required size can also be used.

1.14 PVC Control Cables

1.14.1 The 1100V grade control cables shall be of FRLSH type, C2 category conforming to IS: 1554 (Part-I) and its amendments, read along with this specification. The conductor shall be stranded copper. The insulation shall be extruded PVC of type A of IS: 5831. A distinct inner sheath shall be provided in all cables whether armoured or not. The outer sheath shall be extruded PVC of type ST-1 of IS: 5831 and shall be grey in colour except where specifically advised by the purchaser to be black.

1.14.2 Cores shall be identified as per IS: 1554 (Part-1) for the cables up to five cores and for cables with more than five (5) cores the identification of cores shall be done by printing legible Hindu Arabic Numerals on all cores as per clause 10.3 of IS : 1554 (Part - 1).

*******
SPECFICATION FOR OIL STORAGE TANK  (Quantity as per scope)

1. Oil storage tank shall be of adequate capacity as specified by the utility along with complete accessories. The oil storage tank shall be designed and fabricated as per relevant Indian Standards e.g. IS: 803 or other internationally acceptable standards. Transformer oil storage tanks shall be towable on pneumatic tyres and rested on manual screw jacks of adequate quantity & size. The tank shall be cylindrical in shape and mounted horizontally and made of mild steel plate of adequate thickness. Diameter of the tank shall be 2.0 meter approximately. The tank shall be designed for storage of oil at a temperature of 100\degree C.

2. The maximum height of any part of the complete assembly of the storage tank shall not exceed 4.0 metres above road top.

3. The tank shall have adequate number of jacking pad so that it can be kept on jack while completely filled with oil. The tank shall be provided with suitable saddles so that tank can be rested on ground after removing the pneumatic tyres.

4. The tank shall also be fitted with manhole, outside & inside access ladder, silica gel breather assembly, inlet & outlet valve, oil sampling valve with suitable adopter, oil drainage valve, air vent etc. Pulling hook on both ends of the tank shall be provided so that the tank can be pulled from either end while completely filled with oil. The engine capacity in horse power to pull one tank completely fitted with oil shall be indicated.

5. Oil level indicator shall be provided with calibration in terms of litre so that at any time operator can have an idea of oil in the tank.

6. Solenoid valve (Electro-mechanically operated) with Centrifugal pump shall be provided at bottom inlet so that pump shall be utilized both ways during oil fill up and draining. Suitable arrangement shall also be provided to prevent overflow and drain from the tank.
7. The following accessories shall also form part of supply along with each Oil storage tank.

(a) Four numbers of 50 NB rubber hoses suitable for Transformer oil application up to temperature of 100°C, full vacuum and pressure up to 2.5 Kg/cm² with couplers and unions each not less than 10 metre long shall be provided.

(b) Two numbers of 100 NB rubber hose suitable for full vacuum without collapsing & kinking vacuum hoses with couplers & unions, each not less than 10 metre long, shall also be provided.

(c) One number of digital vacuum gauge with sensor capable of reading up to 0.001 torr, operating on 240V 50Hz AC supply shall be supplied. Couplers and unions for sensor should block oil flow in the sensor. Sensor shall be provided with at-least 8 meter cable so as to suitably place the Vacuum gauge at ground level.

(d) The painting of oil storage tank and its control panel shall be as per Annexure-K.

The tank shall contain a self-mounted centrifugal oil pump with inlet and outlet valves, with couplers -suitable for flexible rubber hoses and necessary switchgear for its control. There shall be no rigid connection to the pump. The pump shall be electric motor driven, and shall have a discharge of not less than 6.0 kl/hr. with a discharge head of 8.0m. The pump motor and the control cabinet shall be enclosed in a cubicle with IP-55 enclosure.
1. Oil sampling bottles shall be supplied as specified by the utility and shall be suitable for collecting oil samples from transformers and shunt reactors, for Dissolved Gas Analysis (DGA). Bottles shall be robust enough, so that no damage occurs during frequent transportation of samples from site to laboratory.

2. Oil sampling bottles shall be made of stainless steel having a capacity of one litre. Oil Sampling bottles shall be capable of being sealed gas-tight and shall be fitted with cocks on both ends.

3. The design of bottle & seal shall be such that loss of hydrogen shall not exceed 5% per week.

4. An impermeable oil-proof, transparent plastic or rubber tube of about 5 mm diameter, and of sufficient length shall also be provided with each bottle along with suitable connectors to fit the tube on to the oil sampling valve of the equipment and the oil collecting bottles respectively.

SPECIFICATION FOR OIL SYRINGE (Quantity as per scope)

1. If specified by the utility, the glass syringe of capacity 50 ml (approx.) and three way stop cock valve shall be supplied. The syringe shall be made from Heat resistant borosilicate Glass, shall have metal luer lock tip and shall comply with BS EN ISO 595-2 and ISO 80369-7. The material and construction should be resistant to breakage from shock and sudden temperature changes, reinforced at luer lock tip Centre and barrel base. The cylinder-plunger fitting shall be leak proof and shall meet the requirement of IEC-60567. Plunger shall be grounded and fitted to barrel for smooth movement with no back flow. Barrel rim should be flat on both sides to prevent rolling and should be wide enough for convenient finger tip grip. The syringe shall be custom fit and uniquely numbered for matching. The syringe shall be clearly marked with graduations of 2.0 ml and 10.0 ml and shall be permanently fused for life time legibility.

******
## SCOPE OF DESIGN REVIEW

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
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<tr>
<td>Core and Magnetic Design</td>
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<tr>
<td>Over-fluxing characteristics up to $1.7 \text{ U}_m$ (for transformer)</td>
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<tr>
<td>Inrush-current characteristics while charging</td>
</tr>
<tr>
<td>Winding and winding clamping arrangements</td>
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<tr>
<td>Characteristics of insulation paper</td>
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<td>Typical data and parameters mentioned in GTP</td>
</tr>
<tr>
<td>Short-circuit withstand capability including thermal stress / withstand capability for 2 seconds</td>
</tr>
<tr>
<td>Thermal design including review of localized potentially hot area</td>
</tr>
<tr>
<td>Structural design</td>
</tr>
<tr>
<td>Cooling design</td>
</tr>
<tr>
<td>Overload capability</td>
</tr>
<tr>
<td>Calculations of losses, flux density, core quantity etc.</td>
</tr>
<tr>
<td>Calculations of hot spot temperature</td>
</tr>
<tr>
<td>Eddy current losses</td>
</tr>
<tr>
<td>Seismic design, as applicable</td>
</tr>
<tr>
<td>Insulation co-ordination</td>
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<tr>
<td>Tank and accessories</td>
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<tr>
<td>Bushings</td>
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<tr>
<td>Mechanical layout design including lead routing and bushing termination</td>
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<td>Tapping design (as applicable)</td>
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<td>Protective devices</td>
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<tr>
<td>Number, locations and operating pressure of PRD</td>
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<tr>
<td>Location, Operating features and size of Sudden Pressure Relay/ Rapid Pressure Rise Relay</td>
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<td>Radiators, Fans and Pumps (as applicable)</td>
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<td>Sensors and protective devices—its location, fitment, securing and level of redundancy</td>
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<td>Oil and oil preservation system</td>
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<tr>
<td>Corrosion protection</td>
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<td>Electrical and physical Interfaces with substation</td>
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<td>Earthing (Internal &amp; External)</td>
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<td>Processing and assembly</td>
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<tr>
<td>Testing capabilities</td>
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<tr>
<td>Inspection and test plan</td>
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<td>Transport and storage</td>
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<tr>
<td>Sensitivity of design to specified parameters</td>
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<td>Acoustic Noise</td>
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<td>Spares, inter-changeability and standardization</td>
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<td>Maintainability</td>
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<td>Conservator capacity calculation</td>
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<td>Winding Clamping arrangement details with provisions for taking it “in or out of tank”</td>
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<td>Conductor insulation paper details</td>
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<tr>
<td>Location and numbers of Optical temperature sensors (if provided)</td>
</tr>
<tr>
<td>The design of all current connections</td>
</tr>
<tr>
<td>Location &amp; size of the Valves</td>
</tr>
<tr>
<td>Manufacturing facilities and manufacturing environment (clean, dust free, humidity controlled environment)</td>
</tr>
</tbody>
</table>

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ANNEXURE –O

TRANSPORTATION, ERECTION, TESTING AND COMMISSIONING

1.0 Transportation

1.1. The supplier shall be responsible to select and verify the route, mode of transportation and make all necessary arrangement with the appropriate authorities for the transportation of the equipment. The dimension of the equipment shall be such that when packed for transportation, it shall comply with the requirements of loading and clearance restrictions for the selected route. It shall be the responsibility of the supplier to coordinate the arrangement for transportation of the transformer/reactor for all the stages from the manufacturer’s work to site.

1.2. The supplier shall carry out the route survey along with the transporter and finalize the detail methodology for transportation of transformer/reactor and based on route survey; any modification/extension/improvement to existing road, bridges, culverts etc. if required, shall be in the scope.

1.3. The inland transportation of the transformer/reactor shall be on multi-axel low platform trailers of adequate capacity and equipped with GPS system for tracking the location of transformer at all times during transportation from manufacturer works to designated site. The supplier shall intimate to purchaser about the details of transporter engaged for transportation of the transformer/reactor for tracking the units during transit. Requirement of Hydraulic trailer is envisaged for a load of more than 40 T. The transportation during monsoon period should be avoided as far as possible.

1.4. All metal blanking plates and covers which are specifically required for transportation and storage of the transformer/ reactor shall be considered as part of the transformer/reactor and shall be handed over to the Purchaser after completion of the erection. Bill of quantity of these items shall be included in the relevant drawing/document.
15. The supplier shall despatch the transformer/reactor filled with dry air conforming to EN 12021 or filled with Nitrogen at positive pressure. The necessary arrangement shall be ensured by the supplier to take care of pressure drop of dry air/Nitrogen during transit and storage till completion of oil filling during erection. A dry air/Nitrogen pressure testing valve with necessary pressure gauge and adaptor valve shall be provided. The duration of the storage of transformer/reactor at site with dry air/ Nitrogen, shall preferably be limited to three months (including the duration of transportation), after which the recommendation of manufacturer is to be followed if it is not filled with oil. The dry air/Nitrogen cylinder(s) (with regulating valves) provided to maintain positive pressure can be taken back by the supplier after oil filling.

In case turret, having insulation assembly, is transported separately then positive dry air/Nitrogen pressure shall be ensured.

16. The largest / heaviest package of transformer / reactor shall be sufficiently lashed and same shall be checked before dispatch from the manufacturing unit.

17. Transformer/reactor shall also be fitted with at least 2 numbers Electronic impact recorders (on returnable basis) in diagonally opposite position (to eliminate chances of loss of data to failure of recorder) during transportation to measure the magnitude and duration of the impact in all three directions. The impact recorder shall be mounted on the upper side of the tank (width wise). The acceptance criteria and limits of impact, which can be withstood by the equipment during transportation and handling in all three directions, shall not exceed “3g” for 50 msec (20Hz) or as per OEM standard, whichever is lower.

Following setting of impact recorder shall be ensured at the time of installation with transformer/reactor unit before despatch from factory:

1g: Start recording
2g: Warning
3g: Alarm

Further, drop-out setting shall be 1g and threshold setting shall be in the range of 5g to 10g.
2.0 Points to be checked after receipt of transformer/reactor at site in presence of manufacturer’s and purchaser’s representative:

2.1. The transformer/reactor unloading and handling work at site should be carried out by skilled people, under the supervision of manufacturer’s representative.

2.2. A careful external inspection must be made when transformer/reactor arrives at site. Condition of each package and its contents and visible parts of transformer/reactor etc. shall be checked for any damage and recorded.

2.3. Pressure and Dew point of dry air/Nitrogen shall be checked after receipt of transformer/reactor at site. It should be within permissible band as per relevant standards.

2.4. In case of transportation of transformer/reactor in oil filled condition, oil level & leakage (if any) shall be checked.

2.5. In case of any damage or dry air/ oil leakage beyond permissible limit, the manufacturer shall be informed immediately.

2.6. In case of dry air/ nitrogen leakage is beyond permissible limit, the dry air pressurization to be done on a continuous basis to safe guard the transformer Core Coil Assembly (CCA) condition till the problem is located and solved.

2.7. Core Insulation Test shall be carried out to check healthiness of insulation between core to tank, core to yoke clamp (frame) and yoke clamp (frame) to tank. (Not applicable for Air Core Reactors)

2.8. The data of impact recorder shall be analyzed jointly by the purchaser in association with the manufacturer. In case the impact recorder indicates shocks of $\geq 3g$ during shipment, further course of action for internal inspection shall be taken jointly by the manufacturer & supplier. Impact Recorder should be detached from the Transformer/ Reactor, preferably after the main unit has been placed on its foundation.

2.9. Unpacking and inspection of all accessories shall be carried out taking all precautions so that the tools used for opening do not cause damage to the contents. Proper storage of all accesso-
ries shall be ensured after unpacking in line with the OEM’s recommendation. Fragile instruments like oil level gauge, temperature indicators, etc. are to be stored indoor. Any damaged or missing components shall be reported to equipment manufacturer and insurance agency so that the same can be investigated or shortage made up as per the terms/conditions of the contract. All accessories for long storage shall be packed by OEM in special packing case.

3.0 Storage of the main unit and the accessories at site:

3.1 If erection work cannot start immediately due to some reasons, then accessories shall be repacked into their own crates properly and packing list should be retained.

3.2 All packing cases shall be kept above ground by suitable supports so as to allow free air flow underneath. The storage space area shall be such that it is accessible for inspection, water does not collect on or around the area and handling/transport is easy. Proper drainage arrangement in storage areas to be ensured so that in no situation, any component gets submerged in water due to rain, flooding etc.

3.3 It is preferable to store the main unit on its own location/foundation. If the foundation is not likely to be ready for more than three (3) months, then suitable action has to be recommended by OEM.

3.4 If the transformer/reactor is to be stored up to three (3) months (including the duration of transportation) after arrival at site, it can be stored with dry air filled condition. Dry air pressure shall be monitored on daily basis so that chances of exposure of active part to atmosphere may be avoided. In case of drop in dry air pressure, dew point of dry air shall be measured to check the dryness of the transformer/reactor. If there is drop in dew point, fresh dry air need to be filled. Leaks shall be identified and rectified and dry air shall be filled to the required pressure.

3.5 In case the transformer/reactor is to be stored for more than 3 months, it shall be stored in oil filled condition. Processed oil shall be filled which complies with the required specification with moisture content ≤ 5 ppm and BDV ≥ 70kV. In case of storage of transformer/reactor in oil-filled condition, the oil filled in the units shall be tested for BDV and moisture contents once in every three months. The oil sample shall be taken from bottom valve. If BDV is less
and moisture content is more than as given for service condition, then oil shall be filtered.

4.0 Internal Inspection

4.1 Before starting erection, thorough internal inspection of transformer/reactor shall be carried out by engineer along with manufacturer’s representative.

4.2 Internal inspection shall preferably be carried out in dry and sunny weather along with circulation of dry air (With working person inside the tank, a minimum of 20 cfm/0.56 cubic-meter/minute of breathable air and additional 5 cfm/0.14 cubic-meter/minute for each additional person should be purged in the tank. Entry of person inside the tank should be avoided if adequate space is not available as in case of smaller rating of transformer.) using dry air generator of dew point -40\(^\circ\) C or better and shall be completed as quickly as possible to avoid ingress of moisture. If the Ambient humidity exceeds 65 % the internal inspection is to be avoided.

4.3 Prior to making any entry into the transformer/reactor tank, a foreign material exclusion programme shall be established to avoid the danger of any foreign objects falling into the transformer/reactor:

- Loose articles should be removed from the pockets of anyone working on the transformer/reactor cover.
- All jewelry, watches, pens, coins and knives should be removed from pockets.
- Protective clothing and clean shoe covers are recommended.
- Tools should be tied with clean cotton tape or cord securely fastened.
- Plated tools or tools with parts that may become detached should be avoided.
- An inventory of all parts taken into transformer/reactor should be recorded and checked before closing inspection cover to assure all items were removed.

If any object is accidentally dropped into the transformer/reactor and cannot be retrieved, the manufacturer should be notified.

4.4 The inspection should include:

- Removal of any shipping, blocking or temporary support.
- Examination for indication of core shifting.
- Tests for unintentional core or core clamp grounds.
- Visual inspection of windings, leads, and connections including clamping, bracing, blocking, spacer alignment, phase barriers, oil boxes, and coil wraps.
- Inspection of De-energized Tap Changer (DETC) and in-tank On-Load Tap Changers (LTCs) including contact alignment and pressure.
- Inspection of current transformers including supports and wiring harness.
- Checks for dirt, metal particles, moisture, or other foreign material.
- Any other suspected damage based on impact recorder readings

In case of any abnormality noticed during internal inspection, same shall be referred to manufacturer immediately before starting erection activities. Detailed photographs of all visible parts/components as per above shall be taken during internal inspection and shall be attached with pre-commissioning report.

5.0 Precautions during erection

5.1 During all erection activities, a well-qualified and experienced representative of manufacturer shall be present at the site for supervision and other necessary activities.

5.2 During erection, efforts shall be made to minimize the exposure of active parts (core and coils) of transformer/reactor. Moisture may condense on any surface cooler than the surrounding air. Excessive moisture in insulation or dielectric liquid lowers its dielectric strength and may cause a failure of transformer/reactor.

5.3 For transformer/reactor with a gas pressure of 2.5-3 PSI, the acceptable limits of dew point shall be as under:

TABLE 1- Variation of dew point of dry air/N2 Gas filled in transformer/reactor tank w.r.t temperature

<table>
<thead>
<tr>
<th>Temperature of Insulation in °F</th>
<th>Permissible dew point in °F</th>
<th>Temperature of Insulation in °C</th>
<th>Permissible dew point in °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-78</td>
<td>-17.77</td>
<td>-61.11</td>
</tr>
<tr>
<td>5</td>
<td>-74</td>
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<td>10</td>
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<tr>
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<td>-3.33</td>
<td>-49.99</td>
</tr>
<tr>
<td>30</td>
<td>-53</td>
<td>-1.11</td>
<td>-47.22</td>
</tr>
</tbody>
</table>
5.4 Final tightness test with vacuum (i.e. leakage test or Vacuum Drop Test)

Before oil filling is started, a final check is made for the tightness of the transformer/reactor tank by applying vacuum. After vacuum is applied to a transformer/reactor main tank without oil, leakage test must be carried out to ensure that there are no leaks on the tank which would result in ambient air being drawn into the transformer/reactor.

6.0 Drying of wet winding of transformer/reactor by application of vacuum, dry nitrogen gas filling and heating

The drying of a new transformer/reactor is required on the first commissioning and when the moisture gets absorbed by the solid insulation used in transformer/reactor due to various reasons.

6.1 After completion of drying process, oil filling and hot oil circulation is to be carried out before commissioning. Recommended standing time as per Table-2 given below before charging.

Table – 2

<table>
<thead>
<tr>
<th>Voltage class</th>
<th>Application of Vacuum &amp; holding for (before oil filling)*</th>
<th>STANDING TIME After Oil circulation and before energizing</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>-48</td>
<td>+1.66</td>
</tr>
<tr>
<td>40</td>
<td>-44</td>
<td>+4.44</td>
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<tr>
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<tr>
<td>50</td>
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</tr>
<tr>
<td>55</td>
<td>-31</td>
<td>12.77</td>
</tr>
<tr>
<td>60</td>
<td>-27</td>
<td>15.55</td>
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<td>-22</td>
<td>18.33</td>
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<tr>
<td>70</td>
<td>-18</td>
<td>23.11</td>
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<tr>
<td>Up to 145kV</td>
<td>12 HRS</td>
<td>12 HRS</td>
</tr>
<tr>
<td>145 kV and up to 420kV</td>
<td>24 HRS</td>
<td>48 HRS</td>
</tr>
<tr>
<td>Above 420 kV</td>
<td>36 HRS</td>
<td>120 HRS</td>
</tr>
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</table>

*Without running the vacuum pump and leakage rate to be ≤ 40 mbar·lit/sec*

After the completion of standing time, air release operation is to be carried out in Buchholz relays, turrets and other release points given by the manufacturers before charging. If the transformer has oil pumps, then the oil pumps are to be operated for a duration of 10 minutes before conducting the air release.

7.0 Oil Filling

Once the oil is tested from the drums and found meeting the requirements, the oil is transferred to oil storage tank for oil filtration before filling inside the transformer.

After filtration, particle count shall be done (Limiting value for the particle count are 1000 particle/100 ml with size ≥ 5 μm; 130 particle/100 ml with size ≥ 15 μm.) and oil sample is tested for meeting specification for new oil.

Prior to filling in main tank at site, it shall be tested for:

(a) Break Down voltage (BDV) : 70 kV (min.)
(b) Moisture content : 5 ppm (max.)
(c) Tan-delta at 90 °C : Less than 0.0025
(d) Interfacial tension : More than 0.04 N/m

For transformer/reactor dispatched with dry air filled from the works, the filling of oil inside the tank shall be done under vacuum. Transformer/reactor of high voltage ratings and their tanks are designed to withstand full vacuum.

When the oil filling, under vacuum of the transformer/reactor main tank and diverter tank, is complete, the cooling system/ radiator bank can be filled (without vacuum) at atmospheric pressure, via an oil processing plant. Oil must be admitted, very slowly, through the bottom cooler filter valve and the top cooler filter valve with air release valve kept open to atmosphere. As the oil level reaches the top vent, then top valve and air release valve are to be closed and the processing plant can be shut down.
Note: Care must be taken not to pressurize the coolers/radiators.

Before filling oil into the conservator, the air cell/bellow to be inflated to 0.5 PSIG i.e. 0.035 kg/cm² max. or upto the value recommended by the manufacturer by applying pressure (N2/Compressed dry air) so that it can take shape. After releasing pressure, breather pipe is to be fitted however it is recommended not to fit breather in position, instead a wire mesh guard may be connected over the flange of the pipe to prevent entry of any insect inside the pipe.

After Oil filling, Hot Oil Circulation has to be applied to the transformers/reactors except under the circumstances when active part of transformer/reactor gets wet. Following conditions can be considered to define the transformer/reactor wet:

1. If transformer/reactor received at site without positive dry air pressure.
2. If Dry air not used during exposure while doing erection activities
3. Overexposure of active part of transformer/reactor during erection (Overexposure when exposure > 12 Hrs)

Under above mentioned conditions, manufacturer shall take necessary action for effective dry out of the Transformer/Reactor

8.0 Hot oil circulation using high vacuum oil filter machine

To ensure proper dryness and absorption of possible trapped gas bubbles, the oil in the tank shall be circulated through the vacuum filter. The temperature of the oil from the filter to the transformer/reactor should be around 60°C and in no case it should go beyond 70°C otherwise this may cause oxidation of oil.

9.0 Safety measures and precautions

The following safety measures and precautions shall be followed:

(a) Keep recommended fire extinguishers at site.
(b) During hot oil circulation, keep fire extinguisher ready near transformer.
(c) Carry out all pre-commissioning test and final commissioning check as elaborated in this document before energizing transformer.
(d) Take precaution while handling PRV devices having heavy springs in compression to safeguard person and system.
(e) Provide adequately rated cables & fuses.
(f) Never apply voltage when transformer is under vacuum.
(g) Oil spillage shall be inspected regularly and attended, if any. Oil shall not be allowed to fall on
ground.
(h) Keep all combustible items at safe distance to reduce risk of fire.
(i) No welding work shall be taken up near transformer.
(j) Welding on oil filled transformer shall be avoided as far as possible. If, under special circum-
stances, welding is absolutely necessary, it shall be done as per instruction of manufacturer on-
ly.
(k) All erection personnel must use Personal Protective Equipment like, helmet, safety shoe, boiler
suit, etc.
(l) Electrical equipment like filter machine, dry air generator etc., must be earthed.
(m) First Aid box shall be kept ready at site.
(n) Adequate lighting must be available for clear visibility
(o) Cordon off the working area, particularly when transformer augmentation work in a switchyard
is taken up.
(p) All major erection activity like bushing, conservator and radiators must be carried out with
crane of adequate capacity and boom size.
(q) Never carry out work with unskilled workers.
(r) Safety posters, like “No Smoking”, “Wear Helmet”, etc., must be displayed.
(s) Use approved and tested Earth rods
(t) Safety Nodal Officer to make sure that site is cleared on daily basis to prevent fire hazards.

10.0 Pre-Commissioning checks and tests for Transformers and Reactors

Once oil filling is completed, following pre-commissioning checks and tests are performed to ensure
the healthiness of the Transformer/ Reactor prior to its energization.

The following checks should be carried out before commencement of the pre-commissioning tests:

(a) Ensure that transformer/reactor and its auxiliaries are free from visible defects on physical
inspection
(b) Ensure cleanliness of transformer and the surrounding areas
(c) Ensure that all fittings are as per out line General Arrangement Drawing
(d) Ensure that bushings are clean and free from physical damages
(e) Ensure that oil level is correct in all bushings
(f) Ensure that oil level in Main/OLTC Conservator tank in MOG is as desired.
(g) Ensure gear box oil level in OLTC
(h) Ensure that OTI and WTI pockets are filled with transformer oil
(i) Ensure that cap in the tan delta measurement point in the bushing is tight and grounded
(j) Ensure unused secondary cores of Bushing CT’s, if any, has been shorted
(k) Ensure CT secondary star point has been formed properly and grounded at one end only as per
scheme
(l) Ensure that Buchholz Relay is correctly mounted with arrow pointing towards conservator
(m) Ensure all power and control cable terminals are tightened
(n) Ensure all cables and ferrules are provided with number as per cable schedule
(o) Ensure that external cabling from junction box to relay/control panel is completed
(p) Ensure operation of cooling fans, oil pumps etc.
(q) Ensure correct operation of all protection devices and alarms/trip:
   i) Buchholz relay
   ii) Pressure Relief Device
   iii) Sudden Pressure Relay (if applicable)
   iv) Excessive winding temperature
   v) Excessive oil temperature
   vi) Low oil flow
   vii) Low oil level indication
   viii) Fan and pump failure protection (as applicable)

(r) Check for the adequate protection on the electric circuit supplying the accessories.
(s) Ensure operation of OLTC manually & electrically at local and remotely by RTCC/BCU/SAS
(t) Ensure that indication of tap position on Diverter switch, Drive mechanism & RTCC are same.
(u) Ensure working of numerical AVR
(v) Ensure that the cable glands have been packed properly. The unused holes if any have also been blanked.

The following pre-commissioning tests shall be carried out before energization:

(a) Insulation resistance measurement for the following:

   i) Control wiring
   ii) Cooling system motor and control circuit
   iii) Main windings (PI & DAI)
   iv) Tap changer motor and control (as applicable)

(b) Test on Bushing CTs
(c) 2 kV for 1 minute test between bushing CT terminal and earth
(d) Polarity and vector group test (for transformer)
(e) Ratio test on all taps (for transformer)
(f) Magnetising current test
(g) Magnetic balance test (for 3 phase transformer/reactor)
(h) Capacitance and Tan delta measurement of winding and bushing
(i) Tan delta of bushing at variable frequency (Dielectric frequency response)
(j) Frequency response analysis (FRA).
(k) Measurement of vibration and noise level (for reactor)
(l) Short circuit impedance test
(m) Contact resistance measurement
(n) Measurement of resistance of all windings on all steps of the tap changer
(o) Protection relay settings
(p) Measurement of safety clearances
(q) Measurement of earth pit resistance

11.0 Final commissioning checks
The following commissioning checks should be carried out before energization of the transformer/reactor:

(a) All the pre-commissioning test results of unit are verified and compared with factory results before commissioning.
(b) No leakage of oil in any part of unit.
(c) Ensure safe electrical clearance of conductor jumpers in the switchyard with transformer/reactor body, gantry, column, jumpers, fire wall etc.
(d) Ensure that tertiary winding terminals are insulated, when they are not used/connected to any system.
(e) Ensure earthing of Neutral, main tank body, radiator frame structure, fans and motor.
(f) Neutral earthing conductor of suitable size must run through support insulator and connected to two separate earthing pits which are in turn connected to main earth mat of switchyard.
(g) Ensure that conductor jumpers connected to HV, LV and tertiary terminals are not tight and should have the allowance for contraction. Also ensure that connectors are properly tightened at bushing terminal.
(h) Ensure that R,Y,B designated terminals of transformer/reactor are matching with R,Y,B buses of switchyards on HV and LV side.
(i) Ensure oil level in the Bushings.
(j) Ensure continuity of OLTC operation at all taps.
(k) In a transformer bank of three single phase units, ensure master-slave OLTC scheme.
(l) In a transformer bank of three single phase units, ensure tertiary connection and protection scheme (if provided).
(m) Ensure oil filling in conservator tank according to temperature scale in MOG and also ensure oil level in prismatic glass.
(n) Ensure that all valves between main tank and radiator banks are opened.
(o) Ensure those radiator valves connected to header are open.
(p) Ensure that valve to conservator tank via Buchholz relay is open.
(q) Ensure physical operation of local protections like Buchholz, PRV, Surge relay of OLTC etc.
(r) Ensure OTI and WTI settings of fan & pumps operation, Alarm and Trip as per approved drawings. Fan and pump operation shall be ensured locally and remotely.
(s) Review and ensure protection scheme of power transformer/reactor with over all protection scheme at remote end in control room.

For Transformer:
- Differential Protection
- Restricted Earth Fault (REF) Protection.
- Over current and Earth fault protection / impedance protection.
- Over fluxing Protection
- Tertiary Protection (if applicable)
- Over load alarm
- OTI & WTI- alarm and trip
- RTCC panel/relay interface with protection system
- Local protection like Buchholz, PRV etc.
- MOG-low oil alarm
- Integration of on-line condition monitoring equipment (if applicable).
• Integration of RTCC with BCU/SCADA system

For Reactor:
• Differential Protection
• Restricted Earth Fault (REF) Protection.
• Reactor backup protection (impedance protection/ Over current and Earth fault protection)
• OTI & WTI- alarm and trip
• Local protection like Buchholz, PRV etc.
• MOG-low oil alarm
• Integration of on-line condition monitoring equipment (if applicable).

(f) Ensure the common earthing of tank, frame and core provided in transformer.
(u) Ensure the shorting of spare cores of bushing CT’s.
(v) Ensure that cap in the tan delta measurement point in the bushing is put back.
(w) Ensure Fire Protection System and oil drain valve operation before charging and commissioning.
(x) Oil test results after filtration must be within specified limit.
(y) Spares like bushings shall be tested and kept ready before charging and commissioning.
(z) Allow minimum period of 24 hrs. after filtration for oil temperature to settle down.
(aa) Ensure release of air from plugs provided on top of main tank, conservator and radiator headers.
(bb) Take charging clearance certificate from all erection agencies for removal of man, material and T&P from site.
(cc) Ensure healthiness of Air Cell.
(dd) Ensure availability of oil in the breather cup in main tank/ OLTC tank.
(ee) Ensure all rollers are locked with rails if transformer is on rollers
(ff) Ensure door seals of Marshalling Box are intact and all cable gland plate’s unused holes are sealed.
(gg) Ensure change over operation of AC supply from source- I to source-II in local master control cubicle.
(hh) Ensure that all associated equipment of the bay e.g. CB, Isolator/Earth switch, CT/PT/CVT etc. has been checked properly as per OEM’s recommendations and utility practice.

12.0 Energization of transformer/ reactor

Commissioning of transformer / reactor is not complete unless it is put into regular service. Following activities to follow:

(a) Perform DGA just before commissioning
(b) Initially charge the transformer under no load.
(c) Continuously observe the transformer operation at no load for at least 24 hours.
(d) Gradually put the transformer on load, check and measure increase in temperature in relation to the load and check the operation with respect to temperature rise (monitor OTI & WTI), vibration, oil leakage, oil level indicators & gas detector relay and noise level etc.
(e) Check OLTC operation.
(f) Carry out Thermo-vision scanning of HV/LV terminals and tank body.[This test should be carried out once the transformer/reactor is stabilised and operating at higher temperature (> 60 deg.C)]
(g) Carry out DGA of oil after 24 hours, one week, 15 days, one month & 3 months of energisation at site, thereafter as per normal frequency of 6 months / as and when required based on the trend analysis.

Contractor shall prepare a comprehensive commissioning report and hand over testing and commissioning records to DTL for future reference and record.

*******
SPECIFICATION FOR ON-LINE INSULATING OIL DRYING SYSTEM
(CARTRIDGE TYPE)
(For 400 kV transformer and as per scope)

In addition to provision of air cell in conservators for sealing of the oil system against the atmosphere, each transformer of 400 kV voltage class shall be provided with an on line insulating oil drying system of adequate rating with proven field performance. This system shall be separately ground mounted and shall be housed in metallic (stainless steel) enclosure. The bidder shall submit the mounting arrangement. This on line insulating oil drying system shall be:

1. Designed for very slow removal of moisture that may enter the oil system or generated during cellulose decomposition. Oil flow to the equipment shall be controlled through pump of suitable capacity (at least 5 litres/minute).

2. The equipment shall display the moisture content in oil (PPM) of the inlet and outlet oil from the drying system.

3. In case, drying system is transported without oil, the same shall be suitable for withstanding vacuum to ensure that no air/ contamination is trapped during commissioning.

4. In case, drying system is transported with oil, the oil shall conform to the specification for unused oil. Before installation at site, oil sample shall be tested to avoid contamination of main tank oil.

5. Minimum capacity of moisture extraction shall be 10 Litres before replacement of cartridge. Calculation to prove the adequacy of sizing of the on line insulating oil-drying system along with make and model shall be submitted for approval of purchaser during detail engineering.

6. The installation and commissioning at site shall be done under the supervision of OEM representative or OEM certified representative.
7. The equipment shall be capable of transferring data to substation automation system confirming to IEC 61850 through FO port. Necessary interface arrangement shall be provided by the contractor for integration with the automation system.

8. The equipment shall be supplied with Operation Manual (2 set for every unit), Software (if any), and CD/DVD giving operation procedures of Maintenance Manual & Trouble shooting instructions.

*******
ANNEXURE Q

LIST OF CODES/STANDARDS/REGULATIONS/PUBLICATIONS

A list of Codes/Standards/Regulations/Publications which shall be used for design review, manufacturing, testing, erection, transportation etc. has been given below. In case of revision/amendment of these, revised/amended versions shall be followed.

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<thead>
<tr>
<th>Code</th>
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<td>Power transformers Part 2 Temperature-rise</td>
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<td>Power Transformers Part 3 Insulation Levels, Dielectric Tests and External Clearances in Air (Fourth Revision)</td>
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<td>Power Transformers Part 7 Loading Guide for Oil-Immersed Power Transformers</td>
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<td>IS 3024 : 2015</td>
<td>Grain Oriented Electrical Steel Sheet and Strip (Third Revision)</td>
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<td>Code of practice for selection, installation &amp; maintenance of transformer</td>
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<td>- Dimensions for porcelain transformers bushings for use in heavily polluted atmospheres 12/17.5kV, 24kV and 36kV</td>
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<td>- Methods for switching impulse tests on high voltage insulators</td>
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<td>High-voltage Test Techniques Part 1 General Definitions and Test Requirements (Third Revision)</td>
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<td>Metal arc welding of carbon and carbon manganese steels - Recommendations</td>
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<tr>
<td>IEEE Standard C57.156-2016</td>
<td>Guide for tank rupture mitigation of oil immersed transformers</td>
<td></td>
</tr>
<tr>
<td>IEEE Standard C57.150-2012</td>
<td>Guide for Transformer Transportation</td>
<td></td>
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<tr>
<td>IEEE Standard C57.149-2012</td>
<td>Guide for the application and interpretation of Frequency Response Analysis of immersed transformers</td>
<td></td>
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<tr>
<td>IEC 60599-2015</td>
<td>Mineral oil-filled electrical equipment in service - Guidance on the interpretation of dissolved and free gases analysis</td>
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<td>IEEE Std. C57.12.10 - 2017</td>
<td>Standard requirements for liquid immersed power transformers</td>
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<tr>
<td>IEEE Std. 57.104-2019</td>
<td>Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers</td>
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<tr>
<td>IEC 60599</td>
<td>Mineral oil-filled electrical equipment in service – Guidance on the interpretation of dissolved and free gases analysis</td>
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<tr>
<td>CIGRE Technical Brochure No. 529-2013</td>
<td>Guide lines for conducting design reviews for Power Transformers</td>
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<tr>
<td>CIGRE Technical Brochure No. 673-2016</td>
<td>Guide on Transformer Transportation</td>
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<td>CIGRE Technical Brochure No. 530-2013</td>
<td>Guide for conducting factory capability assessment for Power Transformers</td>
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<tr>
<td>CIGRE Technical Brochure No. 761 (WG A2.49)</td>
<td>Condition assessment of power transformers</td>
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<td>CIGRE TB 209</td>
<td>Short Circuit Performance of Power Transformers</td>
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<td>CIGRE TB 436</td>
<td>Experiences in service with new insulating liquids</td>
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<td>Central Electricity Authority (Measures Relating to Safety and Electric Supply) Regulations</td>
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<tr>
<td>Central Electricity Authority (Technical Standard for Construction)</td>
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<tr>
<td>Central Electricity Authority (Installation and Operation of Meters) Regulations</td>
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<td>CBIP Manual on Transformers (Publication No. 317)</td>
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<tr>
<td>ISO-14001 (Environmental Management System)</td>
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<td>OHSAS 18001 (Occupational Health and Safety Management System)</td>
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</table>

*******
SECTION – III
TECHNICAL SPECIFICATION OF NIFPES
Technical Specifications of Nitrogen Injection Fire Prevention & Extinguishing System  
(Applicable for Transformer and Reactors)

A. Preamble

Electrical Transformers are the main pillars of the power system network for enabling the transformation of voltage/current and transfer of power so that the utilities are able to supply the electricity to consumers with proper quality and reliability. At the same time the utilities endeavor to keep their assets in safe and secure conditions by providing protective equipment/systems which would help in properly maintaining the health and prevent damage to the equipment being protected.

Any failure of transformer would have the adverse impact on supply of power and satisfactory operation and performance of the system. Power outage and also the possible fire incidences are the common consequences. Transformer may fail because of many reasons. Sometimes the failure of transformer lead to the emergence of fire, which becomes quite dangerous. In addition of loss of asset and money, a transformer, if it catches fire may lead to severe accidental damages to nearby equipment, living being, assets and ecology. With proper fire prevention arrangement provided on the transformers/reactors, the damage on account of incidences of fires in transformer/reactor could be avoided/ reduced. Nitrogen Injection Fire Prevention and Extinguishing System (NIFPES) is one such system which is helpful in this regard.

B. Scope

Supply of NIFPES, installation, laying of pipes and cables, termination, testing and commissioning including fixation of all interconnecting cables between instruments, junction boxes, local panel. Transformer manufacturer/supplier will provide all the necessary support for effective installation of NIFPES, including making available the transformer tripping signal required for successful functioning of the NIFPES.

C. Specifications

1. Nitrogen Injection Fire Prevention and Extinguishing System (NIFPES) shall be designed to prevent the fire taking place in the transformer and possible explosion of transformer tank during internal faults/arc. In case of internal fire in the transformer, the NIFPES shall be capable of extinguishing the fire, minimize the damage to the transformer and thus avoiding the spread of fire. In case of fire whose source is external to the transformer, other fire control/extinguishing devices/systems such as water spray system, water mist system etc will be provided by the utility separately.

2. NIFPES system shall work on the principle of drain and stir of transformer oil. On activation of NIFPES, it shall drain a pre-determined quantity of oil from the tank top through drain valve to reduce the tank pressure, isolate conservator tank oil from the oil in the main transformer tank and inject nitrogen gas at high pressure from the bottom side of the tank through inlet valves to create stirring action and reduce the temperature of oil to prevent/extinguish the fire. On operation of NIFPES, the quantity of oil
removed from the tank shall be such that adequate amount of oil shall remain in the transformer to cover active part of the transformer i.e. the core coil assembly.

3. Arrangement for sensing Pre-fire condition shall be provided along with the alarm which would be site configurable as per the site requirements.

Electrical isolation of transformer shall be an essential pre-condition for activation of NIFPES system.

4. **Operational Controls**

The system operation shall be automatic and will be activated when the pre-set conditions of activation of the system are attained/triggered. Maximum time period for extinction of fire from commencement of nitrogen injection into the transformer shall be 30 seconds. In addition to automatic operation, remote operation from the control room/remote centre/local control in the fire extinguishing cubicle (FEC) shall also be provided. System shall operate in the following situations:

4.1 **System Activation in Fire Prevention Mode**

To prevent fire and explosion in the transformer including that from internal fault, signals from the following shall be used to activate the NIFPES:

(i) Operation of either of the protective relays i.e. differential or restricted earth fault or over current;

AND

(ii) Operation of either ‘Buchholz Relay or Pressure Relief Valve (PRV)’ or the signal from Rapid Pressure Rise Relay (RPRR) operation

AND

(iii) For operation of NIFPES the tripping of circuit breakers of High Voltage (HV), Intermediate Voltage (IV) and Low Voltage [LV (tertiary)] of the transformer is a must i.e. transformer should be electrically isolated and then only the NIFPES should operate.

However, the exact logic for system activation shall be finalized during detailed engineering.

4.2 **System Activation in Fire Detection Mode**

In case of fire detection mode, signals from the following shall be used to activate the NIFPES:
(i) Fire/heat detectors/sensors; 

AND

(ii) Operation of either of the protective relays [Buchholz relay or Pressure Relief Valve (PRV) or Rapid Pressure Rise Relay (RPRR)]

AND

(iii) For operation of NIFPES the tripping of circuit breakers of High Voltage (HV), Intermediate Voltage (IV) and Low Voltage [LV (tertiary)] of the transformer is a must i.e. transformer should be electrically isolated and then only the NIFPES should operate.

However, the exact logic for system activation in fire detection mode shall be finalized during detailed engineering.

In case of fire in the transformer, the NIFPES shall be activated in auto or manual mode only after complete electrical isolation of the transformer, confirmed by HV, IV and LV (tertiary) circuit breakers trip.

If the fire detection is not associated with any other fault, the system activation shall be manual. Manual operation switch and local manual control with a proper cover to avoid accidental operation of the switch, shall be provided in the control room/remote centre. Interlock shall be provided so that manual operation will work only when HV, IV and LV (tertiary) circuit breakers have tripped.

The manual operation of NIFPES shall override the automatic mode and will ensure the complete isolation of the transformer before coming of the NIFPES in to service.

The NIFPES manufacturer should provide the warning information on the Control Box and FEC that “Ensure that HV, IV and LV breakers are open before operating in Manual Mode” both in Hindi and English or the English and the local language as prevalent.

5. Operation of System

On receiving activation signal, the system shall:

i) Open the quick opening drain valve of transformer to drain its top layer oil (pre-determined quantity);

ii) Shut off the transformer conservator isolation valve (TCIV) to prevent flow of oil from the conservator tank to the main transformer tank; and

iii) Open the valve to inject Nitrogen into the transformer tank to create stirring of oil.

There shall be interlock to prevent activation of the system if the transformer is not electrically isolated. There shall also be provision for isolating the system during maintenance and/or testing of the transformer.

The system shall be designed in such a manner that Nitrogen purging shall commence only after ensuring that the oil draining has commenced.
6. Technical Particulars

The contractor shall be responsible for design of the complete system and shall submit the drawings and design calculations for the number of Fire/heat detectors/sensors, pipe sizing of drain pipe, Nitrogen injection pipe, Nitrogen cylinder capacity, number of injection points, etc and get approval from the user. The facility shall be provided to test the system by operation of valves [Nitrogen injection valve, TCIV and Oil Drain Valve (ODV)] when the transformer is in service, without actually draining the oil and injecting Nitrogen in real time operation by obtaining the feedback from valve. The Nitrogen injection scheme shall be designed in such a way that the Nitrogen shall not enter the transformer tank even in case of passing/leakage of valve. The oil drain mechanism may or may not be a part of the fire extinguishing cubicle.

Owner shall provide two distinct station auxiliary DC & AC supplies for control power supply purposes. The system shall work on station DC & AC supply with voltage variation as per relevant standards. The control box of fire prevention and extinguishing system shall have facility to receive these DC & AC supplies for auto changeover of supply. It shall be the contractor’s/NIFPES supplier’s responsibility to further distribute power to the required locations. In case auxiliary DC & AC power supply requirement is different than station auxiliary DC & AC supply, then all necessary converters shall be provided by the Contractor.

Following minimum indications and alarms shall be provided in the control cubicle in the control room:

a) DC & AC supply ‘ON’
b) Total System Healthy
c) DC & AC supply fail
d) System of out of Service
e) Differential trip
f) PRV trip/RPRR trip
g) Buchholz Relay trip
h) Master Relay trip[(HV,IV and LV (Tertiary Voltage)]
i) Restricted Earth Fault (E/F) Relay Trip
j) Over current Relay Trip
k) Nitrogen cylinder pressure low
l) Pre-fire alarm
m) Heat/Fire detector/Sensor faulty Signal
n) Heat/Fire Detector/Sensor alarm/signal
o) Nitrogen injection Valve open
p) Nitrogen injection Valve close
q) Nitrogen injection Valve leakage
r) Oil drain Valve open
s) Oil drain Valve Close
t) Leakage in Oil drain valve
u) TCIV Open
v) TCIV Closed
w) Cable fault signal for interconnecting cable for transformer trip signals
x) Auto operation failed

Other indicator which supplier/user consider necessary shall also be provided.
The following push buttons shall be provided as a minimum:

a) Mode Selection Switch, Auto/Manual/Off
b) Lamp test push buttons
c) System reset push button
d) Detector reset push button, if applicable.
e) Manual extinction push-button for manual operation of the system
f) Hooter mute push button
g) Hooter reset push button

Apart from the above list Nitrogen cylinder pressure indication manometer with sufficient number of adjustable ‘Normally Opened (NO)’ contacts shall also be provided in FEC. In case of fire in the transformer and fulfilling the conditions of defined logic for NIFPES operation for fire extinguishing mode and fire prevention mode alarm (Audio & Visual) will be generated in control room as well FEC.

**Technical Data Sheet:**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fire detection period on commencement of fire</td>
<td>Maximum 10 seconds</td>
</tr>
<tr>
<td>2.</td>
<td>Fire Extinction period on commencement of Nitrogen injection</td>
<td>Maximum 30 seconds</td>
</tr>
<tr>
<td>3.</td>
<td>Fire detectors’/sensors’ “heat sensing” temperature</td>
<td>Flash point of the transformer oil minus 5 °C with tolerance of +/-1 °C.</td>
</tr>
<tr>
<td>4.</td>
<td>Power source for:</td>
<td>110/220 VDC (+10% &amp; -15%) / 230 V AC 110/220 VDC (+10% &amp; -15%) / 230VAC</td>
</tr>
<tr>
<td></td>
<td>a) Control Box</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Fire extinguishing cubicle</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Nitrogen Cylinder and Valve (PESO approved)</td>
<td>As per IS:7285(Part2) and IS:3224 (latest)</td>
</tr>
<tr>
<td>6.</td>
<td>Degree of protection of Control Box and FEC</td>
<td>IP 55</td>
</tr>
<tr>
<td>7.</td>
<td>Steel Sheet of FEC, Control Box and Signal Box</td>
<td>Steel sheet shall be as per grade CR2 of IS:513,Part-1.Thickness shall not be less than 2mm.</td>
</tr>
<tr>
<td>8.</td>
<td>Color of all panels and Nitrogen Injection pipes</td>
<td>Shade 538 of IS:5</td>
</tr>
</tbody>
</table>

**7. Details of Supply of System/Equipment and Other Related Activities:**

Nitrogen injection fire protection system shall broadly consist of the following components/devices. However, all other components that are necessary for fast, reliable, complete, and effective working of the fire protection system shall deemed to be included in the scope of supply.
A. Fire extinguishing cubicle with base frame and containing at least the following:

i. Nitrogen gas cylinder having the Petroleum and Explosive Safety Organization (PESO) certificates of sufficient capacity with pressure regulator and manometer with sufficient number of adjustable ‘Normally Open (NO)’ contacts;

ii. Oil Drain Assembly including oil drain valve and its equipment for operation, oil drainpipe extension of suitable size for connecting pipes to Oil Storage Tank, along with level switch for detecting leakage in oil drain valve;

iii. Mechanical release device for oil drain and nitrogen gas release;

iv. Limit switches for monitoring of the systems;

v. Panel lighting;

vi. Flanges on top of the panel for connecting oil drain in case of oil drain mechanism is part of fire extinguishing cubicle and nitrogen injection pipes for transformer;

vii. Pressure indicators for Nitrogen pressure of the cylinder and actual injection through Nitrogen regulator;

viii. Fire Extinguishing Cubicle (FEC) shall have LED lights for indicators.

ix. The heater with thermostat shall be provided in the FEC. Heater should be operated as per the setting of thermostat.

x. FEC shall have minimum IP55 degree of protection;

xi. Following mandatory spares shall also be supplied by the manufacturer/supplier with the system:

• 01no. fitted nitrogen cylinder
• 01 set of hose pipes with fittings
• Heat sensor assembly for fire detectors
• Fire survival cable sufficient for one system
• 01no. PNRBV
• Limit switch for fire detectors (03nos. of each type)
• 01 set of fire detectors
• 01 no. thermostat
• 01no. heating element

In case if oil drain mechanism is not a part of FEC – the related items shall be as per the Original Equipment Manufacturer (OEM) design, however functional requirements have to be met with.

B. Control box/cubicle to be installed in the control room of the substation for monitoring the NIFPES operation, automatic control, and remote operation, with alarms, indications, switches, push buttons, audio signal etc. Control Box/Cubicle should be microprocessor based/PLC based compatible to be interfaced with Supervisory Control and data Acquisition (SCADA) system.

Required number of fire/heat detectors/sensors to be located at strategic locations and to be finalized during detailed engineering. Fire/heat detector/sensor shall be IP 65 approved or to be mounted in an IP 65 approved enclosure. IP certificate to mention the details of Fire/Heat detector/Sensor. All the control/power cables between the NIFPES panel and the transformer, from the control room to FEC, from the Control and Relay Panel to the Control Box/cubicle,
Control Box/cubicle to DC/AC supply Source shall be fire/flame retardant low smoke (FRLS) type up to the thermal limit (in case of fire and or explosion). However, Fire survival cables, able to withstand 750°C shall be used for the connection of Fire/Heat detectors/Sensors if operating mechanism of Fire/Heat detector/Sensors mounted on transformer top.

Transformer Conservator Isolation Valve to isolate the conservator oil from the main tank oil is to be provided by the NIFPES supplier. This valve shall be located in the piping between the conservator and the Buchholz relay.

8. **SCADA compatibility / accessibility**

   The NIFPES shall be fully integrated to the SCADA system of the utility/user as applicable in the scope.

9. **Drain Oil Storage Tank**

   Each transformer unit shall be provided with a drain oil storage tank.

   The oil storage tank shall have non-corrosive, waterproof, epoxy coated, mild steel (minimum thickness 5mm) to store drained out oil on operation of NIFPES.

   The total capacity of storage tank shall be more than 10% of transformer tank oil to avoid overflowing of oil considering that drained oil volume shall be around 10% of transformer tank oil. All the pipes and physical connections from transformer to storage tank shall be in the scope of supplier.

10. **Tests**

   a. **Factory Acceptance Test (FAT)**

   Desired functional verification of NIFPES shall be conducted by the utility at the works of NIFPES manufacturer.

   Test procedure – refer **Annexure – A**

   b. **Type Test of Fire/Heat Detector/Sensors:**

   Type test report of the Fire/Heat Detector/Sensors shall be submitted to client along with the design/drawing documents. The Fire/Heat detector/Sensors shall be tested as per the procedure given below:
<table>
<thead>
<tr>
<th>Test Type</th>
<th>Procedure</th>
<th>Requirement</th>
<th>Observed Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testing of the Fire/Heat detectors/Sensors</td>
<td>Type of the Fire/Heat detectors/Sensors along with the make and model number is to be mentioned in this column</td>
<td>1. Fire/Heat detector/sensor is to be tested by immersing it in the heating liquid with temperature measurement or by suspending in hot air oven with temperature measurement.</td>
<td>The temperature, at which the Fire/Heat detectors/Sensors activate, is to be recorded.</td>
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<td></td>
<td></td>
<td>2. The temperature of the liquid/air is to be increased at the rate of 1 °C per minute and reading of the thermocouples to be noted.</td>
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<tr>
<td></td>
<td></td>
<td>3. Thermocouple for measuring the temperature is to be provided at the tip/surface of the detector.</td>
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<tr>
<td></td>
<td></td>
<td>4. The temperature of the liquid/air is to be increased till the detector bursts/activates.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Fire/Heat detectors/Sensors activate at a Temperature of flash point of the transformer oil minus 5 °C with tolerance of +/- 1 °C</td>
<td></td>
</tr>
</tbody>
</table>

### c. Site Acceptance Test (SAT) /Performance Test

SAT/Performance test of the NIFPES shall be carried out after the completion of installation at site. It shall also be ensured that the interfacing of NIFPES with SCADA has been completed by manufacturer / supplier before SAT. These tests shall include simulation and verification of the response of the complete system without actual draining of the oil and injection of the Nitrogen gas. In addition to the above, additional tests as considered necessary shall be conducted. SAT shall also include to test the provisions as specified in item (5) above.

SAT shall also include demonstration of the system checking when transformer is in online condition as mentioned in item (6) above.

11. Installation and pre-commissioning test after installation of the system shall be carried out jointly with the user’s representative before the system is put in service.

If the scope is only for supply, erection, testing and commissioning of NIFPES than the warranty shall be for a period of five (5) years from the date of commissioning of NIFPES on individual transformer / reactor. If however the NIFPES is supplied with the procurement of transformer/reactor than the warranty obligation shall be as governed by the T&C of warranty for transformer/reactor.

Post warranty, in order to properly maintain the system, the bidder shall also quote for 3 years AMC of the system. The AMC shall be non-comprehensive with half yearly performance check.
Annexure – A

Format for the Factory Acceptance Test

1. **Visual Inspection:** Visual examination of the NIFPES equipment i.e. Fire Extinguishing Cubicle, Control box/cubicle, Signal Box, Transformer Conservator Isolation Valve, Fire detectors, cables, etc shall be made as per the approved drawings.

2. **Functional Test:** Bidder to submit functional test report for approval of client. The report shall cover demonstration of functional test of all the indications as available on control box including interlocks. Functional test shall be carried out on one (1) set out of the total manufactured lot for the respective order as minimum in presence of client/client nominated inspection agency. Following are the list of critical items to be used in FAT out of manufactured lot for the respective Purchaser Order:
   
i) Fire Extinguishing Cubicle with its internals, except nitrogen cylinder. Nitrogen cylinder meant for internal testing can be used during FAT testing. However, connection of cylinder shall be in line with regulator valve intended for dispatch.
   
ii) Control Box with its internal components and accessories.
   
iii) Signal box with its internal components and accessories.
   
iv) Fire/Heat/Detector/sensor.
   
v) TCIV Valve.
   
vi) ODV Valve.
   
vii) SCADA compatibility of all the signals over RS 485/IEC protocol as applicable.

3. **Functional Test of Transformer Isolation Conservator Valve (TCIV):**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Test</th>
<th>Procedure</th>
<th>Requirement</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Leakage Test</td>
<td>Immerse the TCIV (Valve body) in the oil at the inlet pressure of 4kg/cm² for 6 hours.</td>
<td>There should be no leakage from TCIV body</td>
<td></td>
</tr>
</tbody>
</table>
| 2.     | TCIV Close test (A or B as per the Design of TCIV) | **A.** For oil flow rate based TCIV:
   
i. Mount TCIV with approx. 3 degree inclination on test rig
   
ii. Switch ON oil Pump
   
iii. Increase oil flow rate gradually | **➢** TCIV should close at flow rate specified by manufacturer.
   
**➢** Flap closing shall be visible through transparent glass inspection window.
   
**➢** Normally open (NO) contacts in TCIV should close/TCIV Close indication in control Box should be reflected. |
### Functional Tests of Fire/Heat detector/sensors:

1. The operating temperature shall be as per the requirement mentioned in technical data sheet.

2. The NIFPES manufacturer shall submit the declaration from OEM of Fire/Heat detector/sensor that the make and model/design of the Fire/Heat detector/sensor supplied with NIFPES is of proven quality and capable of failsafe operation as per tender requirement.

   a. Live demonstration test: To verify the working of the system, live demonstration is to be conducted in both fire prevention and extinguishing mode. Following to be ensured:

      (i) Demonstration is to be carried out at the works of NIFPES Manufacturer. It shall be responsibility of NIFPES manufacturer to arrange a suitable location for live testing.
      
      (ii) A dummy tank of minimum 5000 litres oil capacity and filled with oil, should be used as a transformer tank for testing.
      
      (iii) The FEC and Control Box manufactured for the said Purchase Order are to be used for live testing.
      
      (iv) Separate filled Nitrogen cylinder should be used for live tests.
      
      (v) Testing shall be conducted as per procedure mentioned below:

#### A. Testing in Fire Prevention Mode
1. **Procedure:**
   a. Oil Drain Pipe, Nitrogen Injection pipe, FEC, Control box/Cubicle, Signal box, TCIV, oil pit with all necessary pipes and cable connections shall be connected with transformer tank.
   b. Nitrogen gas Cylinder pressure should be recorded.
   c. The NIFPES System shall be made ON.
   d. Any one set of input of the fire prevention mode shall be generated by a suitable method.

2. **Observations/Result:**
   a) After fulfilling of required condition, system gets activated in auto mode.
   b) Oil Drain should be started.
   c) Nitrogen should be injected.
   d) TCIV should close.

Following Indications on control box will turn ON:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| a) | Differential trip / PRV trip/RPRR trip / Buchholz Relay trip / Master Relay trip [(HV, IV and Tertiary Voltage to ensure that the Circuit Breakers are open)]
|   | Restricted Earth Fault (E/F) Relay Trip / Over current Relay Trip as per logic
| b) | Nitrogen Injection valve open
| c) | Oil Drain valve open
| d) | TCIV Valve closed
| e) | Audio Alarm activated

B. **Testing in Fire Detection** Mode (By igniting the transformer oil of the tank)

1. **Procedure:**
   a. There should be an opening on the Transformer tank to ignite the transformer oil.
   b. Fire/Heat detector/Sensor should be mounted at the distance of 800mm from the opening (mentioned in point 1 (a) above)
   c. Oil Drain Pipe, Nitrogen Injection pipe, FEC, Control box, Signal box, TCIV,
oil pit with all necessary pipes and cable connections shall be connected with transformer tank.
d. The NIFPES shall be made ON.
e. The Buchholz Relay or PRV Trip and Master Relay trip (HV, IV and Tertiary Voltage) Signal shall be activated by a suitable method.
f. Ignite the transformer oil by any method such as pouring any flammable liquid (example- petrol) or any suitable chemical spray and igniting the flame.
g. Start the timer /stopwatch on commencement of Fire and Nitrogen injection.

2. Observations:

a. After fulfilling of required conditions of fire extinguishing mode, system should get activated in auto fire extinguishing mode.
b. Oil Drain should start.
c. Nitrogen injection shall begin.
d. TCIV would close.
e. Following Indications on control box will turn ON:

<table>
<thead>
<tr>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) PRV trip/RPRR trip / Buchholz Relay trip / Master Relay trip (HV, LV and Tertiary Voltage to ensure that the Circuit Breakers are open) / Fire / Heat Detector as per logic</td>
</tr>
<tr>
<td>b) Nitrogen Injection valve open</td>
</tr>
<tr>
<td>c) Oil Drain valve open</td>
</tr>
<tr>
<td>d) TCIV Valve closed</td>
</tr>
<tr>
<td>e) Audio Alarm activated</td>
</tr>
</tbody>
</table>

f. Stop the timer/stop watch when fire detection (Fire Alarm signal is received) takes place.
g. Stop the timer/stop watch when fire get extinguished.

3. Results:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Details</th>
<th>Requirement</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fire detection period upon commencement of Fire</td>
<td>Maximum10 seconds</td>
<td>……….Seconds</td>
</tr>
<tr>
<td>2.</td>
<td>Fire Extinction period on commencement of Nitrogen injection</td>
<td>Maximum30 seconds</td>
<td>……….Seconds</td>
</tr>
</tbody>
</table>

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SECTION – IV

TECHNICAL SPECIFICATION OF LT POWER CABLE.
TS OF 1100V GRADE XLPE/PVC INSULATED POWER CABLES

1. TECHNICAL REQUIREMENTS

1.1. General

1.1.1. The cables shall be suitable for laying in racks, ducts, trenches, conduits and underground buried installation with uncontrolled back fill and chances of flooding by water.

1.1.2. They shall be designed to withstand all mechanical, electrical and thermal stresses under steady state and transient operating conditions. The XLPE/PVC insulated L.T. power cables of sizes 240 sq. mm. and above shall withstand without damage a 3 phase fault current of at least 45 kA for at least 0.12 second, with an initial peak of 105 kA in one of the phases. The armour for these power cables shall be capable of carrying 45 kA for at least 0.12 seconds without exceeding the maximum allowable temperature of PVC outer sheath.

1.1.3. The XLPE insulated cables shall be capable of withstanding a conductor temperature of 250°C during a short circuit without any damage. The PVC insulated cables shall be capable of withstanding a conductor temperature of 160°C during a short circuit.

1.1.4. The Aluminium/Copper wires used for manufacturing the cables shall be true circular in shape before stranding and shall be uniformly good quality, free from defects. All aluminium used in the cables shall be of H2 grade.

1.1.5. The fillers and inner sheath shall be of non-hygroscopic, fire retardant material shall be softer than insulation and outer sheath shall be suitable for the operating temperature of the cable.

1.1.6. Progressive sequential marking of the length of cable in meters at every one meter shall be provided on the outer sheath of all cables.

1.1.7. Strip wire armouring method of IS: 1554 (Part 1) – 1988 shall not be accepted for any of the cables.

1.1.8. The cables shall have outer sheath of a material with an oxygen index of not less than 29 and a temperature index of not less than 250°C.

1.1.9. The size of conductor in the cables shall be in line with relevant IS and as per requirement of scope of scheme/tender.

1.1.10. The normal current rating of all PVC insulated cables shall be as per IS: 3961 and that of XLPE insulated cables shall be as per relevant IS/IEC.

1.1.11. Repaired cables shall not be accepted.

1.1.12. Allowable tolerance on the overall diameter of the cables shall be as per relevant IS/IEC.

1.2. Climatic Conditions

1.2.1. The cables covered under this specification are for laying in the climatic conditions that are prevailing at the sites of Delhi.

a) Max Ambient temperature 50°C
b) Min Ambient temperature \( 0^\circ\text{C} \)

c) Ref. Ambient temperature as per IS:9676 \( 43.3^\circ\text{C} \)

d) Relative humidity (% range) \( 10 – 100\% \)

e) Average number of rainy days per annum \( 50 \)

f) Average rainfall \( 750\text{ mm} \)

g) Altitude not exceeding \( 300\text{ meters} \)

1.2.2. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. Heavy lightning occurs in the area during rainy months (June to October).

1.3. Standards

1.3.1. The cables as stipulated in this specification shall conform to the latest applicable provision of the following standards:-

<table>
<thead>
<tr>
<th>No.</th>
<th>Standards Reference</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IS:1554(Part-I)</td>
<td>Specification for PVC insulated (Heavy Duty) electric cables for working voltage up to including 1100 V.</td>
</tr>
<tr>
<td>2.</td>
<td>IS: 3961</td>
<td>Recommended current rating for cable.</td>
</tr>
<tr>
<td>3.</td>
<td>IS:8130</td>
<td>Conductors for insulated electric cables and flexible cores.</td>
</tr>
<tr>
<td>4.</td>
<td>IS:5831</td>
<td>PVC Insulation and sheath of electric cables.</td>
</tr>
<tr>
<td>5.</td>
<td>IS:10810(58)</td>
<td>Oxygen index</td>
</tr>
<tr>
<td>6.</td>
<td>IS:10810(63)</td>
<td>Standard test method for density of smoke from burning/decomposition of plastics</td>
</tr>
<tr>
<td>7.</td>
<td>IS:10810(64)</td>
<td>Temp. Index.</td>
</tr>
<tr>
<td>8.</td>
<td>IS:3975</td>
<td>Low carbon galvanized steel wires, formed wires and tapes for armouring of cables - specifications</td>
</tr>
<tr>
<td>9.</td>
<td>IS:2982</td>
<td>Copper conductors insulated cables and cords.</td>
</tr>
<tr>
<td>10.</td>
<td>IS-10418</td>
<td>Specification for drums for electric cables.</td>
</tr>
<tr>
<td>11.</td>
<td>IS-10810(53)</td>
<td>Flammability Test.</td>
</tr>
<tr>
<td>12.</td>
<td>IS-10810(60)</td>
<td>Thermal stability of PVC Insulation and sheath.</td>
</tr>
<tr>
<td>13.</td>
<td>IS-10810(61)</td>
<td>Flame retardant test.</td>
</tr>
<tr>
<td>15.</td>
<td>IS-694</td>
<td>PVC insulated cables for working voltages upto and including 1100 volts.</td>
</tr>
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<tr>
<td>16.</td>
<td>IS-6380</td>
<td>Elastometric insulating and sheath of electric cables.</td>
</tr>
<tr>
<td>17</td>
<td>IEC-60502-1</td>
<td>Power cables from 1kV to 3kV</td>
</tr>
<tr>
<td>18</td>
<td>IS-7098-1</td>
<td>Power cables up to 1100V, XLPE insulated.</td>
</tr>
</tbody>
</table>

1.3.2. Unless otherwise specified, the equipment shall conform to the latest applicable standards mentioned above. The equipment complying with any other internationally accepted standard will also be considered if it ensures performance equivalent to or superior to standards detailed above. In the event of supply requirement conforming to any internationally recognized standards other than the Indian Standards, the salient features of comparison shall be brought out in the tender. Photocopies of such standards in English Language or English Translation shall be attached with the offer. In case of any consistency provisions in ISS and IEC shall prevail.

1.4. Marking

1.4.1. The cable shall be marked DTL PROPERTY, year of manufacturing throughout the length in addition to marking as per IS/IEC. The progressive sequential marking on the length of the cable in meters at every one meter shall be provided on the outer sheath of the cable/cable drum.

2. XLPE Power Cables

2.1. The XLPE insulated cables shall be of FR-LSH type, C2 category, suitable for normal working temperature of 90°C conforming to IS:7098(Part-I) / IS: 7098 (Part-II)/ IEC-60502-01 and its amendments read alongwith this specification. The conductor shall be stranded aluminium/copper circular/sector shaped and compacted. In multi core cables, the core shall be identified by red, yellow, blue and black colored strips or coloring of insulation. A distinct inner sheath shall be provided in all multi core cables. For XLPE cables, the inner sheath shall be of extruded PVC of type ST-2 of IS: 5831. When armouring is specified for single core cables, the same shall consist of aluminium wires/strips. The outer sheath shall be extruded PVC to Type ST-2 of IS: 5831 for all XLPE cables.

3. PVC Power Cables

3.1. The PVC insulated 1100V grade power cables shall be of FR-LSH type, C2 category, conforming to IS: 1554 (Part-I) and its amendments, read alongwith this specification and shall be suitable for a steady conductor temperature of 85°C. The conductor shall be stranded aluminium/copper. The Insulation shall be extruded PVC type-C of IS: 5831. A distinct inner sheath type ST-2 shall be provided in all multicore cables. For multicore armoured cables, the inner sheath
shall be of extruded PVC. The outer sheath shall be extruded PVC of Type ST-2 of IS: 5831 for all cables.

4. CABLE DRUMS
4.1. Cables shall be supplied in non-returnable wooden or steel drums of heavy construction. Wooden drum shall be properly seasoned sound and free from defects. Wood preservative shall be applied to the entire drum.
4.2. Standard lengths for each size of power cables shall be 500/1000 meters. The cable length per drum shall be subject to a tolerance of plus or minus 5% of the standard drum length. The Purchaser shall have the option of rejecting cable drums with shorter lengths. However, the total quantity of cables after taking into consideration of all cable drums for each size shall be within the tolerance of ± 2%.
4.3. A layer of water proof paper shall be applied to the surface of the drums and over the outer most cable layer.
4.4. A clear space of at least 40 mm shall be left between the cables and the lagging.
4.5. Each drum shall carry the manufacturer's name, the Purchaser's name, address and contract number and type, size and length of the cable, net and gross weight stenciled on both sides of drum. A tag containing the same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.
4.6. Packing shall be sturdy and adequate to protect the cables, from any injury due to mishandling or other conditions encountered during transportation, handling and storage. Both cable ends shall be sealed with PVC/Rubber caps so as to eliminate ingress of water during transportation and erection.

5. TESTS
5.1. Type Tests: The bidder shall submit all the applicable type test reports of the power cable in line with latest edition of IS/IEC, as applicable, and validity of the type test reports shall be as per CEA guidelines. The reports shall be submitted for review by DTL. If any type test has not been conducted by the bidder, than the same shall be conducted by the bidder free of cost and without affecting the completion period of the project/tender.
5.2. Routine and Acceptance tests: All the applicable routine and acceptance tests on the power cables shall be conducted by the bidder as per relevant IS/IEC during and after manufacture (As applicable).

GTP OF PVC INSULATED POWER CABLE

1. Name of Manufacturer and country:
2. Standard according to which cable is manufactured
3. Rated voltage
4. Continuous current rating in air at ambient temperature:
5. Short time current withstand (3 seconds):
6. Short time current withstand (1 seconds):
7. Short time current withstand (0.5 seconds)
8. Allowable conductor temperature for short circuit:
9. Conductor:
   a. Material
   b. cross-sectional area
   c. Whether stranded
   d. Number and diameter of wire (before stranding)
10. Insulation:
    a. Material
    b. Nominal Thickness
    c. Core Identification
11. Inner Sheath
    a. Material
    b. Whether extruded or wrapped?
    c. Thickness (Minimum)
    d. Calculated diameter under sheath
    e. Color of sheath
12. Outer Sheath
    a. Material
    b. Thickness (Minimum)
    c. Extruded or wrapped?
    d. Calculated diameter under sheath
    e. Color of sheath
    f. FR-LSH properties
    g. Oxygen Index
    h. Temperature Index:
       i. Smoke density rating
       j. Acid Gas Generation (HCL)
       k. Flammability Test
13. Size and material of armour
14. Whether round wire or tape
15. Details of screen, if any
16. Total overall diameter of cable:
17. Maximum DC resistance at 20 degree Celsius:
18. Inductance of cable per kM
19. One minute power frequency withstand voltage
20. Impulse withstand voltage
21. Water immersion test voltage
22. Safe pulling force when pulled by pulling eye
23. Minimum Bending radius
24. Insulation resistance constant at room temperature
25. Tensile strength of conductor
26. Max. Allowable continuous operating temperature
27. Volume Resistivity
28. Dielectric constant at 50Hz, 20degree Celsius
29. Tan Delta at 50Hz, 20degree Celsius
30. Continuous current rating when laid in air in ambient temperature of 50degree Celsius and for maximum conductor temperature 85 degree Celsius for PVC cable:
31. Filler
32. Sequential length marking
33. Type of cable end sealing
34. Embossing /printing
35. Cable drums
36. Dimension of drum
37. Shipping weight
38. Nominal length per drum

GTP OF XLPE INSULATED POWER CABLE

1. Name of Manufacturer and country:
2. Standard according to which cable is manufactured
3. Rated voltage
4. Type and category
5. Continuous current rating in air at ambient temperature:
6. Rating factors applicable to the current ratings for various conditions of installation:
7. Short circuit capacity:
   a. Short circuit current for 01 second:
   b. Conductor temperature allowed for short circuit duty
8. Conductor:
   a. Material
   b. Grade
   c. Form of conductor
   d. cross-sectional area
   e. Direction of lay of stranded layers
9. Conductor resistance (DC) at 20 degree celsius
10. Insulation:
    a. Material
    b. Nominal Thickness
    c. Minimum Thickness
11. Inner Sheath
    a. Material
    b. Thickness (Minimum)
    c. Calculated diameter under sheath
    d. Color of sheath
12. Armour
    a. Type and material of armour
    b. Direction of armouring
    c. Calculated diameter of cable over inner sheath (under armour)
    d. Nominal diameter of wire
    e. Number of armour wires (Approx.)
    f. Short circuit capacity of armour and duration
    g. DC resistance at 20 degree Celsius and resistivity of armour
13. Outer Sheath
    a. Material
b. Thickness (Minimum)
c. Extruded or wrapped?
d. Calculated diameter under sheath
e. Color of sheath
f. FR-LSH properties
g. Oxygen Index
h. Temperature Index:
i. Smoke density rating
j. Acid Gas Generation (HCL)
k. Flammability Test

14. Details of screen, if any
15. Total overall diameter of cable:
16. Maximum DC resistance at 20 degree Celsius:
17. Whether cables offered are ISI marked
18. Short time current withstand (0.5, 1, 3 seconds)
19. Inductance of cable per kM
20. One minute power frequency withstand voltage
21. Impulse withstand voltage
22. High voltage test
23. Water immersion test voltage
24. Safe pulling force when pulled by pulling eye
25. Minimum Bending radius
26. Insulation resistance constant at room temperature
27. Tensile strength of conductor
28. Max. Allowable continuous operating temperature
29. Volume Resistivity
30. Dielectric constant at 50Hz, 20degree Celsius
31. Tan Delta at 50Hz, 20degree Celsius
32. Continuous current rating when laid in air in ambient temperature of 50degree Celsius and for maximum conductor temperature 90 degree Celsius for XLPE cable:
33. Filler
34. Sequential length marking
35. Type of cable end sealing
36. Embossing /printing
37. Cable drums
38. Dimension of drum
39. Shipping weight
40. Nominal length per drum

**Note:** Only applicable parameters as per IS/IEC to be filled.
SECTION – V

TECHNICAL SPECIFICATION OF CONTROL CABLE
SPECIFICATION OF 1.1kV GRADE CONTROL CABLE

1.0 SCOPE

1.1 This specification covers the design, manufacturing, testing and supply of FR-LSH Control Cable of High conductivity, annealed copper, acid, alkali, weather, oil and moisture resistant armored Multi-core laid up heavy duty PVC insulated and graded up to 1100 Volts sheathed cables for electric supply and control purposes.

1.2 The Control cables are required for power supply, control & connections of various equipments including protective devices etc.

2.0 GENERAL TECHNICAL REQUIREMENT

2.1 Cable under this specification shall be suitable for use on A.C. or D.C. System for rated voltages up to 1100 Volts to earth R.M.S.

2.2 All materials shall be free from flaws and defects and shall conform to the relevant Indian Standards and good engineering practice.

2.3 The cables shall be suitable for laying in racks, ducts, trenches, conduits and underground buried installation with uncontrolled back fill and chances of flooding by water.

2.4 These shall be designed to withstand all mechanical, electrical and thermal stresses under steady state and transient operating conditions.

2.5 The Copper wires used for manufacturing the cables shall be true circular in shape before stranding and shall be uniformly good quality, free from defects.

2.6 Cable shall have suitable fillers laid up with the conductors a substantially circular cross section before the sheath is applied, fillers shall be suitable for operating temp of the cable and compatible with the insulating material.

2.7 All materials shall be new, unused and of finest quality. Repaired cables shall not be accepted.

2.8 Workmanship shall be neat, clean and of highest grade.

2.9 Control cable shall be anti rodent type.

2.10 Unless brought out clearly the tenderer shall conform to the specifications scrupulously. Any deviation from the specification shall be brought out in the
representative schedule of deviation forming part of the tender. Any deviation between the specifications and the descriptive catalogue of the equipment with the offer, not clearly brought out in the schedule of deviation shall not be considered as valid deviations and the equipment shall deem to be as per specifications. Reasons for any deviation shall be spelled out clearly in the schedule itself.

3.0 CLIMATIC CONDITIONS

The cables covered under this specification are for laying in the climatic conditions that are prevailing at the sites of Delhi.

a) Max Ambient temperature 50°C
b) Min Ambient temperature 0°C
c) Ref. Ambient temperature as per IS:9676 43.3°C
d) Relative humidity (% range) 10 – 100 %
e) Average number of rainy days per annum 50
f) Average rainfall 750 mm
g) Altitude not exceeding 300 meters

The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. Heavy lightning occurs in the area during rainy months (June to October).

4.0 STANDARDS

The cables as stipulated in this specification shall conform to the latest applicable provision of the following standards:-

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
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<tr>
<td>2.</td>
<td>IS: 3961</td>
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<tr>
<td>3.</td>
<td>IS:8130</td>
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<td>4.</td>
<td>IS:5831</td>
</tr>
<tr>
<td>5.</td>
<td>IS:10810(58)</td>
</tr>
<tr>
<td>6.</td>
<td>IS:10810(63)</td>
</tr>
</tbody>
</table>
burning/decomposition of plastics

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<tbody>
<tr>
<td>7</td>
<td>IS:10810(64)</td>
<td>Temp. Index.</td>
</tr>
<tr>
<td>8</td>
<td>IS:3975</td>
<td>Low carbon galvanized steel wires, formed wires and tapes for armouring of cables - specifications</td>
</tr>
<tr>
<td>9</td>
<td>IS:2982</td>
<td>Copper conductors insulated cables and cords.</td>
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<tr>
<td>10</td>
<td>IS-10418</td>
<td>Specification for drums for electric cables.</td>
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<tr>
<td>11</td>
<td>IS-10810(53)</td>
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</tr>
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<td>12</td>
<td>IS-10810(60)</td>
<td>Thermal stability of PVC Insulation and sheath.</td>
</tr>
<tr>
<td>13</td>
<td>IS-10810(61)</td>
<td>Flame retardant test.</td>
</tr>
<tr>
<td>14</td>
<td>IS-10810(62)</td>
<td>Fire resistance test for bunched cables.</td>
</tr>
<tr>
<td>15</td>
<td>IS-694</td>
<td>PVC insulated cables for working voltages upto and including 1100 volts.</td>
</tr>
<tr>
<td>16</td>
<td>IS-6380</td>
<td>Elastometric insulating and sheath of electric cables.</td>
</tr>
</tbody>
</table>

Unless otherwise specified, the equipment shall conform to the latest applicable standards mentioned above. The equipment complying with any other internationally accepted standard will also be considered if it ensures performance equivalent to or superior to standards detailed above. In the event of supply requirement conforming to any internationally recognized standards other than the Indian Standards, the salient features of comparison shall be brought out in the tender. Photocopies of such standards in English Language or English Translation shall be attached with the offer. In case of any consistency provisions in ISS and IEC shall prevail.

5.0 **MARKING**

5.1 The cable shall be marked DTL PROPERTY, year of manufacturing and ISI marked throughout the length in addition to marking as per IS 1554 (Part-I). The progressive sequential marking on the length of the cable in meters at every one meter shall be provided on the outer sheath of the cable/cable drum.

5.2 Identification of cores shall be done by printing legible Hindu Arabic Numerals on all cores as per IS :1554 (Part-I)

5.3 Identification, Packing And Marking as per IS-1554(Part-I).

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Code Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC Insulation</td>
<td>Y</td>
</tr>
<tr>
<td>Steel Round Wire Armour</td>
<td>W</td>
</tr>
<tr>
<td>PVC Outer Sheath</td>
<td>Y</td>
</tr>
</tbody>
</table>
6.0 CONSTRUCTIONAL FEATURES

The control cables are required for power supply, control & connections of various equipments including protective devices etc.

6.1 TYPE OF CABLES

The cable shall be multi core HR PVC insulated type C2 (FR-LSH) category conforming to IS-1554(Part-1) and/or relevant subsections/ clauses of this Technical Specification.

6.2 CONDUCTOR

The cable conductor shall be made from stranded copper to form compact conductor having a resistance within the limits specified in IS. Size of conductor shall be as per relevant IS and in line with scope of scheme. The normal current rating of all PVC insulated cables shall be as per IS: 3961.

6.3 INSULATION (PVC Type C Category)

The insulation of the cable shall be designed and manufactured for the specified system voltage. The manufacturing process shall ensure that insulation is free from voids. The insulation shall withstand mechanical and thermal stresses under steady stage and transient short circuit operating conditions. Test requirement for PVC insulation sheath shall be as per Table 2 of IS: 5831-1984.

6.4 INNER SHEATH (HR FRLS PVC)

The sheath shall be suitable to withstand the site conditions and desired temp. It shall be of adequate thickness and applied by a continuous process to produce a sheath of consistent quality, free from all defects. PVC, sheath shall be extruded and to HR FR-LSH type.

6.5 ARMOUR

6.5.1 Single galvanized steel wire armoring shall be used for multi core cables which shall comply with the reference of IS-3975-1979.

6.5.2 For control cables only galvanized round steel wire armoring shall be used.

6.6 OUTER SHEATH (HR FR-LSH PVC)

6.6.1 The outer sheath should be of flame retardant low smoke heat resistant PVC compound type ST2 conforming to requirements of IS:5831-1984.
6.6.2 The cables shall have outer sheath of a material with an oxygen index of not less than 29 and a temperature index of not less than 250°C at 21 percent of oxygen as per IS 1554 (part-I).

7.0 CABLE DRUMS

7.1 Cables shall be supplied in nonreturnable wooden drums of heavy construction as per IS 10418. Wooden drum shall be properly seasoned sound and free from defects. Wood preservative shall be applied to the entire drum.

7.2 Standard lengths for each size of control cables shall be 500/1000 meters. The cable length per drum shall be subject to a tolerance of plus or minus 5% of the standard drum length. However, tolerance of plus or minus 1% of total ordered cable length is permissible. The owner shall have the option of rejecting cable drums with shorter lengths. Maximum One (1) number non standard length of cable size(s) maybe supplied in drums for completion of order.

7.3 A layer of water proof paper shall be applied to the surface of the drums and over the outer most cable layer.

7.4 A clear space of at least 40 mm shall be left between the cables and the lagging.

7.5 Each drum shall carry the manufacturer's name, the purchaser's name, address and contract number and type, size and length of the cable, net and gross weight stenciled on both sides of drum. A tag containing the same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.

7.6 Packing shall be sturdy and adequate to protect the cables, from any injury due to mishandling or other conditions encountered during transportation, handling and storage. Both cable ends shall be sealed with PVC/Rubber caps so as to eliminate ingress of water during transportation and erection.

8.0 TYPE, ROUTINE AND ACCEPTANCE TESTS

1. Type Tests: The bidder shall submit all the applicable type test reports of the cable system in line with latest edition of IS-1554 part-I and validity of the type test reports shall be as per CEA guidelines. The reports shall be submitted for review by DTL. If any type test has not been conducted by the bidder, than the same shall be conducted by the bidder free of cost and without affecting the completion period of the project/tender.
2. **Routine and Acceptance tests**: All the applicable routine and acceptance tests on the control cables shall be conducted by the bidder as per relevant IS during and after manufacture (As applicable).

### SHEDULE OF GUARANTEED TECHNICAL PARTICULARS TO BE FURNISHED BY THE TENDERERS.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Name of the manufacturer / Address</td>
</tr>
<tr>
<td>2.</td>
<td>Manufacturer’s type &amp; designation</td>
</tr>
<tr>
<td>3.</td>
<td>Type of use (suitable to be laid in ground/duct/also to be laid exposed to atmosphere conditions).</td>
</tr>
<tr>
<td>4.</td>
<td>Standard to which manufactured.</td>
</tr>
<tr>
<td>5.</td>
<td>Rated Current.</td>
</tr>
<tr>
<td>6.</td>
<td>Rated Voltage.</td>
</tr>
<tr>
<td>7.</td>
<td>Rated Frequency</td>
</tr>
<tr>
<td>8.</td>
<td>Suitable for earthed or unearthed system.</td>
</tr>
<tr>
<td>9.</td>
<td>Continuous current rating when laid in air in an ambient temp. of 50$^\circ$C and for max. conductor temp. of 85$^\circ$C for PVC cable.</td>
</tr>
<tr>
<td>10.</td>
<td><strong>Material of Insulation:</strong></td>
</tr>
<tr>
<td></td>
<td>a) Thickness (average) (in mm)</td>
</tr>
<tr>
<td></td>
<td>b) Material of insulation and composition.</td>
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<tr>
<td></td>
<td>c) Tensile strength.</td>
</tr>
<tr>
<td></td>
<td>d) Min % elongation at break without ageing.</td>
</tr>
<tr>
<td></td>
<td>e) Minimum thermal resistivity of dielectric in electrical measure (diff. In C between opposite face of 4 cm cubes of the di-electric to cause transference of Watt heat).</td>
</tr>
<tr>
<td></td>
<td>f) Insulation resistance in ohm/250m of finished cable at 20$^\circ$C.</td>
</tr>
<tr>
<td>11.</td>
<td><strong>Conductor:</strong></td>
</tr>
<tr>
<td></td>
<td>a) Materials (Cu)</td>
</tr>
<tr>
<td></td>
<td>b) Grade</td>
</tr>
<tr>
<td></td>
<td>c) Nominal cross-section area (sq.mm)</td>
</tr>
<tr>
<td></td>
<td>d) No. &amp; dia of wire (No/mm)</td>
</tr>
<tr>
<td></td>
<td>e) Current density</td>
</tr>
<tr>
<td></td>
<td>f) Max. normal operation temp. of conductor in cable.</td>
</tr>
<tr>
<td>12.</td>
<td><strong>Short Circuit Capacity:</strong></td>
</tr>
</tbody>
</table>
a) Short circuit current (KArms)  
b) Duration of short circuit (sec)  
c) Conductor temp. allowed for the short circuit duty (°C)  
d) Formula relating short circuit current (in rms) and duration (in sec).  
e) Short ckt. max. conductor temp.  

13. **Outer sheath:**  
   a) Material  
   b) Calculated diameter under sheath.  
   c) Type of thickness.  
   d) Composition of PVC for outer sheath.  
   e) Operating temperature  
   f) Weather flexibility test arid or not.  
   g) Oxygen index at room temperature.  
   h) Temperature index at 21% of oxygen  
   i) HCL % by weight.  

14. Overall diameter of cable  
15. Length of cable in each drum.  
16. Weight of the cable.  

17. **Inner sheath:**  
   a) Material composition.  
   b) Thickness allowable (minimum in mm)  
   c) Operating temperature  
   d) Method of application of inner sheath.  
   e) Calculated diameter over the Laid up cores (mm)  

18. Short circuit capacity with conductor temperature of 90°C at commencement of short circuit possible max. temperature.  
19. Resistance of cable at 20°C per KM.  
20. Inductance of cable per KM.  

21. **Armouring:**  
   a) Type & Material of armour (wire/strip)  
   b) Calculated diameter under armour (mm)  
   c) Nominal diameter of round armour wire  
   d) Short circuit capacity armour alongwith formulae.  
   e) Single or double wire armouring.  
   f) Nominal size of wire/strip.  
   g) Area of wire/strip
h) Maximum D.C. Resistance at 20°C.
i) Joint in armour.

22. Dielectric constant 50 Hz at 20°C.
23. Tan- Delta at 50 Hz at 20°C.
25. Max. allowable continuous operating temp.
26. Tensile strength.
27. Whether type test certificate enclosed or not.
28. The sequence in which the type tests have been performed.
29. Insulation resistance in ohm/250m of finished cable at 20°C.

30. **Test Voltage:**

   a) High voltage test voltage (KV)
   b) Water immersion test voltage (KV)

31. Safe Pulling force when pulled by Pulling eye on the conductor (kg)
32. Minimum bending radius permissible
33. Are all the cables approved by ISI & marked as such (Y/N)
34. Whether the cables are type tested as per IS (Y/N)

*****
Bidding Document

For
Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

VOLUME – III

BID FORM, ATTACHMENTS, GTP& PRICE SCHEDULES
## VOLUME-III

Bid Form, Attachments, GTP & Price Schedules

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<th>CONTENTS</th>
<th>DESCRIPTION</th>
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<td>4.</td>
<td>SECTION-IV</td>
<td>PRICE SCHEDULE</td>
</tr>
</tbody>
</table>
SECTION-I

BID FORM
SECTION: I

BID FORMS

Bid Proposal Ref. No……………………… Date: ………………

Name of Package:

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

To,
Delhi Transco Limited
Shakti Sadan, Kotla Road
New Delhi – 110002

Ladies and Gentlemen,

1.0 Having examined the Bidding Documents, including Amendment Nos. ____________(Insert Numbers) dated ………………… the receipt of which is hereby acknowledged, we ____________, offer to design, test, deliver, install and commission (including carrying out Performance & Guarantee Test) the Facilities under the above-named package in full Conformity with the said Bidding Documents for the sum of:

(______________________________)  
(Amount in Words)

(______________________________)  
(Amount in Figures)

or such other sums as may be determined in accordance with the terms and conditions of the Bidding Documents.

“Note: Being a Two Part tender, bidders are required to submit the Bid Forms in Part –I as well as in Part-II. However, the prices shall be quoted only in the Bid Form to be submitted with Price Bid Part - II.”
2.0 ATTACHMENTS TO THE BID FORM

In line with the requirement of the Bidding Documents, we enclose herewith the following Attachments to the Bid Form:

| (a) Attachment 1  | Bid Security in the form of ……………….* for a sum of ……………………. (amount in words and figures) initially valid for a period of two hundred Forty (240) days from the date set for opening of bids.  
*Please fill in the alternative chosen in line with 23.3 Section-ITB, Vol.-I, of the Bidding Documents. |
<p>| (b) Attachment 2  | A power of attorney duly authorized by a Notary Public indicating that the person(s) signing the bid have the authority to sign the bid and thus that the bid is binding upon us during the full period of its validity in accordance with the ITB Clause 24. |
| (c) Attachment 3  | The documentary evidence that we are eligible to bid in accordance with Clause 10.3 (c) &amp; (d) of ITB are qualified to perform the contract if our bid is accepted. The qualification data has been furnished as per your format enclosed with the bidding documents. |
| (d) Attachment 4  | The details of all major items of services or supply which we propose subcontractor in case of award, giving details of the name and nationality of the proposed subcontractor/sub-vendor for each item. |
| (e) Attachment 5  | The variation and deviations from the requirements of the Conditions of Contract as per ITB and other commercial conditions, in your format enclosed with the Bidding Documents, including, inter alia, the cost of withdrawal of the variations and deviations indicated therein. |
| (f) Attachment 6  | The variation and deviations from the requirements of the Important Conditions of Contract as per ITB, in your format enclosed with the Bidding Documents, including, inter alia, the cost of withdrawal of the variations and deviations indicated therein. |</p>
<table>
<thead>
<tr>
<th>Attachment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(g)</td>
<td>The variation and deviations from the requirements of the Technical Deviation clauses mentioned in Volume-II, in your format enclosed with the Bidding Documents, including, inter alia, the cost of withdrawal of the variations and deviations indicated therein.</td>
</tr>
<tr>
<td>(h)</td>
<td>Additional information submitted by the bidder, in your format enclosed with the Bidding Documents, including, inter alia, indicated therein, if any.</td>
</tr>
<tr>
<td>(i)</td>
<td>Bought-out &amp; Sub-contracted item listed with bidding documents.</td>
</tr>
<tr>
<td>(j)</td>
<td>Work Completion Schedule.</td>
</tr>
<tr>
<td>(k)</td>
<td>List of special tools &amp; tackles listed with bidding documents.</td>
</tr>
<tr>
<td>(l)</td>
<td>Information regarding ex-employees of DTL in our firm.</td>
</tr>
<tr>
<td>(m)</td>
<td>Deleted</td>
</tr>
<tr>
<td>(n)</td>
<td>Price Adjustment Data</td>
</tr>
<tr>
<td>(o)</td>
<td>Guarantee Declaration (If applicable)</td>
</tr>
<tr>
<td>(p)</td>
<td>Integrity Pact, in a separate envelope duly signed on each page by the person signing the bid.</td>
</tr>
<tr>
<td>(q)</td>
<td>Deleted</td>
</tr>
<tr>
<td>(r)</td>
<td>Checklist (Bidder shall submit the information regarding documents submitted by them in the offer as per the checklist provided in Attachment-18 of Sec: Attachments, Vol-III of bidding document. It shall be sole responsibility of bidder to provide the information</td>
</tr>
<tr>
<td>Attachment</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Attachment 19</td>
<td>Affidavit of Self certification regarding Minimum Local Content in line with PPP-MII order and MoP Order, as applicable (submission of Hard Copy in ‘Original’), to be submitted on a non-judicial stamp paper of Rs. 100/-</td>
</tr>
<tr>
<td>Attachment 20</td>
<td>Certificate from statutory auditor or cost auditor of the company giving the percentage of Local Content, in line with PPP-MII order and MoP Order, as applicable (submission of Hard Copy in ‘Original’) to be submitted on the letter head of the auditor/ cost accountant.</td>
</tr>
<tr>
<td>Attachment 21</td>
<td>Undertaking for not indulging in Corrupt &amp; Fraudulent practice</td>
</tr>
<tr>
<td>Attachment 22</td>
<td>Certification by the Bidder as per DoE Order no-F.No.7/10/2021-PPD(1) dated 23/02/2023 in line with ITB Clause 1.2.2 (In case of a Joint Venture bid, the declaration shall be given by all partners of the Joint Venture)</td>
</tr>
<tr>
<td>Attachment 23</td>
<td>Deleted.</td>
</tr>
<tr>
<td>Attachment 24</td>
<td>Deleted.</td>
</tr>
</tbody>
</table>

### 3.0 Price Schedules

3.1 Schedule 1 : Price break-up Plant and Equipment (including Mandatory Spares) to be supplied

Schedule 2 : Break-up of Local Transportation, Insurance and other Incidental Services

Schedule 3 : Price Breakup of Installation Charges

Schedule 4 : Grand summary of the quoted bid price.

3.2 We are aware that the Price Schedules do not generally give a full description of the Work to be performed under each item and we shall be deemed to have read the Technical Specifications and other sections of the Bidding Documents and Drawings to ascertain the full scope of Work included in each item while filling-in the rates and prices. We agree that the entered rates and prices shall be deemed to include for the full scope as aforesaid, including overheads and profit.

3.3 We declare that as specified in the clause 11.2 CC of the Bidding Documents prices quoted by us in the Price Schedules shall be subject to variation as per applicable latest formula issued by IEEMA for Transformers and Reactors of voltage above 33kV and up to 400kV supplied against domestic contracts.
The price variation clause for transformer shall be applicable w.e.f date of award of contract till delivery of equipments.

3.4 We understand that in the price schedules, where there are errors between the total of the amounts given under the column for the price Breakdown and the amount given under the Total Price, the former shall prevail and the latter will be corrected accordingly. We further understand that where there are discrepancies between amounts stated in figures and amounts stated in words, the amount stated in words shall prevail. Similarly, any discrepancy in the total bid price and that of the summation of Schedule price (price indicated in a Schedule indicating the total of that schedule), the total bid price shall be corrected to reflect the actual summation of the Schedule prices.

3.5 We declare that items left blank in the Schedules will be deemed to have been included in other items. The TOTAL for each Schedule and the TOTAL of Grand Summary shall be deemed to be the total price for executing the Facilities and sections thereof in complete accordance with the Contract, whether or not each individual item has been priced.

4.0 We confirm that except as otherwise specifically provided our Bid Prices include all taxes, duties, levies and charges as may be assessed on us, our Sub Contractor/Sub-Vendor or their employees by all municipal, state or national government authorities in connection with the Facilities, in and outside of India.

4.1 Deleted

4.2 We further understand that notwithstanding 4.0 above, in case of award on us, you shall also bear and pay/reimburse to us, Taxes, Duties and Levies as per GST rules in respect of transaction between you and us, imposed on the Plant & Equipment including Mandatory Spare Parts specified in Price Schedule to be incorporated into the Facilities; by the Indian Laws.

4.3 Deleted.

4.4 We confirm that we shall also get registered with the concerned Tax Authorities as per GST rules, in all the states where the project is located.

4.5 Deleted.

4.6 We confirm that TDS under the applicable laws shall be deducted by the Employer from the payments made to us and Employer shall issue TDS certificates in lieu of deductions so made.

5.0 CONSTRUCTION OF THE CONTRACT

5.1 We declare that we are making this offer on the basis of divisible Supply-cum-Erection Contract on a single source responsibility basis. The supply portion of the Contract will relate to the Supply of equipment and materials on the ex-works basis and the Erection portion will relate to transportation, storage, insurance, erection, testing and commissioning etc. of equipment/ materials as specified in the bidding documents. However, we have no objection in case Owner decides to split the above mentioned package into two separate Contracts-one Contract for Supply of all equipment on ex-works basis and second Contract for all services such as transportation & insurance, handling at site, storage, insurance, installation, testing and commissioning etc of equipment/materials as specified in the bidding documents.

We hereby declare that the award of two separate Contracts, will not, in any way, dilute our responsibility for successful completion of work and fulfillment of all obligations as per Bidding Documents and that both the Contracts will have a cross-fall breach clause i.e. a breach in one Contract will automatically be considered as a breach of the other Contract
which will confer on the Owner the right to terminate the other Contract at our risk and cost
and/or recover damages under any or both the Contracts.

6.0 PERFORMANCE GUARANTEE

We declare that the ratings and performance figures of the equipment to be furnished and erected
by us are guaranteed. The Guaranteed particulars of different equipment are enclosed in Technical
Data Sheets.

7.0 QUALIFICATION DATA

We confirm having submitted the Qualification Data in two Copies, as required by you in your
Conditions of Contract in a separate envelope along with this Bid. Further we have filled in the
information for qualification requirements in Attachment-3. In case you require any further
information in this regard, we agree to furnish the same.

8.0 DEVIATIONS

8.1 We declare that the contract shall be executed strictly in accordance with the specifications and
documents except for the variations and deviations, all of which have been detailed out
exhaustively in the following Attachments, irrespective of whatsoever has been stated to the
contrary elsewhere in our proposal.

(a) Commercial Deviations Attachment : Attachment-5
(b) Cost of withdrawal of deviation on Important/critical conditions Attachment : Attachment-6
(c) Technical Deviations Attachment : Attachment-7

8.2 We confirm having noted Clause 11.2 of Section-ITB, Conditions of Contract, Volume-I, as per
which Bid containing deviations from following provision relating to following critical clauses
will be treated as non-responsive, as stated therein. :

(a) Governing Laws : Clause 5, CC
(b) Settlement of Disputes : Clause 6, CC
(c) Taxes and Duties, : Clause 14, CC
(d) Appendix 2 to the Form of Contract Agreement (Price Adjustment) : Clause No. 15 ITB
(e) Bid Security : Clause 23.0, Section ITB Volume-I, conditions of contract
(f) Contract Performance Guarantee : Clause 43.0, Section ITB, Volume-I, Conditions of Contract
(g) Liquidated Damages & (Functional Guarantee) : Clause 28 & 28.5 CC
(h) Defect Liability : Clause No. 27 CC
8.2.1 We confirm that we have not taken any deviations / exceptions to above clauses.

8.3 Further, we agree that additional conditions, deviations, if any, found in the proposal documents other than those stated in attached Deviation Attachments (i.e., Attachment 5, 6 & 7), save that pertaining to any rebates offered, shall not be given effect to.

9.0 ADDITIONAL INFORMATION

We have included with this proposal additional information as listed in Attachment-8. We further confirm that such additional information do not imply any additional deviation beyond those covered in Attachment- 5, 6 & 7 and in case of any contradiction between these additional information and other provisions of Bid, the latter will prevail.

10.0 GUARANTEE DECLARATION

We guarantee that the equipment offered shall meet the rating and performance requirements stipulated in the specifications.

11.0 BOUGHT-OUT AND SUB-CONTRACTED ITEMS

We are furnishing herewith at Attachment-9, the detail of all major items of supply amounting to more than 10% of our bid price, which we propose subcontract giving detail of the name of sub-contractor / sub-vendor and quantity for each item.

12.0 WORK SCHEDULE

If this proposal is accepted by you, we agree to complete the entire scope of work as per the bidding documents, in accordance with schedule indicated in the proposal. We fully understand that the work completion schedule stipulated in this proposal is the essence of the Contract, if awarded. The completion schedule of the various major key phases of the work is indicated in Attachment-10.

13.0 SPECIAL TOOLS AND TACKLES

We have given a list of Special Tools and Tackles in Attachment-11 and prices thereof are included in his lumpsum bid price. We further agree that any items of special tools and tackles, though not included in the aforesaid list, but required for effective erection, testing and commissioning & operation of the equipment for subject Package shall also be furnished by us at no extra cost to you.

14.0 CONTRACT PERFORMANCE GUARANTEE

The successful Bidder shall be required to furnish to DTL a Contract Performance Guarantee (CPG) for the value of ten percent (10%) of total Contract Price as per conditions stipulated in Clause 43.0, Section-ITB and Clause 13.0, Section-CC, Conditions of Contract, Volume-I of the Bidding Documents, which shall be extended from time to time beyond the actual date of successful completion of warranty/ defect liability period, as may be required under the Contract. The Bid Security/ guarantee shall be kept valid by the successful Bidder till the CPG is accepted by DTL.

(i) Price Basis and Payment : Clause No.12 CC and Clause 14 Section ITB
(j) Completion Time : Section F&P Appendix-4
(k) Patent Indemnity : Clause No.29, CC
15.0 INFORMATION REGARDING EX-EMPLOYEES OF DTL

We have furnished the details of Ex-employees of DTL, who had retired/resigned at the level of General Manager and above from DTL and subsequently have been employed by us, in Attachment-12.

16.0 CHECK LIST

We have included a checklist duly filled in Attachment-18

17.0 Deleted

18.0 We undertake, if our bid is accepted, to commence the work on Facilities immediately upon your Notification of Award to us, and to achieve Completion within the time stated in the Bidding Documents.

We agree to abide by this bid for a period of 180 days from the date fixed for opening of bids as stipulated in the Bidding Documents, and it shall remain binding upon us and may be accepted by you at any time before the expiration of that period.

19.0 We, hereby, declare that only the persons or firms interested in this proposal as principals are named herein and that no company, persons or firms other than mentioned herein have any interest in this proposal or in the Contract to be entered into, if we are awarded the Contract, and this proposal is made without any connection with any other persons, firm or party likewise submitting a proposal and that this proposal is in all respect for and in good faith, without collusion or fraud.

Dated this ..................................... day of ................................ 20....................

Thanking you, we remain

Yours faithfully

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

(Printed Name)........................................

(Designation) .................................

(Common Seal) ...................................

Date:...........................................

Place...........................................

Business Address:

Name and Address of Principal Officer

(© Written Power of Attorney of all signatories of bid to commit the bidder must be enclosed with the bid.)
SECTION-II
ATTACHMENTS
ATTACHMENT - 1

Tender No. T23P111611

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

(Bid Security Form)

Please Refer Volume I (Conditions of Contract), Section: Forms & Procedures
Tender No. T23P111611

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

(Power of Attorney)

Please Refer Volume I (Conditions of Contract), Section : Forms & Procedures.

or

Bidders may use their own performa for furnishing the required information with bid.
ATTACHMENT-3

Tender No. T23P111611

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

(QUALIFYING REQUIREMENT (QR) DATA)

Bidder’s Name and Address:   To: Delhi Transco Limited,  
DGM (T) M&S C&MM division, Room No.-105, 1st Floor, Rajghat Power House, 
Pre-fabricated RPH Building, New Delhi-110002 (India), 
Email: dgmms.cmm @dtl.gov.in, dgmms105@gmail.com

In support of the Qualification Requirements (QR) for bidders, stipulated in Annexure-A, BDS Section-III, Volume-I of the Bidding Documents, we furnish herewith our QR data/details along with other information, as follows herewith, however, in case of any discrepancy the QR as given in Annexure-A, BDS Section-III shall prevail.

We have submitted bid as Individual Firm* through route 1.1/1.2* of QR as given in Annexure-A, BDS Section-III.

[*Strike off whoever is not applicable.)

We are furnishing the following details/document in support of Qualifying Requirement for the subject package:

A. Attached copies of original documents defining:
   a) The constitution or legal status;
   b) The principal place of business;
   c) The place of incorporation (for bidders who are corporations); or the place of registration and the nationality of the Owners (for applicants who are partnerships or individually-owned firms).

B. Attached original & copies of the following documents:
   a) Written power of attorney of the signatory of the Bid to commit the bidder.

GENERAL INFORMATION

Qualification of bidder will be based on meeting the minimum pass/fail criteria specified below regarding the Bidder's technical experience and financial position as demonstrated by the Bidder's responses in the corresponding Bid Schedules.

The Employer may assess the capacity and capability of the bidder, to successfully execute the scope of work covered under the package within stipulated completion
period. This assessment shall inter-alia include (i) document verification; (ii) bidders work/ manufacturing facilities visit; (iii) manufacturing capacity, details of works executed , works in hand, anticipated in future & the balance capacity available for the present scope of work; (iv) details of plant and machinery, manufacturing and testing facilities, manpower and financial resources; (v) details of quality systems in place; (vi) past experience and performance; (vii) customer feedback; (viii) banker's feedback etc.

Further DTL reserves the right to waive off minor deviation if they do not affect the capability of the bidder to perform the contract. However it does not allow the bidder for any deviation in technical experience & financial capability.

a. Bidder is required to provide general information as per the following format. [Where the Bidder proposes to use named subcontractor(s) for critical components of the works or for work contents in excess of ten (10) percent of the bid price, the following information should also be supplied for the subcontractor(s)].

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parts particulars</th>
<th>For Individual Firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Name of Firm</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Head Office / Registered Office Address</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Telephone</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Fax</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Contact Person</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Place of Incorporation/ Registration</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Year of Incorporation/ Registration</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Authorized signatory of the bid</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Whether copy of Power of Attorney of the signatory to commit the bidder is attached.</td>
<td>Yes or No</td>
</tr>
</tbody>
</table>

(Necessary documents to establish legal status of the bidder should be enclosed with the bid)

b. The qualification and experience of key personnel, proposed for carrying out the work;

<table>
<thead>
<tr>
<th>Name of Person</th>
<th>Professional Qualification</th>
<th>Experience</th>
<th>Designation</th>
</tr>
</thead>
</table>

|                  |                           |            |            |


c. **Litigation History:** Information regarding any current litigation in which the bidder is involved, the parties concerned and disputed amount; As per ITB, the information is to be completed for individual bidder.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Parties concerned</th>
<th>Cause of litigation and matter in dispute</th>
<th>Disputed amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
1.0 TECHNICAL REQUIREMENTS: - Bidder is required to submit the essential documents as per following requirements:

{Reference Annexure-A, Section BDS}

Technical Experience

1.1 The bidder should have designed, manufactured, type tested 400kV or above voltage class transformers of at least 500 MVA/ 315 MVA capacity or equivalent capacity in banks of 3 single phase units (capacity of 500MVA or 315MVA shall be applicable as per scope of tender). The bidder should have supplied and commissioned at least 01 (one) number of such transformers during the last seven (07) years as on ending last day of month previous to the one in which the tender is invited and the same should have been in satisfactory operation* for at least two (2) years.

Note:
1. $: For the purpose of qualifying requirement, during the last seven years means that the commissioning date is to be within a period of seven years ending last day of month previous to the one in which the tender is invited.
2. *: Satisfactory Operation means Certificate issued by the Employer certifying the operation without any adverse remark.

1.2 The 400kV or above voltage class Transformer manufacturer(s) who have established production line in India for these equipment(s) based on technological support of parent / another entity of the same parent/ group/ subsidiary/ sister concern## or collaborator for the respective equipment(s) shall also be considered provided:

(i) Such manufacturer has designed, manufactured, type tested, supplied, installed and commissioned 400kV or above voltage class transformer and,

(ii) The parent / another entity of the same parent/ group/ subsidiary/ sister concern## or collaborator meets qualifying requirements stipulated at para 1.1.1 above; and

(iii) The 400kV or above voltage class Transformer manufacturer(s) furnishes:

a. A legally enforceable undertaking (jointly with the parent / another entity of the same parent/ group/ subsidiary/ sister concern## company or collaborator) to guarantee quality, timely supply, performance and warranty obligations as specified for the equipment(s); and

b. A confirmation letter from the parent / another entity of the same parent/ group/ subsidiary/ sister concern## or collaborator along with the bid stating that parent / another entity of the same parent/ group/ subsidiary/ sister concern## or collaborator shall furnish performance guarantee for an amount of 10 % of the cost of such equipment(s). This performance guarantee shall be in addition to Contract Performance Guarantee to be submitted by the Bidder.
Note: Sister concern## of bidder means the company which has same parent as that of the bidder.

**Format-A for the bidders who wish to qualify through route 1.1 and for Parent/another entity of the same parent/group/subsidiary/sister concern or collaborator of bidder who want to qualify through route 1.2:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name of the Bidder</strong> :- Single Firm (as per 1.1 above)/Name of Parent Company/ another entity of the same parent/ group/ subsidiary/ sister concern or collaborator(as per 1.2 above)</td>
<td></td>
</tr>
<tr>
<td><strong>a.</strong></td>
<td>Name of Contract Undertaken</td>
</tr>
<tr>
<td><strong>b.</strong></td>
<td>Contract Reference No. &amp; Date of Award</td>
</tr>
</tbody>
</table>
| **c.** | Name and Address of the Employer/Utility for whom the Contract was executed by bidder/ Parent Company/ another entity of the same parent/ group/ subsidiary/ sister concern or collaborator  
E-mail ID  
Telephone No.  
Fax No. |
| **d** | Voltage Level of Transformer supplied under the Contract(Indicate Only 400 kV or above class)  
No. of Transformer(s) under the contract (indicate nos. Transformer with rating not less than 500 MVA capacity  
MVA capacity of the Transformer  
Name of the substation or switchyard  
Type of cooling of above Transformer |
| **e.** | Scope of work executed under the above contract  
(Tick only whichever is/are applicable)  
□ Design  
□ Manufacture  
□ Supply  
□ Testing  
□ Installation & commissioning of 400 kV or above class Transformer |
| **f.** | Date of Commissioning of above Transformer |
| **g.** | No. of years the above Transformer is in satisfactory operation as on the date of bid opening |
| **h.** | Details of documents furnished in the Bid, in support of the aforesaid data/details/information |
Format-B for the bidders (Manufacturers) who wish to qualify through route 1.2:

<table>
<thead>
<tr>
<th>Name of the Bidder (Manufacturer)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Whether the bidder is a <strong>400 kV</strong> class Transformer manufacturer, who has recently established production line in India for these equipment(s), based on technological support of parent/ another entity of the same parent/ group/ subsidiary/ sister concernor collaborator for <strong>400 kV</strong> class Transformer</td>
<td></td>
</tr>
<tr>
<td>b. Name of the Parent/ another entity of the same parent/ group/ subsidiary/ sister concern or collaborator for <strong>400 kV</strong> class Transformer (The qualifying data for parent/ another entity of the same parent/ group/ subsidiary/ sister concernor collaborator for the Transformer shall be furnished in Format-A)</td>
<td></td>
</tr>
<tr>
<td>c. Date of Commissioning of above Transformers</td>
<td></td>
</tr>
<tr>
<td>d. Whether the <strong>400 kV</strong> class Transformer or above class Transformer manufacturer (bidder) has furnished. (Tick only whichever is/are applicable)</td>
<td></td>
</tr>
<tr>
<td>e(i) A legally enforceable undertaking (jointly with the parent/ another entity of the same parent/ group/ subsidiary/ sister concernor collaborator) to guarantee quality, timely supply, performance and warranty obligations as specified for the equipment(s); and</td>
<td></td>
</tr>
<tr>
<td>e(ii) A confirmation letter from the parent/ another entity of the same parent/ group/ subsidiary/ sister concern or collaborator along with the bid stating that Parent company or collaborator shall furnish performance guarantee for an amount of 10 % of the cost of such equipment (s). This performance guarantee shall be in addition to Contract Performance Guarantee to be submitted by the Bidder.</td>
<td></td>
</tr>
<tr>
<td>f. Details of documents furnished in the Bid, in support of the aforesaid data/details/information</td>
<td></td>
</tr>
</tbody>
</table>

2.0 FINANCIAL POSITION:

The bidder should have adequate financial capability to meet the following minimum criteria:

a) **Net Worth requirement of QR**

Net Worth for last three financial years should be positive. (Total Assets less Total liabilities shall be positive)
b) Minimum Average Annual Turnover (MAAT) requirement for the last three years of the bidder should not be less than:

(Cost Estimate x 1.5/Completion period in years).

MAAT: - Rs. 1998217786 (Rs. One Hundred ninety nine Crores eighty two Lacs seventeen Thousand seven Hundred eighty six Only)

(For the purpose of arriving at MAAT, total income, except non-recurring income e.g. Sale of fixed assets shall be considered). Further the completion period for calculating MAAT shall be considered as 1 year even if the Contractual Completion period is less than 1 year.

c) Liquid Asset (LA) requirement of

(Cost Estimate x 3/Completion period in months).

LA: - Rs. 333036298/- (Rs. Thirty three Crore thirty Lacs Thirty six Thousand two hundred ninety eight Only)

(For the purpose of arriving at LA, Current Assets less Inventories and prepaid expenses shall be considered i.e. LA=Current Asset-Inventories-Prepaid Expenses) Further, the Completion Period for calculating LA shall be considered as 12 months even if the Contractual Completion period is less than 12 months.

The cost Estimate referred above shall include GST and other taxes & duties.

(d) Relaxation for Start-Ups^/ MSEs

Start-Ups^/ MSEs, meeting the specified requirements at Para 2.0 (a) above in Financial Position shall also be considered qualified if they meet Eighty (80) % of the requirement specified at Para 2.0 (b) & 2.0 (c) above in Financial Position.

^Start-Ups as defined by DIPP, applicable as on ending last day of month previous to the one in which tender is invited.

Note:
In case bidder is a holding company, the financial position criteria referred to in clause 2.0 above shall be of that holding company only (i.e. excluding its subsidiary/ group companies). In case bidder is a subsidiary of a holding company, the financial position criteria referred to in clause 2.0 above shall be of that subsidiary company only (i.e. excluding its holding company)

In case completion period is less than one (1) year the denominator to calculate MAAT and LA shall be considered as one (1) and twelve (12) respectively. The bidders are required to submit Annual Financial Report (Balance Sheet and Profit & Loss A/C) of last three financial years (ending last day of month previous to the one in which the tender is invited). Annual financial statement should be duly certified by a Chartered Accountant for last three financial years and counter signed by bidders/Authorized signatory.
### 2.1 Financial Qualification Data

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Financial Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2022-23</td>
</tr>
<tr>
<td>2</td>
<td>2021-22</td>
</tr>
<tr>
<td>3</td>
<td>2020-21</td>
</tr>
<tr>
<td>4</td>
<td>2019-20</td>
</tr>
<tr>
<td>5</td>
<td>2018-19</td>
</tr>
</tbody>
</table>

#### A Turnover details:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Financial Year</th>
<th>Turnover (in Millions)</th>
<th>Details of documentary evidence submitted in support of Qualification Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### B Net Worth (Paid Up Capital + Free Reserves and Surplus + Misc expenses to the extent not net)

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Financial Year</th>
<th>Net Worth (in Millions)</th>
<th>Details of documentary evidence submitted in support of Qualification Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2022-23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2021-22</td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>2020-21</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>2019-20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2018-19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### C Liquid Assets

<table>
<thead>
<tr>
<th>LA</th>
<th>Details of evidence of having Liquid assets (LA)</th>
<th>Or</th>
<th>Details of evidence of access to or availability of credit facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

3.0 The Bidder shall also furnish following documents/details with its bid.

3.1 The complete annual reports together with Audited statement of accounts of the company for last three years of its own (separate) immediately preceding the date of submission of bid.

Note I. In the event the bidder is not able to furnish the information of its own (i.e. separate), being a subsidiary company and its accounts are being consolidated with its group/holding/parent company, the bidder should submit the audited balance sheets, income statements, other information pertaining to it only (not of its group/Holding/Parent Company) duly certified by anyone of the authority [(i) Statutory Auditor of the bidder/(ii) Company Secretary of the bidder or (iii) A Certified Public Accountant] certifying that such information/documents are based on the audited accounts as the case may be.
Note II. Similarly, if the bidder happens to be a Group/Holding/Parent Company, the bidder should submit the above documents/information of its own (i.e. exclusive of its subsidiaries) duly certified by anyone of the authority mentioned in Note I above certifying that these information/documents are based on the audited accounts, as the case may be.

3.2 The bidder should accordingly also provide the following information/documents:

Audited balance sheet and income statements for the last three years as per the following:

<table>
<thead>
<tr>
<th>Years preceding to the bid opening</th>
<th>Audited Balance Sheet and Income Statements enclosed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Year</td>
<td></td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Year</td>
<td></td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Year</td>
<td></td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt; year</td>
<td></td>
</tr>
<tr>
<td>5&lt;sup&gt;th&lt;/sup&gt; year</td>
<td></td>
</tr>
</tbody>
</table>

Date:       Printed Name:  
Place:       Designation:
Tender No. T23P111611

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub- Stations of DTL on turnkey basis.

Bidder’s Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre-fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm @dtl.gov.in, dgmms105@gmail.com

LIST OF APPROVED SUBCONTRACTORS

Prior to award of Contract, the following details shall be completed indicating those subcontractors proposed by the Bidder by Attachment to its bid that are approved by the Employer for engagement by the Contractor during the performance of the contract.

The following Subcontractors are approved for carrying out the item of the facilities indicated. Where more than one Subcontractor is listed, the Contractor is free to choose between them, but it must notify the Employer of its choice in good time prior to appointing any selected Subcontractor. No Subcontractors shall be placed with any such Subcontractors for additional items until the Subcontractors have been approved in writing by the Employer and their names have been added to this list of Approved Subcontractors.

<table>
<thead>
<tr>
<th>Item of Facilities</th>
<th>Approved Subcontractors</th>
<th>Nationality</th>
</tr>
</thead>
</table>


Tender No. T23P111611

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

(Commercial Deviations)

Bidder’s Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre- fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm @dtl.gov.in, dgmms105@gmail.com

Dear Sirs,

The following are the Commercial Deviations and variations from and exceptions to the specifications and documents for the subject package. These deviations and variations are exhaustive. Except for these deviations, the entire work shall be performed as per your specifications and documents.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Volume-Clause No.</th>
<th>Ref./Page No.</th>
<th>Details of Deviation</th>
<th>Reason/Justification of Deviation</th>
<th>Withdrawal Price in Rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

Date : .................................................................

Place : .................................................................

(Printed Name) ..................................................

(Designation) ..................................................

(Common Seal) ..................................................

Note : Continuation sheets of like size and format may be used as per Bidder's requirements and annexed to this Schedule.
Tender No. T23P111611

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

(DEVIATIONS ON IMPORTANT CONDITIONS)

Bidder's Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre-fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm@dtl.gov.in, dgmms105@gmail.com

Dear Sirs,

Sub.: Deviation on Important Conditions along with their withdrawal price.

The following are the Deviations/variations/exceptions to the provisions of important conditions stipulated in Clause 11.2 of ITB, Conditions of Contract, Volume-I. We undertake to execute the contract in line with the provisions of bidding documents in respect of above said clauses in case DTL agree to pay us the withdrawal price indicated below against each such deviations/variations/exceptions.

<table>
<thead>
<tr>
<th>Volume of bidding document</th>
<th>Section</th>
<th>Clause No.</th>
<th>Page No.</th>
<th>Statement of deviations/variations/exceptions</th>
<th>Withdrawal Price in Rupees</th>
</tr>
</thead>
</table>

Date : .................................................................

Place : .................................................................

(Printed Name) ...........................................................

(Designation) ...........................................................

(Common Seal) ...........................................................

Note : Continuation sheets of like size and format may be used as per Bidder's requirements and annexed to this Schedule.
Tender No. T23P111611

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis

Bidder’s Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&M division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre-fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm@dtl.gov.in, dgmms105@gmail.com

Dear Sir,

Sub. : Technical Deviations.

The following are the Technical Deviations and variations from and exceptions to the specifications and documents for the subject package. These deviations and variations are exhaustive. Except for these deviations, the entire work shall be performed as per your specifications and documents.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Volume/Clause No.</th>
<th>Ref./Page No.</th>
<th>Details of Deviation</th>
<th>Reason/Justification of Deviation</th>
<th>Withdrawal Price in Rupees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Date : ..................................................

Place : ............................................... (Printed Name) ...........................................

(Designation) ..........................................

(Common Seal) ..........................................

Note: 1. Continuation sheets of like size and format may be used as per Bidder's requirements and annexed to this Schedule.

2. The deviations and variations, if any, shall be brought out separately for each of the equipment.
Tender No. T23P111611

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

(Additional Information)

Bidder’s Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre- fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm@dtl.gov.in, dgmms105@gmail.com

We have enclosed with our proposal the following additional information for the subject package.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Date :   (Signature) ..................................................
Place :  (Printed Name) ...........................................
          (Designation) ..........................................  
          (Common Seal) ..........................................

Note:  Continuation sheets of like size and format may be used as per Bidder's requirements and annexed to this Schedule.
Tender No. T23P111611

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis

**(BOUGHT-OUT & SUB-CONTRACTED ITEMS)**

Bidder’s Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre-fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm@dtl.gov.in, dgmms105@gmail.com

We hereby furnish the details of the items/sub-assemblies; we propose to buy for the purpose of subject package.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item Description</th>
<th>Quantity Proposed be bought/Sub-contracted</th>
<th>Source of Supply</th>
</tr>
</thead>
</table>

Date : (Signature) ..................................................

Place : (Printed Name) ............................................

(Designation) .............................................

(Common Seal) ...........................................

**Note**: Continuation sheets of like size and format may be used as per Bidder's requirements and annexed to this Schedule.
Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA
Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on
turnkey basis

(WORK COMPLETION SCHEDULE)

Bidder’s Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre-fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm@dtl.gov.in, dgmms105@gmail.com

We hereby declare that the following Work Completion Schedule shall be followed by us for the
subject package.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description of Work</th>
<th>Period in Months (from the date of Award of Contract)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Completion of detailed engineering</td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Commencement</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Completion</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Procurement of equipment &amp; raw materials</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Tests</td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Commencement</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Completion</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Manufacturing</td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Commencement</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Completion</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Shipments</td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Commencement</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Completion</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Establishment of site office</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Receipt at final destination at site</td>
<td></td>
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<tr>
<td>---</td>
<td>-------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Commencement</td>
<td></td>
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<td></td>
<td>b) Completion</td>
<td></td>
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<tr>
<td></td>
<td>Erection</td>
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<td></td>
<td>a) Commencement</td>
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</tr>
<tr>
<td></td>
<td>b) Completion</td>
<td></td>
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<tr>
<td></td>
<td>Testing &amp; Commissioning</td>
<td></td>
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<tr>
<td></td>
<td>a) Commencement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Completion</td>
<td></td>
</tr>
</tbody>
</table>

Date: ..................................................

Place: ............................................

(Signature) ...........................................

(Printed Name) ........................................

(Designation) ........................................

(Common Seal) ........................................

**Note:** Continuation sheets of like size and format may be used as per Bidder's requirements and annexed to this Schedule.
ATTACHMENT-11

Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub- Stations of DTL on turnkey basis.

(LIST OF SPECIAL TOOLS & TACKLES)

Bidder’s Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre-fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm@dtl.gov.in, dgmms105@gmail.com

We hereby furnish below the list of special tools & tackles for erection and commissioning of equipment for the subject package. The prices for these tools & tackles are already included in the lumpsum bid price.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>For Equipment</th>
<th>Item Description</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

Date: (Signature) ..................................................

Place: (Printed Name) ............................................

(Designation) ............................................

(Common Seal) ...........................................

Note: Continuation sheets of like size and format may be used as per Bidder's requirements and annexed to this Schedule.
Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

(INFORMATION REGARDING EX-EMPLOYEES OF “DTL”)

Bidder’s Name & Address:

To, Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre- fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm @dtl.gov.in, dgmms105@gmail.com

We hereby furnish the details of Ex-Employees of DTL who had retired/resigned at the level of General Manager and above from DTL and subsequently have been employed by us.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Person with designation in DTL</th>
<th>Date of Retirement/resignation from DTL</th>
<th>Date of joining and designation in our Organisation</th>
</tr>
</thead>
</table>

Date : ..................................................
Place : .............................................

(Signature) ..........................................
(Printed Name) .....................................
(Designation) .....................................
(Common Seal) .....................................

Note: Continuation sheets of like size and format may be used as per Bidder's requirements and annexed to this Schedule.
Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis

---

**PRICE ADJUSTMENT**

The prices are to remain FIRM and FIXED for the duration of the Contract except for Power Transformer.

**Price adjustment for 500 MVA Power Transformer**

The price variation as per latest IEEMA (Indian Electrical & Electronics Manufacturers Association) formula and any further amendment thereof shall be applicable for power transformer as given below:

**PRICE VARIATION CLAUSE FOR POWER TRANSFORMERS COMPLETE WITH ALL ACCESSORIES AND COMPONENTS**

(of voltage above 33 kV and up to 400 kV of supplied against domestic contracts)

This price variation clause is applicable for Transformers and Reactors of voltage above 33 kV and up to 400 KV supplied against domestic contracts. A separate price variation clause IEEMA/PVC/PWR TRF Up to 400 KV/DE/2021 has been evolved for above types of Transformers and Reactors supplied against export/deemed export contracts.

The price quoted/confirmed is based on the input cost of raw materials/components and labour cost as on the date of quotation and the same is deemed to be related to prices of raw materials and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment, up or down in accordance with the following formula:

\[
P = \frac{P_o}{100} \left( 6 + \frac{C}{C_o} + 32 \frac{ES}{ES_o} + 27 \frac{IS}{IS_o} + 12 \frac{IM}{IM_o} + 9 \frac{TO}{TO_o} + 10 \frac{W}{W_o} \right)
\]

Wherein,

- **P** = Price payable as adjusted in accordance with the above formula
- **Po** = Price quoted/confirmed.
- **Co** = Price of CC copper rods (refer notes). This price is as applicable for the month, **ONE** month prior to the date of tendering.
- **ESo** = Price of CRGO Electrical Steel Lamination (refer note). This price is as applicable for the month, **ONE** month prior to the date of tendering.
- **ISo** = Average price of steel Plates 10 mm thick (refer notes). This price is as applicable for the month, **ONE** month prior to the date of tendering.
- **IMo** = Price of Insulating Materials (refer notes). This price is as applicable for the month, **ONE** month prior to the date of tendering.
- **TOo** = Price of Transformer Oil (refer notes). This price is as applicable for the month, **ONE** month prior to the date of tendering.
Wo= All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2016 = 100).
This index number is as applicable for the month, THREE months prior to the date of tendering.

For example, if date of tendering falls in December 2021, applicable prices of Copper Rods (C₀), Steel Plates 10 mm thick (IS₀), CRGO Electrical Steel Laminations (ES₀) and Insulating material (IM₀) and Transformer Oil (TO₀) should be as on 1st November 2021 and all India average consumer price index no. (W₀) should be for the month of 1st September 2021.

The above prices and indices are as published by IEEMA vide circular reference number IEEMA(PVC)/PWR_DIST_TRF(R-1)/_/ONE months prior to the date of Tendering.

C= Price of CC copper rods (refer notes) This price is as applicable for the month, TWO months prior to the date of delivery.

ES= Price of CRGO Electrical Steel Lamination (refer note) This price is as applicable for the month, TWO months prior to the date of delivery.

IS= Average price of Steel Plates 10 mm thick (refer notes) This price is as applicable for the month, TWO months prior to the date of delivery.

IM= Price of Insulating Materials (refer notes) This price is as applicable for the month, TWO months prior to the date of delivery.

TO= Price of Transformer Oil (refer notes) This price is as applicable for the month, ONE month prior to the date of delivery.

W= All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2016 = 100) This index number is as applicable for the month, THREE months prior to the date of delivery.

For example, if date of delivery in terms of clause given below falls in December 2022, applicable prices of Copper Rods (C), Insulating material (IM), CRGO Electrical Steel Lamination (ES), Plates 10 mm thick (IS) should be as on 1st October 2022 and Transformer Oil (TO) should be 1st November 2022 and all India average consumer price index no. (W) should be for the month of September 2022.

The date of delivery is the date on which the transformer is notified as being ready for inspection/dispatch (in the absence of such notification, the date of manufacturer’s dispatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

Note: All prices are exclusive of GST and exclusive of any other central, state or local taxes etc.

(a) The details of prices are as under:

1. Price of 8 mm CC copper rod (in Rs/MT) is ex-works price as quoted by the primary producer.
2. The price of CRGO is the price of CRGO Electrical Steel Lamination in Rs./MT suitable for Transformers of voltage above 33 kV and up to 400 kV

3. Price of Steel is the average retail price of steel plates 10 mm thick as published by Joint Plant Committee (JPC) in Rs./MT

4. The price of Insulating materials (in Rs./Kg) of pre-compressed pressboards of size 10 mm thick, 3200 mm x 4100 mm is the average C&F price in free currency per MT converted into Indian Rupees with applicable exchange rates prevailing as on 1st working day of the month as quoted by primary suppliers. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.

5. The price of Transformer Oil (in Rs./K.Ltr) is the average price on ex-refinery basis as quoted by primary producers for supply in drums.

b) Some purchasers are purchasing oil immersed Transformers from manufacturers without first filling of oil. Oil for first filling is procured and filled by the purchasers. For such supplies PVC formula, excluding Oil will apply as under:

\[
P = \frac{P_0}{91} \left( 6 + \frac{32}{C} + \frac{27}{ES} + \frac{12}{IS} + \frac{4}{IM} + \frac{10}{W} \right)
\]

Where description of \( P, P_0, C, ES, IS, IM, W \) etc. remains same as mentioned earlier.

- No price increase shall be allowed beyond the original project delivery date unless specifically stated in the Time Extension Letter, if any, issued by the Employer. The Employer will, however, be entitled to any decrease in the Contract Price which may be caused due to lower price adjustment amount in case of delivery of Goods beyond the original delivery dates. Therefore, in case of delivery of Goods beyond the original delivery dates, the liability of the Employer shall be limited to the lower of the price adjustment amount which may work out either on schedule date or actual date of delivery of Goods.

- If the Price Adjustment amount works out to be positive, the same is payable to the Contractor by the Employer and if it works out to be negative, the same is to be recovered by the Employer from the Contractor.
ATTACHMENT-15

Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis

(GUARANTEE DECLARATION)

Bidder's Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre- fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm @dtl.gov.in, dgmms105@gmail.com

Dear Sirs,

We declare that the ratings and performance figures of Power Transformer furnished by us for subject tender covered under this specification are guaranteed. We further declare that in the event of any deficiencies in meeting the guarantees in respect of the characteristics mentioned below as established after conducting the factory test, you may at your discretion, reject or accept the equipment after assessing the liquidated damages as specified in the relevant clauses of Bid document.

**Power Transformer:**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Guaranteed Losses at rated output (kW) per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>400/220/33k, 500 MVA Power Transformer</td>
<td>Max. No Load Loss at rated voltage and frequency</td>
</tr>
</tbody>
</table>

Date:....................  (Signature)...........................................
Place:....................  (Printed Name)...........................................
  (Designation)..............................................................
  (Common Seal).............................................................
Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

(Integrity Pact)

(Signature of Bidder)……………..

(Designation)…………………………

(Stamp)…………………………
Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

INTEGRITY PACT

Between

Delhi Transco Limited

having its Registered Office at Shakti Sadan, Kotla Road, New Delhi -110 002

hereinafter referred to as

“DTL”

and

(Insert the name of the Sole Bidder/Lead Partner of Joint Venture)

having its Registered Office at ________________________________________________________

(Insert full Address)

and

(Insert the name of the Partner(s) of Joint Venture/agent, as applicable)

having its Registered Office at ________________________________________________________

(Insert full Address)

hereinafter referred to as

“The Bidder/Contractor”

Preamble

DTL intends to award, under laid-down organisation procedures, contract(s) for Package

(Insert the name of the package)

and Specification Number _________________________DTL values full compliance with all relevant (Insert Specification Number of the Package) laws and regulations, and the principles of economical use of resources, and of fairness and transparency in its relations with its Bidders/Contractors.

In order to achieve these goals, DTL and the above named Bidder/Contractor enter into this agreement called ‘Integrity Pact’ which will form a part of the bid.

It is hereby agreed by and between the parties as under:-
Section I – Commitments of DTL

(1) DTL commits itself to take all measures necessary to prevent corruption and to observe the following principles:

(a) No employee of DTL, personally or through family members or relative(s), will in connection with the tender, or the execution of the contract, demand, take a promise for or accept, for him/herself or third person, any material or other benefit which he/she is not legally entitled to.

(b) DTL will, during the tender process treat all Bidder(s) with equity and fairness. DTL will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or for the execution of contract.

(c) DTL will exclude form evaluation of Bids its such employee(s) who has any personnel interest in the Companies/Agencies participating in the Bidding/Tendering process.

The action stipulated in this Integrity Pact is without prejudice to any other Legal action that may follow in accordance with the provisions of the relevant law in force relating to any civil or criminal proceedings.

(2) If Managing Director obtains information on the conduct of any employee of DTL which is a criminal offence under the relevant Anti-Corruption Laws of India or illegal under the Indian Contract Act or Indian Laws, or if there be a substantive suspicion in this regard, he will inform its Chief Vigilance Officer and in addition can initiate disciplinary actions under its Rules.

Section II – Commitments of the Bidder/Contractor

(1) The Bidder/Contractor commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

(a) The Bidder/Contractor will not, directly or through any other person or firm, offer, promise or give to DTL, or to any of DTL’s employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange an advantage during the tender process or the execution of the contract.

(b) The Bidder/Contractor will not enter into any illegal agreement or understanding, whether formal or informal with other Bidders/Contractors. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or actions to restrict competitiveness or to introduce cartelization in the bidding process.
(c) The Bidder/Contractor will not commit any criminal offence under the relevant Anti-Corruption Laws of India, further, the Bidder/Contractor will not use for illegitimate purposes or for purposes of restrictive competition or personal gain, or pass on to others, any information provided by DTL as part of the business relationship, regarding plans, technical proposals and business details, including information of any type contained or transmitted electronically.

(d) The Bidder/Contractor of foreign origin shall disclose the name and address of the Agents/representatives in India, if any, involved directly or indirectly in the Bidding. Similarly, the Bidder/Contractor of Indian Nationality shall furnish the name and address of the foreign principals, if any, involved directly or indirectly in the bidding.

(e) The Bidder/Contractor will, when presenting his bid, disclose any and all payments he has made, or committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and/or with the execution of the contract.

(f) The Bidder/Contractor will not misrepresent facts or furnish false/forged documents/information in order to influence the bidding process or the execution of the contract to the detriment of DTL.

(2) The Bidder/Contractor will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section III – Disqualification from tender process and exclusion from future contracts

(1) If the bidder, before contract award, has committed a serious transgression through a violation of Section II or in any other form such as to put his reliability or credibility as Bidder into question, DTL may disqualify the Bidder from the tender process or terminate the contract, if already signed, for such reason.

(2) If the Bidder/Contractor has committed a serious transgression through a violation of Section II such as to put his reliability or credibility into question, DTL may after following due procedures also exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, in particular the number of transgressions, the position of the transgressors within the company hierarchy of the Bidder/Contractor and the amount of the damage. The exclusion will be imposed for a minimum of 12 months and maximum of 3 years and it has to be decided by the Competent authority.

(3) If the Bidder/Contractor can prove that he has restored/Recouped the damage caused by him and has installed a suitable corruption prevention system, DTL may revoke the exclusion prematurely with the approval of Competent Authority.
Section IV – Liability for violation of Integrity Pact

(1) If DTL has disqualified the Bidder from the tender process prior to the award under Section III, DTL may forfeit the Bank Guarantee under the Bid.

(2) If DTL has terminated the contract under Section III, DTL may forfeit the Contract Performance Guarantee of this contract besides resorting to other remedies under the contract.

Section V – Previous Transgression

(1) The Bidder shall declare in his Bid that no previous transgressions occurred in the last 3 years with any other Public Sector Undertaking or Government Department that could justify his exclusion from the tender process.

(2) If the bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section VI – Equal treatment to all Bidders/Contractors

(1) DTL will enter into agreements with identical conditions as this one with all Bidders.

(2) DTL will disqualify from the tender process any bidder who does not sign this Pact or violate its provisions.

Section VII – Punitive Action against violating Bidders/Contractors

If DTL obtains knowledge of conduct of a Bidder or a Contractor or his subcontractor or of an employee or a representative or an associate of a Bidder or Contractor or his Subcontractor which constitutes corruption, or if DTL has substantive suspicion in this regard, DTL will inform the Chief Vigilance Officer (CVO).

(*)Section VIII – Independent External Monitor/Monitors

(1) DTL has appointed a panel of Independent External Monitors (IEMs) for this Pact with the approval of Central Vigilance Commission (CVC), Government of India, out of which one of the IEMs has been indicated in the NIT.

(2) The IEM is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement. He has right of access to all project documentation. The IEM may examine any complaint received by him and submit a report to Managing Director, DTL at the earliest. He may also submit a report directly to the CVO and the CVC, in case of suspicion of serious irregularities attracting the provisions of the PC Act. However, for ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter shall be referred to the full panel of IEMs, who would examine the records, conduct the investigations and submit report to Managing Director, DTL, giving joint findings.
(3) The IEM is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the Managing Director, DTL.

(4) The Bidder(s)/Contractor(s) accepts that the IEM has the right to access without restriction to all documentation of DTL related to this contract including that provided by the Contractor/Bidder. The Bidder/Contractor will also grant the IEM, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his documentation. The same is applicable to Subcontractors. The IEM is under contractual obligation to treat the information and documents of the Bidder(s)/Contractor(s)/Sub-Contractor(s) with confidentiality.

(5) DTL will provide to the IEM information as sought by him which could have an impact on the contractual relations between DTL and the Bidder/Contractor related to this contract.

(6) As soon as the IEM notices, or believes to notice, a violation of this agreement, he will so inform the Managing director, DTL and request the Managing Director, DTL to discontinue or take corrective action, or to take other relevant action. The IEM can in this regard submit non-binding recommendations. Beyond this, the IEM has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action. However, the IEM shall give an opportunity to DTL and the Bidder/Contractor, as deemed fit, to present its case before making its recommendations to DTL.

(7) The IEM will submit a written report to the Managing Director, DTL within 8 to 10 weeks from the date of reference or intimation to him by DTL and should the occasion arise, submit proposals for correcting problematic situations.

(8) If the IEM has reported to the Managing Director, DTL a substantiated suspicion of an offence under relevant Anti-Corruption Laws of India, and the Managing Director, DTL has not, within the reasonable time taken visible action to proceed against such offence or reported it to the CVO, the Monitor may also transmit this information directly to the CVC, Government of India.

(9) The word ‘IEM’ would include both singular and plural.

(*) This Section shall be applicable for only those packages wherein the IEMs have been identified in Section – I: Invitation for Bids and/or Clause 9 in Section – III: Conditions of Contract, Volume-I of the bidding documents.

Section IX – Pact Duration

This Pact begins when both parties have legally signed it. It expires for the Contractor after the closure of the contract and for all other Bidder’s six month after the contract has been awarded.

Section X – Other Provisions

(1) This agreement is subject to Indian Law. Place of performance and jurisdiction is the establishment of DTL. The Arbitration clause provided in the main tender document/contract shall not be applicable for any issue/dispute arising under Integrity Pact.

(2) Changes and supplements as well as termination notices need to be made in writing.
(3) If the Contractor is a partnership firm or a consortium or Joint Venture, this agreement must be signed by all partners, consortium members and Joint Venture partners.

(4) Nothing in this agreement shall affect the right of the parties available under the General conditions of Contract (CC/GCC) and Special Conditions of Contract (SCC).

(5) Views expressed or suggestions/submissions made by the parties and the recommendations of the CVO/IEM in respect of the violation of this agreement, shall not be relied on or introduced as evidence in the arbitral or judicial proceedings (arising out of the arbitral proceedings) by the parties in connection with the disputes/differences arising out of the subject contract.

# CVO shall be applicable for packages wherein IEM are not identified in Section IFB/BDS of Condition of Contract, Volume-I. IEM shall be applicable for packages wherein IEM are identified in Section IFB/BDS of Condition of Contract. Volume-I

(6) Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

(Signature) __________________________ (Signature) __________________________
(For & On behalf of DTL) (For & On behalf of Bidder/Partner(s) of Joint Venture/Contractor)

(Office Seal) (Office Seal)
Name: __________________________  Name: __________________________
Designation: __________________________  Designation: __________________________
Witness 1: __________________________  Witness 1: __________________________
(Name & Address) __________________________  (Name & Address) __________________________

____________________________  ______________________________
____________________________  ______________________________
Witness 2: __________________________  Witness 2: __________________________
(Name & Address) __________________________  (Name & Address) __________________________
Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

(CHECK LIST)

Bidder’s Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre-fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm@dtl.gov.in, dgmms105@gmail.com

We have enclosed with our proposal the following additional information for the subject package.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bid Validity</td>
<td></td>
</tr>
<tr>
<td>Whether Bid is valid is as stipulated in ITB from the date of bid opening.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Bid Security amount</td>
<td></td>
</tr>
<tr>
<td>Whether Bid security amount and form is enclosed as per ITB.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Bid Security Validity</td>
<td></td>
</tr>
<tr>
<td>Whether bid security is valid for a period as stipulated in ITB.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Bid Signatory</td>
<td></td>
</tr>
<tr>
<td>Power of Attorney of Signatory of Bid as per Section ITB</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

**Technical Specification**

<table>
<thead>
<tr>
<th>Number</th>
<th>Question</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Is the material offered according to the specifications required by the purchaser, if not, please state the deviation from the same and deviation statement thereof</td>
<td>Yes/No</td>
</tr>
<tr>
<td>2.</td>
<td>Have you submitted copies of Type Test Certificates in physical form in respect of material offered?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>3.</td>
<td>Have you submitted dimension drawings leaflets, descriptive and illustrative catalogues in physical form (if necessary)?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>4.</td>
<td>Whether product conforms to relevant ISS and our technical particulars?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>5.</td>
<td>Have you submitted in physical form (i) the copy of NIT duly signed &amp; stamped on each page, (ii) copies of past supplies</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>
and (iii) performance certificates?

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>6</td>
<td>Whether testing facilities as per IS for conducting various tests are available with you?</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

**Terms and Condition**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Do you agree to all clauses of General Conditions of our tender documents?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>2</td>
<td>If you do not agree to any/all the clauses, please state clearly the clause which you do not agree and state the modification in respect of clauses of which you do not agree.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>3</td>
<td>Do you agree to furnish security deposit if order is placed with you?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>4</td>
<td>Whether agreeable to DTL’s liquidate damages clause for late completion of work?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>5</td>
<td>Are you agreeable to inspection clause?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>6</td>
<td>Any further particulars not otherwise covered in the tender specifications submitted physically?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>7</td>
<td>Quantity offered against each item be quoted. Are you prepared to accept order for bigger quantity as per NIT?</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

**Part-I Techno-commercial Bid**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Whether undertaking for corrupt &amp; fraudulent practice signed and submitted.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>b</td>
<td>Whether Bid form duly completed, signed and submitted.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>c</td>
<td>Whether following Attachments submitted:</td>
<td>Yes/No</td>
</tr>
<tr>
<td>d</td>
<td>Attachment 1: “Bid security”.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>e</td>
<td>Attachment 2: “Power of Attorney”.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>f</td>
<td>Attachment 3: “Qualifying Requirement Data”.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>g</td>
<td>Attachment 4: “List of approved Subcontractors”.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>h</td>
<td>Attachment 5: “Commercial Deviations”.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>i</td>
<td>Attachment 6: “Deviations on important Conditions”.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>j</td>
<td>Attachment 7: “Technical Deviations”.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>k</td>
<td>Attachment 8: “Additional Information”.</td>
<td>Yes/No</td>
</tr>
<tr>
<td>l</td>
<td>Attachment 9: “Bought Out and Sub-contracted items”</td>
<td>Yes/No</td>
</tr>
<tr>
<td>m</td>
<td>Attachment 10: “Work completion schedule”.</td>
<td>Yes/No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---</td>
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<td></td>
</tr>
<tr>
<td>a)</td>
<td>Whether Price Bid submitted. Yes/No</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Whether Bid form duly completed, signed and submitted. Yes/No</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>Whether following Price Schedules submitted: Yes/No</td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>Schedule 1: “Price break-up Plant and Equipment (including Mandatory Spares) to be supplied.” Yes/No</td>
<td></td>
</tr>
<tr>
<td>e)</td>
<td>Schedule 2: “Break-up of Local Transportation, Insurance and other Incidental Services.” Yes/No</td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>Schedule 3: “Price Breakup of Installation Charges.” Yes/No</td>
<td></td>
</tr>
<tr>
<td>g)</td>
<td>Schedule 4: “Grand summary of the quoted bid price.” Yes/No</td>
<td></td>
</tr>
<tr>
<td><strong>Tender</strong></td>
<td>Whether Tender document along with all amendments duly signed Yes/No</td>
<td></td>
</tr>
</tbody>
</table>
Date:  
(Signature) ..................................................

Place:  
(Printed Name) ...........................................

(Designation) .............................................

(Common Seal) ..........................................  

Note:  
(i) Continuation sheets of like size and format may be used as per Bidder's requirements and annexed to this Attachment.

(ii) Replies against each item should be complete without any ambiguity. Terms such as refer covering letter etc. shall not be acceptable unless the replies/information are specific and complete.
Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Station of DTL on turnkey basis.

Format for Affidavit of Self certification regarding Local Content in line with PPP-MII order dated 15/06/2017, its revision dated 16/09/2020 & their latest amendments thereof and MoP Order dated 16/11/2021 & their latest amendments thereof, as applicable, to be provided on a non-judicial stamp paper of Rs. 100/-.

Date:

I ________S/o, D/o, W/o, _____________________Resident of_________________________________________________________ hereby solemnly affirm and declare as under:

That I will agree to abide by the terms and conditions of the Public Procurement (Preference to Make in India) Order, 2017 of Government of India issued vide Notification No:P-45021/2/2017 -BE-II dated 15/06/2017, its revision dated 16/09/2020 & their latest amendments thereof, (hereinafter PPP-MII order), and ‘Public Procurement (Preference to Make in India) to provide for Purchase Preference (linked with local content)’ order dated 16/11/2021& their latest amendments thereof, issued by Ministry of Power (hereinafter MoP order) and any subsequent modifications/Amendments, if any and

That the information furnished hereinafter is correct to the best of my knowledge and belief and I undertake to produce relevant records before the procuring entity/DTL or any other Government authority for the purpose of assessing the local content of goods/services/works supplied by me for Turnkey Package (Insert the name of Package and Tender no.).

That the local content for all inputs which constitute the said goods/services/works has been verified by me and I am responsible for the correctness of the claims made therein.

That the ‘Local Content ‘as defined in the PPP-MII order and MoP order in the goods/services/works supplied by me for Turnkey Package (Insert the name of Package and Tender no.) is ………. percent (%). 

That the goods/services/works supplied by me for Turnkey Package (Insert the name of Package and Tender no.) meet the ‘Local Content’ requirement as defined in the PPP-MII order and MoP order for ‘Class –I local supplier’.

That the value addition for the purpose of meeting the ‘Local Content ‘has been made by me at ……………………….. (Enter the details of the location(s) at which value addition is made).

That in the event of the local content of the goods/services/works mentioned herein is found to be incorrect and not meeting the prescribed Local Content criteria, based on the assessment of procuring agency (ies)/DTL/Government Authorities for the purpose of assessing the local content, action shall be taken against me in line with the PPP-MII order, MoP order and provisions of the Integrity pact/ Bidding Documents.

I agree to maintain the following information in the Company's record for a period of 8 years and shall make this available for verification to any statutory authority.
i. Name and details of the Local Supplier
   (Registered Office, Manufacturing unit location, nature of legal entity)

ii. Date on which this certificate is issued

iii. Goods/services/works for which the certificate is produced

iv. Procuring entity to whom the certificate is furnished

v. Percentage of local content claimed and whether it meets the Local Content prescribed for ‘Class –I local supplier’

vi. Name and contact details of the unit of the Local Supplier (s)

vii. Sale Price of the product

viii. Ex-Factory Price of the product

ix. Freight, insurance and handling

x. Total Bill of Material

xi. List and total cost value of input used to manufacture the Goods/to provide services/in construction of works

xii. List and total cost of input which are domestically sourced. Value addition certificates from suppliers, if the input is not in-house to be attached

xiii. List and cost of inputs which are imported, directly or indirectly

For and on behalf of…………………………………………………………… (Name of firm/entity)
Authorized signatory (To be duly authorized by the Board of Directors)
<Insert Name, Designation and Contact No.>
Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

Certificate from statutory auditor or cost auditor of the company giving the percentage of Local Content, in line with PPP-MII order dated 15/06/2017, its revision dated 16/09/2020 & their latest amendments thereof, and MoP order dated 16/11/2021 & their latest amendments thereof, as applicable [to be submitted on the letter head of the issuer.]

Dear Sir,

We have read and understood the provisions of “Public Procurement (Preference to Make in India) Order, 2017” dated 15/06/2017, its revision dated 16/09/2020 & their latest amendments thereof [hereinafter, “PPP-MII Order”] issued by Department for promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce and Industry, Government of India, and ‘Public Procurement (Preference to Make in India) to provide for Purchase Preference (linked with local content)” order dated 16/11/2021 & their latest amendments therefoissued by Ministry of Power [hereinafter, “MoP order”] and any subsequent modifications/ Amendments, if any.

In line with the provisions of the PPP-MII Order and MoP Order, M/s. [Enter the name of the Bidder] [hereinafter, “Class-I Local Supplier”] have submitted an Affidavit of self-certification to M/s. Delhi Transco Limited [hereinafter, DTL] regarding Local Content in Goods/Services/Works to be supplied by the “Class-I Local Supplier” for Turnkey Package (Insert the name of Package and Tender No.), wherein they have agreed to abide by the terms and conditions of the PPP-MII Order and MoP Order.

Further, in line with the PPP-MII Order, the statutory auditor or cost auditor of the company shall provide a certificate giving the percentage of Local Content in the Goods/Service/Works to be supplied by the “Class-I Local Supplier” for Turnkey Package (Insert the name of Package and Tender No.).

Accordingly, we, the Statutory Auditor(s) / Cost auditor of the “Class-I Local Supplier”, certify that the Local Content as defined under the PPP-MII and MoP Order, in the Goods/Service/Works to be supplied by the “Class-I Local Supplier” for Turnkey Package (Insert the name of Package and Tender No.) is ……….. Percentage [specify the percentage of Local content].

For and on behalf of, Date:

<<Statutory Auditor’s/Cost auditor’s attestation>>

Firm Reg No. Membership No.

Note: This is a guiding format. In case the bidder submits the certificate in a format different from the above, the same may be considered provided it meets the intent and purpose, as may be ascertained by DTL.
Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub- Stations of DTL on turnkey basis.

UNDERTAKING FOR NOT INDULGING IN CORRUPT & FRAUDULENT PRACTICE

Bidder’s Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre- fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm @dtl.gov.in, dgmms105@gmail.com

We declare that all the documents submitted or would be submitted by us in this tender are/would be genuine, and in case any discrepancy is found in the declaration/documents submitted by us at any stage, action can be taken against us as deemed fit by DTL.

We further declare that in the submission of this tender no agent, middleman or any intermediary has been, or will be engaged to provide any services, or any other item of work related to the award and performance of this contract. We further confirm and declare that no agency commission or any payment which may be construed as an agency commission has been, or will be, paid and that the tender price does not include any such amount.

We acknowledge the right of the employer, if he finds to the contrary, to declare, our tender to be non-compliant and if the contract has been awarded to declare the contract null and void.

STAMP & SIGNATURE OF AUTHORISED SIGNATORY
Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis.

Certification by the Bidder as per order no. F.No.7/10/2021-PPD(1) dated 23/02/2023 issued by Public Procurement Division, Department of Expenditure, Ministry of Finance, Government of India (DoE Order) in line with ITB Clause 1.2.2

(In case of a Joint Venture bid, the declaration shall be given by all partners of the Joint Venture)

Dear Sir,

We have read and understood the provisions of Order no.F.No.7/10/2021-PPD(1)(Order Public Procurement no.4) dated 23/02/2023 regarding “Restriction under Rule 144(xi) of General Financial Rules” issued by Public Procurement Division, Department of Expenditure, Ministry of Finance, Government of India [hereinafter collectively “DoE Order”] and any subsequent modifications/ Amendments, if any.

Particularly, we, the Bidder, have read the clause regarding restrictions on procurement from a ‘Bidder of a country which shares a land border with India’ and on sub-contracting to contractors from such countries.

We certify that we, the bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not subcontract any work to a subcontractor/sub vendor from such countries unless such subcontractor/sub vendor fulfils all requirement in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]

We also undertake to comply the above said DoE order dt. 23.02.2023 and any subsequent modifications/ Amendments, if any.

We further declare that any misrepresentation or submission of false/forged document/information in this regard this would be ground for immediate termination and further legal action in accordance with law.

Date :   (Signature) ..................................................
Place :   (Printed Name) ...........................................
           (Designation) ...........................................
           (Common Seal) ...........................................
Tender No.

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub- Stations of DTL on turnkey basis.

(Undertaking for Dynamic Short Circuit Test for Transformer)

Bidder’s Name & Address:

To,

Delhi Transco Limited,
DGM (T) M&S C&MM division,
Room No.-105, 1st Floor, Rajghat Power House,
Pre-fabricated RPH Building, New Delhi-110002 (India),
Email: dgmms.cmm @dtl.gov.in, dgmms105@gmail.com

We hereby confirm that in the event of order being awarded to us, we will submit the Dynamic Short Circuit Test report of the offered / similar transformer as per IS-2026 Part-5. Otherwise we will submit the capability of the offered transformer to withstand the dynamic effects of short circuit test by calculation as per IS-2026 part-5. We also agree to follow the Design similarity criteria / review as per the CEA regulations.

Date : (Signature) ..................................................

Place : (Printed Name) ________________________________

(Designation) ............................................

(Common Seal) ...........................................

Note: Continuation sheets of like size and format may be used as per Bidder's requirements and annexed to this Schedule.
SECTION-III

GUARANTEED TECHNICAL PARTICULARS
### Annexure-C

**Guaranteed and other technical Particulars**

*(To be filled by the manufacturer)*

#### A. GENERAL

<table>
<thead>
<tr>
<th>S. No</th>
<th>DESCRIPTION</th>
<th>Unit</th>
<th>Specified by Buyer</th>
<th>Offered by manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>General Information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Supplier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>Name of Manufacturer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>Place of Manufacture (Country &amp; City)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv)</td>
<td>Type of transformer (Core/Shell)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Applications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Indoor/Outdoor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>2wdg/3wdg/Auto</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>GT/Step-down/ICT/Station Start-up/ Auxiliary/ Rail Trackside Supply</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3.</td>
<td>Corrosion Level at Site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Light</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>Heavy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv)</td>
<td>Very Heavy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Site altitude above mean sea level</td>
<td>m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Seismic zone and ground acceleration at site (both in horizontal &amp; vertical direction)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Maximum and minimum ambient temperature at site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Applicable Standards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>IEC: 60076</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>IS : 2026</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>Any other, please specify</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Rated Capacity / Full load rating (HV/IV/LV)</td>
<td>MVA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>3-Phase/Bank of Three Single Phase (A,B,C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Rated No Load Voltages (HV/IV/LV)</td>
<td>kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Currents at normal tap (HV/IV/LV)</td>
<td>Amp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Rated Frequency</td>
<td>Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Connections and phase displacement symbols (Vector Group)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Weight Schedules (Minimum with no nega-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Unit</td>
<td></td>
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<tr>
<td>----------------------------------------------------------------------------</td>
<td>------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Active part (Core + coil)</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Insulating Oil (excluding mass of extra oil)</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Tank and Fittings</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Total weight</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv) Transportaion Weight</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v) Overall dimensions L x B x H</td>
<td>Mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi) Size of heaviest package L x B x H</td>
<td>Mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vii) Weight of heaviest package</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>viii) Weight of 5% extra oil</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ix) Weight of core</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x) Weight of copper (HV/IV/LV/ Regulating)</td>
<td>Kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xi) Insulating Oil volume (excluding 5% extraoil)</td>
<td>Ltrs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xii) Quantity of oil in OLTC</td>
<td>Ltrs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. Transport limitation

16. LV Winding
   i) Stabilizing tertiary (Yes/No)
   ii) Loaded (Yes/No)

17. Tappings
   i) Type (OLTC/OCTC) and make of tap changer
   ii) Position of Tapping on the winding
   iii) Variation on
   iv) Range of variation
   v) No. of Steps
   vi) Whether control suitable for:
       • Remote/local operation
       • Auto/manual operation
   vii) Parallel Operation Requirements

18. Impedance and Losses
   i) Guaranteed No load loss at rated voltage and frequency kW
   Tolerance (to be considered for loss evaluation) %
   ii) Guaranteed fR Loss at rated current & frequency (at 75°C) at principal tap kW
   Tolerance (to be considered for loss evaluation) %
| (iii) Eddy current and stray loss at rated current & frequency (at 75°C) at principal tap | kW |
| iv) Load Loss($I^2R$+Eddy and Stray) at rated current & frequency (at 75°C) at principal tap | kW |
| v) Guaranteed Auxiliary loss at rated voltage and frequency | kW |
| Tolerance (to be considered for loss evaluation) | % |
| vi) Calculated Fan Loss | kW |
| vii) Calculated Pump Loss | kW |
| viii) Air core reactance of HV winding | % |
| ix) Guaranteed Impedance (at Highest MVA base) | % |
| (a) HV-IV (at Principal tap) | |
| (b) HV-LV (at Principal tap) | |
| (c) IV-LV (at Principal tap) | |
| Tolerance | % |
| x) Impedance at extreme tap-pings at Highest MVA base [for HV-IV for 3 winding transformer (or) HV-LV for two winding transformer] | % |
| a) Max. Voltage tap | |
| b) Min. Voltage tap | |
| Tolerance | % |
| xi) Zero sequence impedance at principal tap (for 3-phase transformers) | % |
| 19. Capacitance to earth for HV/IV/LV | pF |
| 20. Regulation at full load at 75 °C winding temperature at: | |
| a) upf | |
| b) 0.8 pf | |
| 21. Guaranteed maximum Magnetizing Current at rated Voltage | % |
22. Efficiency:
   At 100% load upf
   0.8 lead
   0.8 lag
   At 75% load upf
   0.8 Lead
   0.8 lag
   At 50% load upf
   0.8 lead
   0.8 lag

23. Load at Maximum efficiency %

24. Any limitations in carrying out the required test? If Yes, State limitations

25. Fault level of system (in kA) and its duration (in sec) kA (sec)

26. Calculated short Circuit current (in kA) withstand capability for 2 seconds (3 seconds for generator transformers) without exceeding temperature limit (i.e. Thermal ability to withstand SC current) kA

27. Test current (in kA) and duration (in ms) for short Circuit current test (i.e. Dynamic ability to withstand SC) kA & msec

28. Over fluxing withstand time (due to combined voltage & frequency fluctuations):
   110%
   125%
   140%
   150%
   170%
msec

29. Free space required above the tank top for removal of core

30. Maximum Partial discharge level at 1.58 Ur/√3 pC

**B. MAGNETIC SYSTEM**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Specified by Buyer</th>
<th>Offered by manufacturer</th>
</tr>
</thead>
</table>

TS/Power/Auto transformer/rev:02/18.04.2023 Page 80
1. **Core Type:**
   - i) 3 Phase 3 Limb (3 wound limbs)
   - ii) 3 Phase 5 Limb (3 wound limbs)
   - iii) 1 Phase 2 Limb (2 wound limbs)
   - iv) 1 Phase 3 Limb (1 wound limb)
   - v) 1 Phase 4 Limb (2 wound limbs)
   - vi) 1 Phase 5 Limb (3 wound limbs)

2. **Type of Core Joint:**
   - i) Mitred
   - ii) Step Lap

3. **CRGO:**
   - i) Make & Country of Origin
   - ii) Thickness, mm
   - iii) Max. Specific loss at 1.7 T, 50Hz, in Watts/kg
   - iv) Grade of core as per BIS
   - v) Insulation between core lamination
   - vi) BIS certified (Yes/No)

4. **Minimum Gross & Net Area of:**
   - i) Core
   - ii) Limb
   - iii) Yoke
   - iv) Unwound limb (May be verified during manufacturing stage – at the discretion of buyer) cm²

5. **Stacking Factor**

6. **Voltage per turn**

7. **Apparent Core Density for Weight Calculation**

8. **Minimum Net Weight of Silicon Steel Lamination CRGO** (may be verified during manufacturing stage by calculation) kg

9. **Maximum Flux density at 90%, 100% and 110% voltage and frequency** (may be verified during manufacturing stage by calculation) T

10. **W/kg at working flux density**

11. **Building Factor Considered**
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Offered by manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>HV</td>
</tr>
<tr>
<td>1.</td>
<td>Type of Winding Helical/Disc/Layer/inter wound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Type of Conductor PICC/CTC/CTCE/CTCEN/BPI CC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Minimum Yield Strength of Conductor for 0.2% elongation</td>
<td>N/mm²</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Maximum Current density at CMR and conductor area at any tap:</td>
<td>A/mm² &amp; sq. mm</td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>HV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>LV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Maximum current density under short circuit:</td>
<td>A/mm²</td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>HV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>LV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Bare Weight of copper without</td>
<td>Kg</td>
<td></td>
</tr>
</tbody>
</table>
paper insulation and lead (Minimum)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Specified by Buyer</th>
<th>Offered by manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>Per Phase Maximum resistance of winding at rated tap at 75 °C</td>
<td>ohm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Number of Turns/Phase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Insulating material used for HV/IV/LV winding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Insulating material used between:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) HV and IV winding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) IV and LV winding</td>
<td></td>
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<tr>
<td></td>
<td>iii) LV winding and core</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iv) Regulating winding and adjacent winding/core</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>11.</td>
<td>Details of special arrangement provided to</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>12.</td>
<td>Dielectric Shielding used:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Interleaved winding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Wound in Shield</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Others</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>13.</td>
<td>Magnetic Shielding used:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Yoke Shunt on core clamp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Magnetic shunt on tank</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Electromagnetic (Copper/Aluminum) shield on tank</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iv) Others</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Noise level when energized at normal voltage and frequency without load</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**D.COOLING SYSTEM**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Specified by Buyer</th>
<th>Offered by manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Type of Cooling [ONAN (or) ONAN/ONAF (or) ONAN / ONAF / OFAF (or) ONAN / ONAF/ ODAF (or) ONAN / ONAF1 / ONAF2 etc.]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Percentage Rating Corresponding to Cooling Stages</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(HV/IV/LV)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>No. of Cooler banks (2x50% / 2x100% / 1x100% etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Temperature gradient between windings and oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Time in minutes for which the transformer can run at full load without exceeding maximum permissible temperature at temperature when supply to fans and / or pumps is cut off</td>
<td>min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Guaranteed Maximum Temperature rise at 1000 mts. altitude and at actual altitude at site at ambient temperature at cooling specified at sl. No. 1: i) Top Oil by thermometer ii) Average Winding by resistance iii) Winding hot spot</td>
<td>ºC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Type of Cooler: i) Radiator Bank ii) Oil to Air Heat Exchanger (Unit Cooler) iii) Oil to Water Cooler (Single Tube) iv) Oil to Water Cooler (Double Tube) v) Tank Mounted vi) Header Mounted vii) Separately Mounted viii) Degree of Protection of terminal box</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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8. **Cooling Fans:**
   - **i)** Type
   - **ii)** Size
   - **iii)** Rating (kW)
   - **iv)** Supply voltage
   - **v)** Quantity (Running + Stand-by) per cooler bank
   - **vi)** Whether fans are suitable for continuous operation at 85% of their rated voltage calculated time constant:
     - natural cooling
     - forced air cooling
   - **vii)** Degree of Protection of terminal box

9. **Oil Pumps:**
   - **i)** Type
   - **ii)** Size
   - **iii)** Rating (lpm and kW)
   - **iv)** Supply voltage
   - **v)** Quantity (Running + Standby) per cooler bank
   - **vi)** Efficiency of motor at full load
   - **vii)** Temperature rise of motor at full load
   - **viii)** BHP of driven equipment

10. **Coolers (Oil to Air):**
    - **i)** Quantity (Running + Stand-by)
    - **ii)** Type and Rating

11. **Coolers (Oil to Water):**
    - **i)** Quantity (Running + Stand-by)
    - **ii)** Type and Rating
    - **iii)** Oil flow rate (lpm)
    - **iv)** Water flow rate (lpm)
    - **v)** Nominal Cooling rate (kW)
    - **vi)** Material of tube
12. Radiators:
   i) Width of elements (mm)
   ii) Thickness (mm)
   iii) Length (mm)
   iv) Numbers

13. Cooler loss at rated output, normal ratio, rated voltage, rated frequency at ambient temperature of 50°C kW

E. DIELECTRIC SYSTEM

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Offered by manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Geometric Arrangement of winding with respect to core e.g: Core-LV-IV-HV-Reg Coarse-Reg Fine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Regulating Winding:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Body Tap</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Separate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>HV Line Exit point in winding:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Top</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Center</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Varistors used across Windings</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If yes, Details</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Insulation Levels of windings</td>
<td>HV</td>
<td>IV</td>
</tr>
<tr>
<td></td>
<td>i) Lightning Impulse withstand voltage (1.2/50µs)</td>
<td>kV_p</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Chopped wave Lightning Impulse withstand voltage</td>
<td>kV_p</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Switching Impulse withstand voltage (250/2500µs)</td>
<td>kV_p</td>
<td></td>
</tr>
</tbody>
</table>
iv) Power frequency withstand voltage \[ kV_{\text{rms}} \] (one minute / 5 minutes)

6. Tan delta of windings at ambient temperature \[ \% \]

---

**F. ACCESSORIES**

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>Description</th>
<th>Unit</th>
<th>Offered by manufacturer</th>
<th>Specified by Buyer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Tap Changers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a-Manual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b-Automatic</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>c-Remote</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>d-Local</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Voltage Class and Current Rating of Tap Changers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Make and Model</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>iv) Make and Type of Automatic Voltage Regulator (AVR)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>v) Tie-in resistor requirement (to limit the recovery voltage to a safe value) and its value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>vi) OLTC control and monitoring to be carried out through Substation Automation System</td>
<td>Y/N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>vii) Power Supply for control motor (No. of Phases/Voltage/Frequency)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>viii) Rated Voltage for control circuit (No. of Phases/Voltage/Frequency)</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Tank</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>i) Tank Cover: Conventional/Bell/Bottom Plate</td>
<td></td>
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<tr>
<td></td>
<td>ii) Material of plate for tank</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>iii) Plate thickness : side, bot-</td>
<td>mm</td>
<td></td>
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<tr>
<td></td>
<td>Rail Gauge</td>
<td>mm</td>
<td></td>
<td></td>
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<tr>
<td>v)</td>
<td>Minimum Clearance height from rail for lifting Active Part</td>
<td>mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi)</td>
<td>Wheels: Numbers/Plane/Flanged/Unidirectional/Bidirectional/Locking Details</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vii)</td>
<td>Vacuum withstand Capability</td>
<td>mm of Hg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>Tank</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Radiators/Conservator/Accessories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>viii)</td>
<td>High Pressure withstand Capability</td>
<td>mm of Hg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>Tank</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Radiators/Conservator/Accessories</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>ix)</td>
<td>Radiator fins/conservator plate thickness</td>
<td>mm</td>
<td></td>
<td></td>
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<tr>
<td>x)</td>
<td>Tank Hot spot temperature</td>
<td>°C</td>
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### 3. Bushings:

<table>
<thead>
<tr>
<th></th>
<th>HV</th>
<th>IV</th>
<th>LV</th>
<th>HV-N LV-N</th>
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<tbody>
<tr>
<td>i)</td>
<td>Termination Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a-Outdoor</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>b-Cable Box (oil/Air/SF₆)</td>
<td></td>
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<tr>
<td></td>
<td>c-Plug in Type</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>ii)</td>
<td>Type of Bushing: OIP/RIP/RIS/oil communicating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>Bushing housing - Porcelain / polymer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv)</td>
<td>Rated Voltage Class</td>
<td>kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v)</td>
<td>Rated Current</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi)</td>
<td>Lightning Impulse withstand voltage (1.2/50µs)</td>
<td>kV p</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vii)</td>
<td>Switching Impulse withstand voltage (250/2500µs)</td>
<td>kV p</td>
<td></td>
<td></td>
</tr>
<tr>
<td>viii)</td>
<td>One minute Power frequency withstand voltage (dry &amp; wet)</td>
<td>kV rms</td>
<td></td>
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</tr>
<tr>
<td>ix)</td>
<td>Minimum Creepage Distance</td>
<td>mm</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>x) Quantity of oil in bushing and specification of oil used</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xi) Make and Model</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xii) Tan delta of bushings</td>
<td>%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xiii) Max Partial discharge level at Um</td>
<td>pC</td>
<td></td>
<td></td>
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<tr>
<td>xiv) Terminal Pad details</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xv) Weight of assembled bushings</td>
<td>kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xvi) Whether terminal connector for all bushings included in the scope of supply</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4. Minimum clearances between bushings (for HV, IV and LV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Phase to phase</td>
<td></td>
<td></td>
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<tr>
<td>(b) Phase to ground</td>
<td></td>
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<tr>
<td>5. Indicator / Relay</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>i) Winding temperature thermometer/indicator: Range Accuracy</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ii) Oil temperature thermometer/indicator: Range Accuracy</td>
<td></td>
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<tr>
<td>iii) Temperature sensors by fiber optic (if provided)</td>
<td></td>
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</tr>
<tr>
<td>iv) Oil actuated/gas operated relay</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>v) Oil level Indicators: Main Conservator OLTC Conservator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi) Oil Sight Window: Main Tank Main Conservator OLTC Conservator</td>
<td></td>
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<tr>
<td>6. Conservator:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Total volume</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ii) Volume between highest and lowest visible oil levels</td>
<td></td>
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<tr>
<td>7. Conservator Bag (air cell)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>i) Material of air cell</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Continuous temperature withstand capacity of air cell</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8. Air cell rupture relay provided | Yes / No |
9. Pressure Relief Device: | |
   i) Number of PRDs provided | |
   ii) Location on the tank | |
   iii) Operating pressure of relief device | |
10. Sudden Pressure Relay / Rapid Pressure rise relay provided; if yes, | Y/N |
    i) Location on the tank | |
    ii) Operating pressure | |
11. Dehydrating Breathers (Type & No. of breathers) | |
    (a) For main Conservator tank | |
    (b) For OLTC conservator | |
12. Flow sensitive Conservator Isolation Valve Provided | Y/N |
13. Tap Changer protective device | |
14. Type and material of gaskets used at gasketed joints | |
15. Bushing CTs: (HV side and IV/LV side) | |
    i) Voltage class | kV |
    ii) No. of cores | |
    iii) Ratio | |
    iv) Accuracy class | |
    v) Burden | VA |
    vi) Accuracy limit factor | |
    vii) Maximum resistance of secondary winding | | | | |
    viii) Knee point voltage | | | | |
    ix) Current rating of secondaries | | | | |
16. Neutral CTs: | | | | |
| i) Voltage class | kV |
| ii) No. of cores | |
| iii) Ratio | |
| iv) Accuracy class | VA |
| v) Burden | Ω |
| vi) Accuracy limit factor | VA |
| vii) Maximum resistance of secondary winding | |
| viii) Knee point voltage | |
| ix) Current rating of secondaries | |

**17. Transformer Oil**

i) IS 335 / IEC60296 / as per specification

ii) Inhibited/ un-inhibited

iii) Mineral / Natural Ester / Synthetic Ester

iv) Spare oil as percentage of first filling

v) Manufacturer

vi) Quantity of oil (before filling and before commissioning)

vii) Moisture content (mg/L or ppm)

viii) Tan delta (Dielectric Dissipation Factor) at 90°C

ix) Resistivity (Ω-cm)

x) Breakdown Voltage (before and after treatment) (kV)

xi) Interfacial tension at 20 °C (N/m)

xii) Pour point (°C) xii) Flash point(°C)

xiii) Acidity (mg KOH/gm)

xiv) Inhibitors (for inhibited oil) (%)

xv) Oxidation Stability

**18. Press Board:**

i) Make

ii) Type

**19. Conductor Insulating Paper**

i) Kraft paper

ii) Thermally upgraded Kraft paper

iii) Nomex

**20. Provision for fire protection system (as per spec), if yes, provide** Y/N
<table>
<thead>
<tr>
<th>details</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. Insulation of core bolts, washers, end plates etc.</td>
</tr>
<tr>
<td>22. Weights and Dimensions:</td>
</tr>
<tr>
<td>i) Weights:</td>
</tr>
<tr>
<td>a. Core</td>
</tr>
<tr>
<td>b. Windings</td>
</tr>
<tr>
<td>c. Tank</td>
</tr>
<tr>
<td>d. Fittings</td>
</tr>
<tr>
<td>e. Oil</td>
</tr>
<tr>
<td>f. Total weights of complete transformers with oil and fittings</td>
</tr>
<tr>
<td>ii) Dimensions:</td>
</tr>
<tr>
<td>a. Overall Height above track</td>
</tr>
<tr>
<td>b. Overall length</td>
</tr>
<tr>
<td>c. Overall breadth</td>
</tr>
<tr>
<td>iii) Minimum bay width required for installation of the transformer</td>
</tr>
<tr>
<td>iv) Weight of the heaviest package of the transformer arranged for transportation</td>
</tr>
<tr>
<td>23. Lifting Jacks</td>
</tr>
<tr>
<td>i) Number of jacks included</td>
</tr>
<tr>
<td>ii) Type and Make</td>
</tr>
<tr>
<td>iii) Capacity</td>
</tr>
<tr>
<td>iv) Pitch</td>
</tr>
<tr>
<td>v) Lift</td>
</tr>
<tr>
<td>vi) Height in close position</td>
</tr>
<tr>
<td>24. Rail Track gauges</td>
</tr>
<tr>
<td>i) 2 Rails or 3 rails or 4 rails</td>
</tr>
<tr>
<td>ii) Distance between adjacent rails on shorter axis</td>
</tr>
<tr>
<td>iii) Distance between adjacent rails on longer axis</td>
</tr>
</tbody>
</table>

******
Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Item Description</th>
<th>HSN Code</th>
<th>Whether HSN is confirmed, if not, indicate applicable the HSN code</th>
<th>Unit Price</th>
<th>Mode of Transaction</th>
<th>Total Price</th>
<th>Taxes &amp; Duties</th>
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</tbody>
</table>

---

**Main Equipment**

1. 400/220/33kV, 500 MVA Power Transformer including bushing and all accessories with first filling of oil including 10% extra oil.
   - HSN Code: 85042330
   - Unit Price: 85042330
   - Mode of Transaction: Direct
   - Total Price: 85042330

2. Nitrogen Injection Fire prevention and Extinguishing System (NIFPES) for 500 MVA power transformer
   - HSN Code: 85042310
   - Unit Price: 85042310
   - Mode of Transaction: Direct
   - Total Price: 85042310

3. LT Power Cable
   - HSN Code: 85446020
   - Unit Price: 85446020
   - Mode of Transaction: Direct
   - Total Price: 85446020

4. Control cable
   - HSN Code: 85446020
   - Unit Price: 85446020
   - Mode of Transaction: Direct
   - Total Price: 85446020

5. Material required for extension of earthmat/earthing of equipments
   - HSN Code: 73082011
   - Unit Price: 73082011
   - Mode of Transaction: Direct
   - Total Price: 73082011

6. Petty items required for completion of work.
   - HSN Code: 73082011
   - Unit Price: 73082011
   - Mode of Transaction: Direct
   - Total Price: 73082011

---

**Mandatory Spares**

1. HV bushing of Transformer with complete metal parts, oil seal and gaskets
   - HSN Code: 85049010
   - Unit Price: 85049010
   - Mode of Transaction: Direct
   - Total Price: 85049010

2. MV bushing of Transformer with complete metal parts, oil seal and gaskets
   - HSN Code: 85049010
   - Unit Price: 85049010
   - Mode of Transaction: Direct
   - Total Price: 85049010

3. LV bushing of Transformer with complete metal parts, oil seal and gaskets
   - HSN Code: 85049010
   - Unit Price: 85049010
   - Mode of Transaction: Direct
   - Total Price: 85049010

4. Set of Gaskets
   - HSN Code: 85049010
   - Unit Price: 85049010
   - Mode of Transaction: Direct
   - Total Price: 85049010

---

**Note:**

- Bidder is required to quote prices in this Schedule for all the individual items/sub-items.
- HSN Code shall be filled by Bidder.
- # Currency shall be only in INDIAN Rupee in accordance with clause 14.2 Section-INB Volume I of the bidding documents.
- In case any additional equipment is required, the same shall be supplied without any additional payment and the offer should be complete and comprehensive.
- Signature: __________________________
- Printed Name _________________________
- Designation __________________________
- Common Seal _________________________
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Unit Description</th>
<th>SAC Code</th>
<th>Whether SAC code is confirmed. If not, indicate applicable SAC code</th>
<th>Unit</th>
<th>Qty</th>
<th>Unit Charges (INR)</th>
<th>Total Charges (INR)</th>
<th>GST Rate</th>
<th>Whether rate of GST is confirmed. If not, indicate applicable rate of GST</th>
<th>Total Tax Amount (INR)</th>
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<td>400/220/33kV, 500 MVA Power Transformer including bushing and all accessories with first filling of oil including 10% extra oil</td>
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<td>No.</td>
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<td>Petty items required for completion of work</td>
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<td>L/S</td>
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<td>18%</td>
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<td>HV bushing of Transformer with complete metal parts, oill seal and gaskets</td>
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<tr>
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<td>MV bushing of Transformer with complete metal parts, oil seal and gaskets</td>
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<td>11</td>
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</tbody>
</table>

Sub-Total (B) |

GRAND TOTAL FOR SCHEDULE 2 i.e Total (A+B) |

Note: Bidder is required to quote prices in this Schedule for all the individual items/sub-items.

HSN Code shall be filled by Bidder.

#Currency shall be only in INDIAN Rupee in accordance with clause 14.2 Section-INB Volume 1 of the bidding documents.

In case any additional equipment is required, the same shall be supplied without any additional payment and the offer should be complete and comprehensive.

Printed Name _________________________

Place : __________________________

Signature : __________________________

Designation __________________________

Common Seal ________________________

Page 2 of 4
**TENDER NO.**

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub-Stations of DTL on turnkey basis

**(Schedule of rates and prices)**

**Bidder's Name and Address:**

<table>
<thead>
<tr>
<th><strong>Installation Charges</strong></th>
<th><strong>Price Schedule-3</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S.No.</strong></td>
<td><strong>Item Description</strong></td>
</tr>
<tr>
<td>1</td>
<td>400/220/33kV, 500 MVA Power Transformer including bushing and all accessories with first filling of oil including 10% extra oil. Including Civil work</td>
</tr>
<tr>
<td>2</td>
<td>Nitrogen Injection Fire prevention and Extinguishing System (NIFPES) for 500 MVA power transformer</td>
</tr>
<tr>
<td>3</td>
<td>LT Power Cable</td>
</tr>
<tr>
<td>4</td>
<td>Control Cable</td>
</tr>
<tr>
<td>5</td>
<td>Material required for extension of earthmat/earthing of equipments</td>
</tr>
<tr>
<td>6</td>
<td>Petty items required for completion of work.</td>
</tr>
<tr>
<td>7</td>
<td>Dismantling of 315 MVA/ 500 MVA transformer along with accessories and Shifting &amp; transportation of same to any store/site of DTL</td>
</tr>
<tr>
<td>8</td>
<td>Civil work(all inclusive as per scope of work)</td>
</tr>
</tbody>
</table>

**GRAND TOTAL FOR SCHEDULE-3**

**Note:** Bidder is required to quote prices in this Schedule for all the individual items/sub-items.

**Signatures:**

**Printed Name:** __________________________

**Designation:** __________________________

**Date:** __________________________

**Place:** __________________________

---

**HSN Code shall be filled by Bidder**

# Currency shall be only in INDIAN Rupee in accordance with clause 14.2 Section-INB Volume I of the bidding documents.

In case any additional equipment is required, the same shall be supplied without any additional payment and the offer should be complete and comprehensive.

---

Page 3 of 4
**TENDER NO.**  

Bidder's  
Name and  
Address :  

I.  
**GRAND SUMMARY OF THE QUOTED BID PRICE.**  

<table>
<thead>
<tr>
<th>S.No</th>
<th>DESCRIPTION</th>
<th>Total Price (INR)</th>
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<tbody>
<tr>
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<td>PRICE</td>
</tr>
<tr>
<td>1</td>
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<tr>
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<td>Plant and Equipment (including Mandatory Spares) to be supplied</td>
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</tr>
<tr>
<td>2</td>
<td>TOTAL SCHEDULE NO. 2</td>
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<tr>
<td></td>
<td>Local Transportation, Insurance and other Incidental Services</td>
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</tr>
<tr>
<td>3</td>
<td>TOTAL SCHEDULE NO. 3</td>
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<tr>
<td></td>
<td>Installation Charges</td>
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<tr>
<td></td>
<td><strong>GRAND TOTAL = [ 1 + 2 + 3 ]</strong></td>
<td></td>
</tr>
</tbody>
</table>

*currency in accordance with INB 14.2, Vol.-I of the Bidding Documents.

II. We declare that the following are our quoted bid price in INR for the entire Scope of work as specified in the specifications and documents:  

A.  
Quoted Bid Price Excluding taxes & duties (Grand Summary of the quoted Bid Price as in I above.):

i. In figures: INR  

ii. In Words: INR  

B.  
Applicable Taxes & Duties and other levies, payable additionally, in respect of the transaction between the Owner and the Contractor (Total Amount to be mentioned).

i. GST (Total Amount to be mentioned)  

ii. Total taxes & duties(i) : INR  

C.  
Total Quoted Bid Price including Taxes and Duties and other levies, if contract is awarded to us

i.e A+B above

i. In figures:INR  

ii. In words: INR  

Date :  

Signature :  

Place :  

Printed Name  

Designation  

Common Seal  

---

Design, Supply, Erection, Testing & Commissioning of 07 no. of 400/220/33kV, 500 MVA Power Transformer along with associated civil work at 400 kV Sub- Stations of DTL on turnkey basis  

(Schedule of rates and prices)