West Bengal State Electricity Distribution Company Limited

Invitation of E-Tender

for the work of replacement of existing overhead 11 kV distribution lines with underground cables and other allied works in English Bazar Municipality area alongwith area attached to KPS 33/11 KV Substation (Malda District) under the jurisdiction of Malda Division of WBSEDCL through turnkey mode.

N.I.T. NO: 09/Departmental (2025-26) Date: 19.11.2025

MALDA REGIONAL OFFICE
1st Floor, Administrative Building (WBSEDCL), Rabindra Avenue, Pin – 732101, Malda.
E-mail: rm.malda@wbsedcl.in

CONTENTS

Section I

NOTICE INVITING e-TENDER

NIT No.: 09/Departmental (2025-26) **Date:19.11.2025**

Online percentage rate e-Tender in two part for the under mentioned work is invited by the Regional Manager, Malda regional Office, Malda ,WBSEDCL from the WBSEDCL's enlisted agencies having work experiences, credentials and expertise on the similar kind of work through turnkey mode and who is also technically and commercially qualified and have successfully completed works similar to the undermentioned work as per specified terms, conditions and specifications. Synopsis of the E-NIT is given hereunder:

Name of the work	Estimated Amount (in Rs.) (incl. 1% Cess but Excl.GST)	Completion Time	Earnest Money Deposit (EMD)(Rs.)
Replacement of existing overhead 11 kV distribution lines with underground cables and other allied works in English Bazar Municipality area alongwith area attached to KPS 33/11 KV Substation (Malda District) under the jurisdiction of Malda Division of WBSEDCL through turnkey mode.	***29,76,94,475.20 /-***	12(twelve) months from date of issue of LOA.	Rs. 5,00,000.00/-

1. Intending bidders should download the tender documents from the websitehttp://www.wbtenders.gov.indirectly with the help of Digital Signature Certificate (DSC). Necessary Earnest Money Deposit (EMD) should be remitted separately through either online mode or in the form of Bank Guarantee (BG) in full on any schedule commercial bank in the annexed format and the same should be documented and scan copy of the aforesaid documents is to be uploaded through said website as per schedule stated in Sl. No. 9 (Details of which has been narrated in the Instruction to the bidders).The last date for submission of physical copy of EMD via Bank Guarantee (if EMD in the form of bank guarantee is opted) as mentioned in clause **date & time schedule (Sl no 9)**. Partial payment through online mode and remaining submission through BG is not allowed. EMD collected via online mode will be settled automatically from e-tendering portal maintained by National informatics Centre (NlC) wherein EMD for rejected or unsuccessful bids shall be refunded in the bank account of participating bidders directly from NIC Portal. However, for successful bidder the Earnest Money will be converted into Security Deposit.

2. Both **Technical Bid** and **Financial Bid** are to be submitted concurrently duly digitally signed by the Bidder through the website https://wbtenders.gov.in. (Details of which has been narrated in 'Instruction to Bidders') as per Schedule stated in Sl.No.9.

3. **Eligibility criteria for participation intender:**

3.1 **Technical Requirement:**

a) Eligibility Criteria of the bidder: WBSEDCL's enlisted agencies who have work experience and expertise on a similar kind of work through a turnkey mode and who is technically & commercially qualified and have successfully completed for under mentioned work as per specified terms, conditions and specifications.

b) Financial Eligibility criteria of the bidder : Three similar works costing not less than the amount equal to 40%of the estimated cost in separate three contracts/Two similar works costing not less than the amount equal to 50% of the estimated cost in separate two contracts /One similar work costing not less than the amount equal to 80% of the estimated cost in single contract (all are excluding GST) under the authority of State/Central Government, State /Central Government undertaking Organizations, Government Enterprises/Co-operative Society/ Electricity power Utility, Power Dept. in India, Statutory Bodies/Local Bodies constituted under the statute after 17th October 2018.

c) Satisfactory Completion Certificate indicating estimated amount and/or Ordered Amount, Value of work-done and Date of completion of the work and detail communicational address along with contact details of the Client should be submitted by the Bidder. Completion Certificate from the concerned Executive Engineer/District Engineer/Divisional Engineer or equivalent rank and above will be treated as valid credential. The bidder is to

upload the LOA/Execution Order/PO in full along with the BOQ showing the full description of items in respect of the work for which completion certificate is being uploaded. Delay in completion of work, if any, must be mentioned in completion certificate along with the reason.

*(*Electrical: The bidder must have successfully completed installation of UG 11kv/LT cables,11kv Breakers etc and other allied electrical works that in last 7 years (i.e. upto 17.11.2025) under the authority of State/Central Government, State/Central Government undertaking, Statutory Bodies constituted under the statute of Central/State Government.)*

3.2 **Commercial Requirement:**

a) Average annual turnover during last three years shall not be less than 30% of the estimated cost.
b) Working capital in the year of bid submission shall not be less than 30% of the estimated cost.
c) In case documents certifying credit facility from a schedule Bank is submitted, the requirement given in (b) shall be judged by adding the available credit facility and working capital taken together.
d) Annual Audited Financial Report for last 3 (three) years (**AY 2022-23, AY 2023-24 & AY 2024-25**) to be submitted for verification in respect of bidders for whom audit of accounts is mandatory. For those whose audit of accounts is not mandatory, they shall submit copy of IT returns along with related enclosures (Form 3CA and Form 3CB) for last five years.

4. **Statutory/Non-Statutory requirements:**

- All categories of prospective Bidders (***Firm/Entity)*** shall have to submit valid copies of the following documents (All the documents must be in the name of the **Firm/Entity** applying as prospective bidders):

I. Professional Tax Registration Certificate/Registration No.(P. Tax Registration Certificate/ Enrollment Certificate as applicable), current professional tax payment certificate along with payment challan.
II. P.F. Registration Certificate/No. along with up to date challan upto Sepetember 2025.
III. GST Registration Certificate/No with up to date return/challan latest,
IV. E.S.I. Registration certificate/No. with up-to date challan upto Sepetember 2025.
V. Upto date documents related to Group Insurance Policy about personal accident insurance under Employee's Compensation Act 1923.
VI. PAN Card and Income Tax Return for last **three Assessment Years (if submission of audit file) or five Assessment Years (if non submission of audit file).**
VII. Valid Electrical Contractor's License issued by the Licensing Board, Government of West Bengal/India under Act with valid Electrical Supervisor's Certificate of Competency (SCC) Part No. 1,2,3,4,5,6A,6B,7A, 7B, 11 & 12 issued by the Licensing Board, Government of West Bengal/India (current engagement of electrical Supervisor at prospective bidders firm needs to be established).
VIII. Valid up-to-date Trade License in respect of the prospective Bidder:
IX. Registration Certificates of Firms/ Entities,
   a) Proprietorship Firm (Valid Trade License),
   b) Partnership Firm (Valid Partnership Deed, Valid Trade License),
   c) Ltd Company (Incorporation certificate i.e. MOA and AOA, Valid Trade License),
   d) Co-operative Society (Society Registration copy, valid Trade License).

NB: Any MOU/Temporary Agreement/Joint Ventures/Consortium/ Any other arrangement to constitute an Entity having no statutory Registration Certificates (Non-Permanent Establishment) beyond the above entities [mentioned in VIII(a) to (d)] for the purpose of applying as prospective bidder will not be considered as valid document.

X. Performance as prime contractor applying as prospective bidder for execution of similar nature of work upto last seven years (after 17.11.2018) will only be considered.
XI. Information regarding any past and current litigation with WBSEDCL/WBSETCL/Govt/PSU in which the bidder is involved, the party's concerned and disputed amount.
XII. **Neither prospective Bidder nor any of the constituent partners had been debarred to participate in any Tender by any Government Department/Semi-Govt/Govt Undertakings/ Enterprise etc. during the last 5 (five) years prior to the date of this NIT. Such debarring will be considered as disqualification towards eligibility. A declaration on the bidder's letterhead, in this respect has to be furnished by the prospective bidders.**
XIII. The bidder shall submit reports on the financial standing i.r.o. solvency of Bidder (Company/ Firm) as certified by bankers, audited annual reports on accounts with auditors' certificate for company registered under Companies Act and Tax Audit Report for Partnership Firms for last three preceding Financial Years.
XIV. Net worth for each of the last 03 (three) Financial Years should be positive. Net worth means the sum total of the paid up capital and free reserves (excluding reserves created out of revaluation) reduced by aggregate value of accumulated losses

(including debit balance in profit and loss account for current year) and intangible assets.

XV. The bidder's Minimum Average Annual Turnover (MAAT) for last 03 (three) Financial Years shall not be less than 30% of the estimated cost per year.

XVI. The working capital of the bidder in the preceding year of bid submission shall not be less than 30% of the estimated cost per year.

XVII. In case documents certifying credit facility from a scheduled bank is submitted, the requirement given in Clause No.XIV above, shall be judged by adding available credit facility and working capital takentogether.

XVIII. Annual Audited Financial Report for last 3 (three) years to be submitted for verification in respect of bidders for whom audit of accounts is mandatory (3CA/3CB and particulars are reported in the Form 3CD u/s 44AB of Income Tax Act'1961 are to be submitted). **For those whose audit of accounts is not mandatory, they shall submit copy of IT returns along with related enclosures for last five years.**

XIX. **The prospective Bidders or any of their constituent partner shall neither have abandoned any work nor any of their contract have been rescinded during the last 5 (five) years. Such abandonment or rescission will be considered as disqualification towards eligibility. A declaration on Rs.100.00/- Non-Judicial Stamp duly notarized by Notary Public, in this respect has to be furnished by the prospective bidders**. (Non-statutory Documents).

XX. No conditional/incomplete/inadequate/wrong submission of Tender Documents and facts will be accepted under any circumstances and no further prayer for consideration will be entertained.

XXI. **Details of Eligibility criteria for participation in tender for Electrical Works are mentioned in Instruction to Bidders (SECTION-A) under the head A-2. (Sl. No. vii, viii & ix) Non statutory cover containing of Eligibility criteria for participation in tender.**

5. The **FINANCIAL OFFER** of the prospective bidder will be considered only if the **TECHNICAL BID** of the Bidder is found qualified by the WBSEDCL. The decision of the WBSEDCL will be final and absolute in this respect. The list of Qualified Bidders of Technical Bid will be displayed in the website.
6. **No mobilization advance and secured advance will be allowed.**
7. A prospective Bidder shall be allowed to participate in the tender either in the capacity of individual or as a partner of firm, Society, Company, Registered Unemployed Engineers Co-operative Society/Registered Labour Co-operative Society. If found applied severally in a single job, all his offers will be rejected for that job.
8. Bid shall remain valid for a period not less than 180 (one hundred twenty) days from the date of opening of Financial Bid. If the bidder modifies/withdraws the bid during the interval between the deadline for submission of bids and the expiry of the period of bid validity, the bid will be cancelled with forfeiture of earnest money deposit (EMD).
9. **Date and Time Schedule:**

Sl. No.	Particulars	Date & Time
1.	Date of uploading of N.I.T. & other Documents (online) (Publishing Date)	24.11.2025 at 10:00 Hrs
2.	Documents download start date (Online)	24.11.2025 at 10:00 Hrs
3.	Pre-bid Meeting	26.11.2025 at 11:30 Hrs
4.	Bid submission start date (On line)	24.11.2025 at 10:00 Hrs
5.	Documents download End Date (On line)	16.12.2025 upto 16:00 Hrs
6.	Bid Submission closing date (On line)	16.12.2025 upto 16:00 Hrs
7.	Last Date of submission of Earnest Money Deposit etc. (online)	16.12.2025 upto 16:00 Hrs
8.	Last Date of physical submission of Earnest Money Deposit. (if EMD in the form of bank guarantee is opted) (Offline)	17.12.2025 at 14:00 Hrs
9.	Technical Bid opening date (Online)	18.12.2025 at 17:00 Hrs
10.	Date of uploading list for Technically Qualified Bidder (Online)	To be intimated later
11.	Financial Bid opening Date (Online)	To be intimated later

10. The Bidder at the their own responsibility is encouraged to visit and examine the site of works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for the work as mentioned in the Notice Inviting Tender. The cost of visiting the site shall be at the Bidder's own expense.
11. The WBSEDCL reserves the right to accept or reject any offer without assigning any reason whatsoever and is not liable for any cost that might have been incurred by any Bidder at any stage of Bidding.
12. Prospective applicants are advised to note carefully the minimum qualification criteria as mentioned in 'Instructions to Bidders' stated in Section – 'A' before tendering the bids.
13. **Exemption from deposition of earnest money deposit (EMD) shall not be allowed under any circumstances.**
14. Conditional / Incomplete tender will not be accepted under any circumstances.
15. The intending Bidders are required to quote the rate **online only through tendering process.**
16. During scrutiny, if it comes to the notice of the tender inviting authority that the credential or any other paper found incorrect / manufactured / fabricated, that bidder would not be allowed to participate in the tender and that application will be

rejected without any prejudice.

17. Canvassing in connection with the tender is strictly prohibited in the Tender submitted by the Contractor.

18. The eligibility of a Bidder will be ascertained on the basis of the documents submitted by a Bidder in support of eligibility criteria. If any document submitted by a Bidder is incorrect/ manufactured / fabricated or false at any stage, his Tender will be out rightly rejected and legal action will be taken against him.

19. The participating bidders may please note that the successful bidder shall have to submit an Indemnity Bond along with Agreement in the prescribed format before commencement of the work.

20. The WBSEDCL does not bind itself to accept the lowest bidder and reserves the right to reject any or all tender(s) or to split the whole work to more than one contractor without assigning any reason whatsoever.

21. The WBSEDCL reserves the right to cancel the N.I.T. due to unavoidable circumstances and no claim in this respect will be entertained.

22. In case of supply of materials, it is mandatory to submit/upload GTP, Drawings, Make & Model, technical specifications from reputed manufacturer as per requirement of NIT and to be approved from the competent department of WBSEDCL.

23. **Pre-bid Meeting:** All the interested bidders are encouraged & requested to participate in pre-bid meeting, which shall be held on 26.11.2025 at 11:30 Hrs at Office of the Regional Manager, Malda Regional Office, 1st Floor, Administrative Building (WBSEDCL), Rabindra Avenue, Pin – 732101, Malda. For any necessary clarification or communications regarding the pre-bid meeting or else, shall be addressed at rm.malda@wbsedcl.in or Mob - 9332791360. Discussion related to tendered job along with any clarifications or corrigendum related issues shall be elaborately presented by the WBSEDCL authorized personnel in the Pre-bid Meeting. The intending Agencies are requested to confirm their participation of visit in the aforesaid communication details at least 01 day prior to the scheduled date of prebid meeting as mentioned. The authorized representative of the intending bidders may address any issues related to the tendered work in the pre-bid meeting, if feels so. Non-participation in the Pre-Bid meeting shall not be disqualification criteria of any bidder.

Sd/-
Regional Manager
Malda Regional Office,
WBSEDCL, Malda
(Tender Inviting Authority)

Memo No: RM/MRO/E-Tender/Dept. 870 (1-11) Dated: 19.11.2025

Copy forwarded for information and necessary action to:

1. The Director (Dist.), WBSEDCL, VidyutBhavan , Kolkata-91
2. The E.D. (Dist.), WBSEDCL, VidyutBhavan , Kolkata-91
3. The C.E. (Dist.- North), WBSEDCL, Siliguri.
4. The Addl. C.E. & Zonal Manager, Malda Zone, WBSEDCL, Malda.
5. The SE & Regional Manager – Raiganj/Dakhsin Dinjpur Region: For Necessary Circulation in Notice Board please.
6. The D.E. & D.M., Malda Division, WBSEDCL, Malda.
7. The Mgr. (F&A), Malda Regional Office, WBSEDCL, Malda.
8. The Mgr. (HR&A), Malda Regional Office, WBSEDCL, Malda.
9. The SE (E)/DE(E) Malda Regional Office, WBSEDCL, Malda.
10. The Notice Board, Malda Regional Office, WBSEDCL, Malda.

19/11/25

Regional Manager
Malda Regional Office,
WBSEDCL, Malda
(Tender Inviting Authority)

Section II
INSTRUCTION TO BIDDERS

1. General guidance for Tendering:
Instructions / Guidelines for electronic submission of the tenders online have been annexed for assisting the contractors to participate in e-Tendering.

2. Registration of Contractor:
Any contractor willing to take part in the process of e-Tendering will have to be enrolled & registered with the Government e-Procurement System of West Bengal, through logging onto http://www.wbtenders.gov.in(the web portal) the contractor is to click on the link for e-Tendering site as given on the web portal.

3. Digital Signature certificate(DSC):
Each contractor is required to obtain a Class-II or Class-III Digital Signature Certificate (DSC) for submission of tenders from the approved service provider of the National Informatics Centre (NIC) on payment of requisite amount. Details are available at the Web Site stated in Clause 2 above. DSC is given as aUSBe-Token.

4. Downloading of Tender documents:
The contractor can search & download N.I.T. & Tender Document(s) electronically from computer once he logs on to the website mentioned in clause 2 using the Digital Signature Certificate. This is the only mode of collection of Tender Documents.

5. Participation in more than one work:
A prospective bidder shall be allowed to participate in the job either in the capacity of individual or as a partner of a firm, Society, Company, Ltd Company (Incorporation certificate i.e. MOA and AOA, Valid Trade License), Co-operative Society (Society Registration copy, valid Trade License).
If found applied severally in a single job, all his offers will be rejected for that job.

6. Submission of Tenders:
General process of submission: Tenders are to be submitted online to the website stated in Cl.2 above, in two folders at a time, one in Technical Proposal & the others Financial Proposal before the prescribed date & time using Digital Signature Certificate (DSC).The documents are to be uploaded in the form of virus scanned copy duly Signed Digitally. The uploaded Documents will get encrypted (transformed into non readable formats).

A Technical Proposal:

A1 Statutory Parts:

a) **To be submitted in "Drafts" folder:**

i Cost of Tender Document: No Cost.

ii **Earnest Money Deposit (EMD):** The amount of Rs 5,00,000.00 (Rupees five lakh only) Earnest Money Deposit (EMD) shall be deposited online as prescribed in the NIT as per the "Civil Works Policy" O.O No 789 dated 08.01.2014 issued by the Director(HR), WBSEDCL. **The bidder shall select the tender to bid and initiate payment of EMD.** Documentary evidence of online EMD payment (if any) should be uploaded in draft folder during submission of bid.

iii **Following payment options are available for paying EMD amount:**

I **Net-banking through Payment Gateway.**

II **RTGS/NEFT Payment**: On selection of RTGS/ NEFT as the payment mode, the e- Procurement portal will show a pre-filled challan having the details to process RTGS/NEFT transaction. The bidder will print the challan and use the prefilled information to make RTGS/NEFT payment using his bank account.Once the payment is made, the bidder will come back to the e-procurement portal to continue the bidding process after expiry of a reasonable time to enable the RTGS/NEFT process to be completed.

III **Submission of the EMD through Bank Guarantee:** For submission of EMD in the form of Bank Guarantee, the bidder will have to opt for EMD exemption in e-tender web portal and upload scanned copy of BG in the EMD exemption document upload section. Physical copy of BG shall be submitted at the Office of the Regional Manager, Malda Region WBSEDCL within scheduled date and time as mentioned in NIT Notice.

iv **General Instructions for Online Payment:**

I The bidder will have to mandatorily pay through Net-banking facility once Net banking mode is opted for payment.

II Status of NEFT/RTGS payment through Challan for a bid may take time for bank settlement which is updated in 24 Hrs. (approx.). As such bidders opting to pay through NEFT/RTGS mode shall make payment well before 24 Hrs. to avoid any complicacy.

III In case actual EMD amount as per NIT is more than the one shown in E-tender Portal, bidders will have to opt for NEFT/RTGS mode (challan mode). In that case the total actual EMD amount is to be paid only through NEFT/RTGS mode (challan mode).

IV The bank account used for payment of EMD by the bidders shall be maintained operative until the completion of tendering process. All refunds will be made mandatorily to the Bank A/c from which the payment of EMD has been initiated.

v Refund/ Settlement of EMD Amount:

I For unsuccessful bidders, EMD amount submitted against the tender shall be refunded automatically, through an automated process, by NIC portal on receipt of updated status of any bid.

II For successful bid(s), EMD will be refunded from WBSEDCL authority after completion of tendering process and following due procedures.

III In case of successful tenderers earnest money shall be refunded only after submission of security deposit in two parts @ 5% each of a total value of the order placed on the tenderer. All security deposit should be in the form of B.G. from any scheduled bank in India. In the B.G. there should be provision for payment at Kolkata in case of invoking.(as per the "Performance bond/ security deposit" clause no 4 of GCC)

IV The bank account used for payment of EMD by the bidders shall be maintained operative until the completion of tendering process. All refunds will be made mandatorily to the Bank A/c from which the payment of EMD has been initiated.

V For any queries related to payments and refunds, bidders will have to communicate with ICICI Customer Support, viz. 33-4O267512/13 since payment gateway facility used by E-tender portal is maintained by ICICI.

VI Successful bidder(s) shall have to mandatorily create vendor id through WBSEDCL Web Portal Vendor Corner if not created earlier.

b) **To be submitted in "NIT" folder:**

i Notice Inviting e-Tender (NIT).

ii Technical Specifications.

iii Addenda/Corrigenda: if published.

Note: Bidders are to keep track of all the Addendum/Corrigendum issued with a particular tender and upload all the above duly digitally signed along with the NIT. Tenders submitted without the Addendum/Corrigendum will be treated as informal and liable to be rejected.

c) **To be submitted in "Forms" folder:**

i Declaration of Black Listing / Holiday Listing (as per Form - IV).

ii Certificate regarding summary statement of yearly turnover (Form - I).

iii Form - II - evidence of access to or availability of credit facilities if applicable.

iv Annexure – I, annexure – II, annexure – III (as stated).

v Form – III - statement of similar type of works (electrical) executed during last 07 (seven) years.

Note: All the above documents are to be uploaded duly digitally signature.

A2 Non Statutory Cover:

I. Professional Tax Registration Certificate/Registration No.(P. Tax Registration Certificate/ Enrollment Certificate as applicable), current professional tax payment certificate along with payment challan.
II. P.F. Registration Certificate/No. along with up to date challan upto Sepetember 2025.
III. GST Registration Certificate/No with up to date return/challan latest,
IV. E.S.I. Registration certificate/No. with up-to date challan upto Sepetember 2025.
V. Upto date documents related to Group Insurance Policy about personal accident insurance under Employee's Compensation Act 1923.
VI. PAN Card and Income Tax Return for last **three Assessment Years (if submission of audit file) or five Assessment**

Years (if non submission of audit file).

VII. Valid Electrical Contractor's License issued by the Licensing Board, Government of West Bengal/India under Act with valid Electrical Supervisor's Certificate of Competency (SCC) Part No. 1,2,3,4,5,6A,6B,7A, 7B, 11 & 12 issued by the Licensing Board, Government of West Bengal/India (current engagement of electrical Supervisor at prospective bidders firm needs to be established for supervision and execution of work).

VIII. Have sufficient credential of similar nature of Electrical works.

IX. Have to give necessary documentery evidence for presence and engagement of licensed electrical supervisor for supervision and execution of work.

X. Valid up-to-date Trade License in respect of the prospective Bidder:

XI. Registration Certificates of Firms/ Entities,

a) Proprietorship Firm (Valid Trade License),
b) Partnership Firm (Valid Partnership Deed, Valid Trade License),
c) Ltd Company (Incorporation certificate i.e. MOA and AOA, Valid Trade License),
d) Co-operative Society (Society Registration copy, valid Trade License).

Note: All the documents stated in Sl. No. vii, viii and ix above for execution of electrical works is to be uploaded along with tender.

XII. The bidder shall submit reports on the financial standing i.r.o. solvency of Bidder (Company/ Firm) as certified by bankers, audited annual reports on accounts with auditors' certificate for companies registered under Companies Act and Tax Audit Report for Partnership Firms for last 3(Three) Financial Years.

XIII. Net worth for the each of the last 03 (three) Financial Years should be positive.Net worth means the sum total of the paid up capital and free reserves (Excluding reserves created out of revaluation) reduced by aggregate value of accumulated losses (including debit balance in profit and loss account for current year) and intangible assets.

XIV. The bidder's Minimum Average Annual Turnover (MAAT) for last 03 (three) Financial Years shall not be less than 30% of the estimated cost per year.

XV. The working capital of the bidder in the preceding year of bid submission shall not be less than 30% of the estimated cost per year.

XVI. In case documents certifying credit facility from a scheduled Bank is submitted, the requirement given in clause no (XV) shall be judged by adding available credit facility and working capital taken together.

XVII. Annual Audited Financial Report for last 3 (three) years to be submitted for verification in respect of bidders for whom audit of accounts is mandatory (3CA/3CB and particulars are reported in the Form 3CD u/s 44AB of Income Tax Act'1961 are to be submitted). **For those whose audit of accounts is not mandatory, they shall submit copy of IT returns along with related enclosures for last five years.**

XVIII. Registration Certificates of Firms/Entities:

- Proprietorship Firm (Valid Trade License),
- Partnership Firm (Valid Partnership Deed, Valid Trade License),
- Ltd Company (Incorporation certificate i.e. MOA and AOA, Valid Trade License),
- Co-operative Society (Society Registration copy, valid Trade License).

- **Credential of completed works as mentioned here are:** The pre-qualification criteria will be subject to bidder's fulfillment of the qualification/eligibilty criteria set forth and stipulated in line with Sl. No. 3 & 4 of the NIT. The bidders shall also have experience and a proven track record in taking up and completing work of a magnitude and nature for similar kind of work:

(A) The bidder must have successfully completed similar works(*defined below) for Electrical works during last 07(Seven) years (i.e. after 17.11.2018) under the authority of State/Central Government, State/Central Government undertaking, Statutory Bodies constituted under the statute of Central/State Government. The criteria for similar completed works will be as follows:

Three similar completed works each costing not less than the amount equal to 40% of the estimated cost.

OR

Two similar completed works each costing not less than the amount equal to 50%of the estimated cost.

OR

One similar completed work costing not less than the amount equal to 80%of the estimated cost.

*(*Electrical: The bidder must have successfully completed installation of UG 11kv/LT cables,11kv Breakers etc and other allied electrical works that in last 7 years (i.e. upto 31.08.2025) under the authority of State/Central Government, State/Central Government undertaking, Statutory Bodies constituted under the statute of Central/State Government.)*

Note: - Satisfactory Completion Certificate indicating estimated amount and/or Ordered Amount, Value of work-done and Date of completion of the work and detail communicational address along with contact details of the Client should be submitted by the Bidder. Completion Certificate from the concerned Executive Engineer/District Engineer/Divisional Engineer or equivalent rank and above will be treated as valid credential. The bidder is to upload the LOA/Execution Order/PO in full along with the BOQ showing the full description of items in respect of the work for which completion certificate is being uploaded. Delay in completion of work, if any, must be mentioned in completion certificate along with the reason.

Note: The bidder must have full-fledged set up for executing similar projects in power utility.

(B) **Financial Proposal(in one cover/folder):**

It contains Bill of Quantities (BOQ). The rate to be quoted in the BOQ on "percentage basis" in the space marked for quoting rate (either excess, less or at par i.e. 0.00%). Quoted rate will be encrypted in the B.O.Q. under Financial Bid.**(Only downloaded copies of the above documents are to be uploaded, virus scanned and digitally signed by the bidder).**

Note: - Failure of submission of any of the above-mentioned documents (as stated in A1, A2 and B) will render the tender liable to summarily rejected for both statutory & non statutory cover.

THE ABOVE STATED NON-STATUTORY/TECHNICAL DOCUMENTS SHOULD BE ARRANGED IN THE FOLLOWING MANNER.

Click' the check boxes beside the necessary documents in the 'My Document' list and then 'click' the tab "Submit Non-Statutory Documents" to send the selected documents to Non-Statutory folder. Next Click the tab "Click to Encrypt and upload" and then click the "Technical" Folder to upload the Technical Documents (Statutory documents).

Sl. No.	Category Name	Details
A	Certificates	1. PAN. 2. E.P.F. Document. 3. G.S.T. Document. 4. P. Tax Document. 5. E.S.I. Document. 6. Audited Annual Report on Accounts documents. 7. ITR Document. (Annual Audited Financial Report for last 3 (three) years to be submitted for verification in respect of bidders for whom audit of accounts is mandatory (3CA/3CB and particulars are reported in the Form 3CD u/s 44AB of Income Tax Act'1961 are to be submitted). **For those whose audit of accounts is not mandatory, they shall submit copy of IT returns along with related enclosures for last five years).** 8. Credit facility from any schedule bank to make short fall in working capital. 9. Electrical Contractor's License issued under Act with valid Electrical Supervisor's Certificate of Competency (current engagement of electrical Super visor at Prospective bidders' firm needs to be established).
B	Company Details	1. Proprietorship Firm (Valid Trade License). 2. Partnership Firm (Valid Partnership Deed, Valid Trade License). 3. Ltd Company (Incorporation certificate i.e. MOA and AOA, Valid Trade License). 4. Co-operative Society (Society Registration copy, Valid Trade License).
C	Credential	Necessary documents regarding Similar nature of work done which is applicable for eligibility in this tender (As per Clause no.3 of NIT)
D	Declaration	1. Declaration of Black Listing / Holiday Listing (as per Form No-

		IV). 2. Certificate Regarding Summary Statement of Yearly Turnover (Form-I). 3. Form-II - Evidence of Access to or Availability of Credit Facilities If Applicable. 4. Annexure–I, Annexure–II, Annexure–III (As Stated). 5. Form– III - Statement of Similar Type of Works (Electrical) Executed During Last 07 (Seven) Years.

7. Opening of Tender:

a) **Technical Proposal**

i. **Opening of Technical proposal**: - Technical proposals will be opened by authorized representatives of WBSEDCL from the web site stated using their Digital Signature Certificate.

ii. Intending bidders may remain present if they so desire.

iii. Covers (folder) statutory documents will be opened first & if found in order, cover (Folder) for non-statutory documents will be opened. If there is any deficiency in the statutory documents the tender will be summarily rejected.

iv. Decrypted (transformed in to readable formats) documents of the non-statutory cover will be downloaded & handed over to the authorized representatives of WBSEDCL.

v. Uploading of summary list of technically qualified bidders:

- Pursuant to scrutiny & decision of the authorized representatives of WBSEDCL the summary list of eligible bidders & the serial number of work for which their proposal will be considered will be uploaded in the web portals.
- While evaluation the authorized representatives of WBSEDCL may summon any of the bidder & seek clarification / information or bidder/s may be asked for producing original hard copy/s of any of the documents already submitted & if these are not produced within the stipulated time frame, their proposals will be liable for rejection.

b) **Financial Proposal**

i The financial proposal should be one cover (folder) containing bill of quantities (BOQ) the contractor is to quote the rate [Percentage Excess/Less] online in the space marked for quoting rate in the BOQ.

ii Only downloaded copies of the above documents are to be uploaded virus scanned & Digitally Signed by the contractor.

8. Parties Who May Bid:

a) Invitation of bid is open to the eligible bidders of Indian origin and the bid will be made in the basis of local competitive bids (LCD).

b) All materials to be supplied and services to be rendered under this contract shall be accepted from bidders fulfilling the eligibility/capability criteria.

c) A prospective bidder shall be allowed to participate in the job either in the capacity of individual or as a partner of the firm, Ltd Company (Incorporation certificate i.e. MOA and AOA, Valid Trade License), Co-operative Society (Society Registration copy, valid Trade License). If any of the bidders is found to have applied severally in a single job all his applications will be summarily rejected for that job.

9. Responsibility of Bidders:

a) WBSEDCL will not assume any responsibility regarding information gathered, interpretations or conclusions made by the bidder or regarding information, interruption or deductions the bidder may derive from the data furnished by the WBSEDCL. Verbal agreement or conversation with any officer, employee of WBSEDCL either before or after the execution of the contracts, shall not affect or modify any of the terms or obligations contained in the contract.

b) It shall be the responsibility of the bidders to determine and to satisfy themselves by such means as they consider necessary or desirable as to all matters pertaining to this contract including in particular all factors that may affect the cost, duration and execution of the works. It must be understood and agreed that such factors have properly been investigated and considered while submitting the bid.

c) Claim, whatsoever, including those for financial adjustment to the contract awarded under these specifications and documents will not be entertained by the purchaser. Neither any change in time schedule of contract nor any financial adjustments arising thereof shall be permitted by the purchaser, which are based on the back of such clear

information of its effect on the cost of the contract to the bidder.

d) The bidder is expected to examine carefully all instructions, conditions, forms, schedules terms, annexure, specifications and drawings in the bidding document. Failure to comply with the requirements of bid submission will be at the bidder's own risk. Bids, which are determined to be not substantially responsive to the requirement of the bidding document, will be rejected.

10. **Pre-Bid Meeting:** A pre-bid meeting will be arranged by WBSEDCL in which all the bidders will be requested to attend. If there be any discrepancy or obscurity in the meaning of any clauses of the bid document or if there be any query of the intending bidder, the bidder may submit their queries to the tendering authority before the specified date. Any change in date shall be intimated to the bidders through e-mail or over telephonic correspondence. Non attendance at the pre-bid discussion will not be a cause for disqualification of bidders. The clarification given in the pre bid discussion shall be final and binding on the bidder, being a part of the original Bid Document. Pre-bid proceedings shall be circulated among all bidders by email.

11. **Cost of Bidding:** The bidder shall bear all cost associated with the preparation and submission of their bid and WBSEDCL in no case shall be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.

12. **Clarification of Bidding Document:** Should there be any discrepancy or obscurity in the meaning of any clauses of the bid document or if there be any query of the intending bidder, the bidder shall set forth in writing such discrepancies, doubt, obscurity or queries and submit the same to WBSEDCL, marked to the **Regional Manager, Malda Regional office, WBSEDCL,** the date specified for this purpose. The clarification given in the pre- bid discussion shall be final and binding on the bidder.

13. **Bid Prices:**

a) The bidder shall quote their price in the appropriate format in percentage excess/at par/ less the estimated price.

b) The quoted price should be firm. There will be no price variation during the pendency of the contract period or thereafter. Bidders are in no way allowed to get any escalation of price against this contract.

c) Prices indicated in the schedule of prices deemed to include all the levies/duties/taxes/Cess & all other incidentals payable as per statute. Goods and Service Tax shall be paid extra as per statute.

14. **Correctness and Sufficiency of Rates Quoted in the Tender:** The bidder shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for work and the rates and prices stated in the schedule of works. The rates and price quoted shall cover all obligation of the bidder under the contract and all materials, labour etc. necessary for proper completion and maintenance of the work.

15. **Amendment of Bidding Documents:**

a) At any time prior to the deadline for submission of bids, WBSEDCL may, for any reason whether at his own initiative or in response to a clarification requested by a prospective bidder, modify the bidding documents by issuing amendments. Any such amendment shall be part of the bidding document.

b) Such amendment(s) will be published on the same website mentioned above. WBSEDCL will bear no responsibility or liability arising out of non-pursuance of the same in time or otherwise by the bidder. In order to afford prospective bidders reasonable time in which to take the amendment in to account in preparing their bids, WBSEDCL may, at its discretion, extend the deadline for submission of bids. Such amendments, clarification, etc. shall be binding on 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 bids.

16. **Validity of Bid:**

a) Financial Bid shall preferably be opened within 30 (Thirty) days from the date of opening of Techno-commercial Bid.

b) The offer against the tender should remain valid for a minimum period of 180 days from the date of opening of Financial Bid.

c) Prior to the expiry of the original validity period WBSEDCL may request extension in the period of validity for a further suitable period without any change in terms & conditions of the offer.

17. **Earnest Money Deposit:** The bidder shall deposit the requisite earnest money through online or offline mode following payment options is available for payment of EMD, for the intending bidders**.**

a) **Net-banking through Payment Gateway.**

b) **RTGS/NEFT Payment**: On selection of RTGS/ NEFT as the payment mode, the e- Procurement portal will show a pre-filled challan having the details to process RTGS/NEFT transaction. The bidder will print the challan and use the prefilled information to make RTGS/NEFT payment using his bank account. Once the payment is made, the bidder will come back to the e-procurement portal to continue the bidding process after expiry of a reasonable time to enable the

RTGS/NEFT process to be completed.

c) **Submission of EMD through BG:** For submission of EMD in the form of Bank Guarantee, the bidder will have to opt for offline mode in e-tender web portal and upload scanned copy of BG in the designated upload section. Physical copy of BG shall be submitted at the Office **the Regional Manager, Malda Regional office, WBSEDCL** within scheduled date and time.

18. **Process to Be Confidential:** After the opening of bids, information relating to the examination, clarification, evaluation and comparison of bids, and recommendations concerning the award of contract shall not be disclosed to bidders or other persons not officially concerned with such process.

19. **Right to Accept Or Reject any or all Offers:** WBSEDCL 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 the reason for WBSEDCL's action. Effort by a bidder to influence WBSEDCL or other connected in the process of examination, clarification, evaluation and comparison of bids, and in decisions concerning the award of contract, may result in the rejection of his/their bid.

20. **Time Schedule:** The basic consideration and the essence of the contract shall be the strict adherence to the time schedule specified in the NIT.

21. **Evaluation and Comparison of Bids:** On examination of document submitted under different covers WBSEDCL will evaluate and compare the bid, determined to be substantially responsive at each step. WBSEDCL shall evaluate and compare only the bids determined to be substantially responsive. The bids shall be evaluated on the basis of total price (Civil & Electrical Works) for the entire scope of work covered under this bid document. Evaluated bid price of all bidders shall be compared among themselves to determine the lowest evaluated bid and as a result of this comparison, the lowest bid will be selected for award of contract. Conditional rebate, if any, offered by any bidder shall not be considered in Bid evaluation.

22. **Opening of Financial Bid:**

a) Financial proposals of the bidders, declared technically eligible, will be opened electronically by the Tender Inviting Authority (authorized representative of WBSEDCL) from the web portal stated above on the prescribed date.

b) The encrypted copies will be decrypted and the rates will be read out to the bidders remaining present at that time.

c) After opening of the financial proposal, the preliminary summary result containing inter-alia, name of the bidder and the rates quoted by them will be uploaded.

d) The bids will be evaluated on the basis of technical and financial proposal for the entire scope of work covered under this bid document.

e) The Tender Accepting Authority may ask any of the bidder(s) to submit analysis to justify the rate quoted by that bidder. Such justification must be submitted by the concerned bidder(s) within the stipulated time.

f) The bidder whose offer has been accepted will be finalized after the evaluation procedure will be notified by the Tender Inviting Authority (authorized representative of WBSEDCL) through Letter of Intimation. The same will be made available/uploaded in the website https://wbtenders.gov.in.

g) Decision of Tender Inviting Authority will be final and bound to every bidder.

h) The selected bidder will be asked to produce the documents like Contract Agreement, Indemnity Bond, Performance Security and any other document on demand of WBSEDCL within a specified timeframe.

i) WBSEDCL has the right to reject the tender if the bidder is unable/disagree to produce the same. In such case the EMD forfeiture of the concerned bidder will take place.

23. In case of **Tie Bid** among the L1 bidders the following procedure shall be adopted:

Keeping the discovered L1 rate as ceiling, sealed bids may be invited from all L1 bidders and out of those lowest one may be selected.

If none of the L1 bidders is ready to offer further reduced rates:

23.1 For items divisible in nature:

23.1.1 The work may be distributed equally among the consenting L1 bidders.

23.1.2 If none of the L1 bidders is ready to accept the reduced quantity, the bidder with higher credential based on the following parameters, may be selected among L1 bidders in the following manner:

a) In case of Supply of goods, last three years average turnover of the bidder shall be considered.

b) In case of Execution of work/ Supply of service, value of single work/ service of similar nature completed during last three years shall be considered.

23.2 **For items not divisible in nature:**

If none of the L1 bidder is ready to offer further reduction of rates, the bidder with higher credential based on parameters, as mentioned in 22.1.2 above may be selected among L1 bidders.

24. **Taxes, Duties and Other Levies:** The contractor shall be solely responsible for the taxes that may be levied on the contractor's persons or on earnings of any office employee and shall hold the purchaser indemnified and harmless against any claims that may be made against the purchaser. The purchaser does not take any responsibility what- so-ever regarding taxes under Indian Income Tax Act, for the contractor or his personnel. If it is obligatory under the provisions of Indian Income Tax Act, deduction of Income Tax at source shall be made by the purchaser.

25. **Laws Governing Contract:** The contract shall be construed according to acts/laws in force in the country and shall be under the jurisdiction of Calcutta High Court.

26. **Language and Measures:** All documents pertain to the contract including specifications, schedule, notice, correspondences, operating and maintenance instructions, drawings or any other writings be written in English language. The metric system of measurement shall be used exclusively in this contract.

27. **Corrupt or Fraudulent Practice:** WBSEDCL expects that bidders/contractors observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, the owner defines for the purpose of this provision, the terms set forth below as follows:

"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

"Fraudulent Practice " means misrepresentation of facts in order to influence a procurement process of the execution of a contract to the detriment of the owner, and includes collusive practice among bidders (Prior to or after bid submission) designed to establish bid prices at artificial no-competitive levels and to deprive the owner of the benefits of free and open competition Will reject a proposal for award if the owner determines that the bidder recommended for award has engaged in corrupt or fraudulent practice in competing for the contract in question will declare a firm ineligible either indefinitely or for a stated period of time if owner any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing the contract.

28. **Insurance:** The successful bidder on awarding of contract shall arrange, secure and maintain all insurance as may be pertinent to the work and obligatory in terms of law to protect the interests of WBSEDCL against all perils. The form & the limit of such insurance together with underwriting in each case shall be acceptable to WBSEDCL. However, irrespective of such acceptance the responsibility to maintain adequate insurance coverage at all times during the period of contract shall be bidder's onus.

29. **Correctness and Sufficiency of Rates Quoted in The Tender:** The bidder shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for work and the rates and prices stated in the schedule of works. The rates and price quoted shall cover all obligation of the bidder under the contract and all materials, laborer necessary for proper completion and maintenance of the work.

30. **Penalty for Suppression / Distortion of Facts:** If any Bidder fails to produce the original hard copies of the documents (especially Completion Certificates and audited balance sheets), or any other documents on demand of the Tender Committee within a specified time frame or if any deviation is detected in the hard copies from the uploaded soft copies or if there is any suppression, the tender committee will take action as deem fit against such defaulting Bidder.

31. **Award of Contract:** The Bidder whose bid would be accepted will be notified by the authorized official through acceptance letter/Letter of award. The notification of award will constitute the formation of the Contract. The Agreement and Indemnity Bond as per enclosed format in G.C.C. will incorporate all agreements between the Tender Accepting Authority and the successful bidder. All the tender documents including N.I.T. & B.O.Q. will be the part of the contract documents. General Condition of Contract for Electrical works are post bidding documents and is totally binding with the lowest bidder, the same shall not be construed as prequalification criteria for the work under tender.

32. **Holiday Listing:** The holiday listing policy of WBSEDCL shall be applicable to the participating bidders in the e- tendering in case of any deviation is found from normal contractual conduct. A declaration as per 'Form No.-IV of Forms' of the tender document is to be submitted by the bidders.

33. **Contract Agreement:** The agreement as per enclosed format specified in 'annexure -A' of this tender will incorporate all

agreements between the tender accepting authority and the successful bidder. All the tender documents including E-NIT and BOQ will be part of the agreement. After acceptance of Letter of Award, the successful bidder shall have to submit requisite copies of contract documents stated as per 'Clause No.-8 of General Conditions of Contract (GCC)'.

34. **Indemnity Bond:** The contractor (successful bidder) shall have to produce Indemnity Bond as per ' annexure -B' within the stipulated time as mentioned in the Letter of Award (LOA) to '**Regional Manager, Malda Regional office, WBSEDCL'.**

35. **Creation of Vendor ID through WBSEDCL Web Portal:** All Participating bidder(s) shall have to mandatorily create vendor ID through WBSEDCL Web Portal Vendor Corner, if not created earlier.

36. **Restoration Charges:**

a) Any short of application in respect of obtaining NOC and Liaison for Road restoration during the execution of UG Cable Laying from English Bazar Municipality, Forset Department, PWD, MES, NHAI, State Highways authorities, PHE etc. or designated authorities will be the honours of the executing agency. Necessary Charges which will be served in the form of quotation/deman from aforesaid entities will be paid from WBSEDCL as per actual basis.

b) In case wherein the road restoration work to be dealt by WBSEDCL as an exception, that will be dealt separately as per prevailing norms of WBSEDCL.

c) Necessary formalities like GSTN, PAN, Bank Details Liscens Agreement format etc from the aforesaid entities will be responsibilities of the executing agency.

37. **Technical Specification**: As annexed

SECTION-III

Form-I - CERTIFICATE REGARDING SUMMARY STATEMENT OF YEARLY TURNOVER

This is to certify that the following statement is the summary of the audited Balance Sheet arrived in favour of . . . . . .
. . . . .For the 03 (three) consecutive years as mentioned below.

Sl.No.	Financial Year	Financial	Remarks
1.			
2.			
3.			
Total			

Average Turnover (In Rupees):

……

SIGNATURE OF THE TENDERER WITH OFFICE SEAL

Form-II - EVIDENCE OF ACCESS TO OR AVAILABILITY OF CREDIT FACILITIES

BANK CERTIFICATE

(To be given by banker of bidder)

This is to certify that M/s……..(FULL NAME ANDADDRESS)
Who are submitting their Bid to ..... against their tender specification vide Ref.No……. and date…… is our customer forthe past …….years.

Their financial transactions with our bank have been satisfactory. They enjoy the following fund based and non-fund based limits including guarantees/and other credit facilities with us against which the extent of utilization as on date is also indicated below:

Sl.No.	Type of Facility	Sanctioned limit as on date	Utilization as on Date.

This letter is issued at the request of M/s…….

Sd/-

Name of Bank ……..

Name of authorized Signatory……..

Designation……..

Phone No……..

Address……..

SEAL OF THE BANK

Form– III - STATEMENT OF SIMILAR TYPE OF WORKS (CIVIL&ELECTRICAL) EXECUTED DURING LAST 07 (SEVEN) YEARS.

Sl. No.	Name of the workexecuted	Nature of the project to which the work is related	OrderNo.anddate(s)	Name of Owner/ order issuing authority	Financial year	Executed value (Rs.)	Date of commencement, scheduled completion &actual completion	Whether Completion/ Payment Certificate(s) submitted (Y/N)

Remarks, if any:

SIGNATURE OF THE TENDERER WITH OFFICE SEAL

Form-IV(A)

(On the Bidder's Letterhead)

Declaration of not being blacklisted/Debarred/Put on Holiday list

Certified that our Company, M/s ……is not blacklisted/ debarred/ suspended or put on holiday list by any Statutory/Regulatory/ Government Authorities / State Electricity Utility/ PSU in India.

It is certified that the information furnished above is true to the best of my knowledge and belief.

Bidders Name:

Signature of the Tenderer:

Designation:

Seal of the Company

Date:

Form-IV(B)

(On the Bidder's Letterhead)

Self-declaration by Proprietor of the Bidding Company for not being blacklisted/Debarred/Put On Holiday list

I hereby confirm and declare that, none of the other concerns of which I am a Proprietor /Managing Partner are blacklisted/ debarred/ suspended or put on holiday list by any Statutory/ Regulatory/Government Authorities/State Electricity Utility/PSU in India.

It is certified that the information furnished above is true to the best of my knowledge and belief.

Signature of the Proprietor:

Name

Designation:

Seal of the Company:

Date:

Form-IV(C)

(On the Bidder's Letterhead)
Declaration regarding no litigation against WBSEDCL

We hereby declare that, no legal litigation/arbitration is pending/ongoing against WBSEDCL in any court/Forum against/by the bidder or its sister concern/Director/Partner/Proprietor.

If it is found at any stage of tendering, our offer will be rejected and I/We don't have any objection on the same.

Bidder's Name:

Signature of the Tenderer:

Designation:

Seal of the Company

Date:

ANNEXURE –I

(To be produced on Rs. 100.00/- Non Judicial Notarized Stamp Paper)

PROFORMA FOR UNDERTAKING TO BE SUBMITTED BY THE BIDDER
(For genuineness of the information furnished on-line and authenticity of the Documents produced before Tender Committee for verification in support of his eligibility)

I,.....,Partner/LegalAttorney/Accredited representativeofM/S_____, solemnly declare that:

1. We are submitting Tender for the Work against Tender NoticeNo.: ..... dt……

2. None of the Partners of our firm is relative of employee of WBSEDCL

3. All information furnished by us in respect of fulfillment of eligibility criteria and qualification in formation of this tender is complete, correctand true.

4. All documents/credentials submitted along with this Tender are genuine, authentic, true and valid.

5. If any information and document submitted is found to be false/incorrect any time, department may cancel my Tender and action as deemed fit may be taken against us, including termination of the contract, forfeiture of all dues including Earnest Money and banning/delisting of our firm and all partners of the firm.

Signature of the Bidder Dated_____

ANNEXURE-II

Format of Letter of Bid

(IN LETTER HEAD OF BIDDER)
(AS ENROLLED ONLINE ON e-tendering PORTAL OF NIC)

To
The Tender Committee

Sub: Letter of Bid for the work

Ref: 1. NIT No. dated...

2. Tender IdNo.-.....

Dear Sir,

We offer to execute the work as per our offered bill of quantity in accordance with the conditions of the NIT document as available in the website. The details of the EMD being submitted by us has been furnished on-line.

This Bid and your subsequent Letter of Acceptance/Work Order shall constitute a binding contract between us.

We hereby confirm our acceptance of all the terms and conditions of the NIT document unconditionally.

Signature of the Bidder

ANNEXURE-III

(IN LETTER HEAD OF BIDDER)

Dated:_____

DECLARATION BY THE BIDDER

I/We have inspected the site of work and have made myself/ourselves fully acquainted with local conditions in and around the site of work. I /We have carefully gone through the Notice Inviting Tender and other tender documents mentioned therein. I/We have also carefully gone through the 'Bill of Quantities'.

My/Our tender is offered taking due consideration of all factors regarding the local site conditions stated in this Detailed Notice Inviting Tender to complete the proposed construction in all respects.

I/We promise to abide by all the stipulations of the contract documents and carry out and complete the work to the satisfaction of the department.

I/We also agree to procure tools and plants, at my/our cost required for the work.

_____
Signature of Bidder

_____
Postal address of the Bidder

ANNEXURE-IV

PROFORMA OF BANK GUARANTEE FOR BID GUARANTEE/SECURITY
The non-Judicial stamp paper of Rs 100.00 should be in the name of issuing bank

Ref..... Bank Guarantee No……..

Date.....

To
The ……
……
…… West Bengal

Dear Sir(s),

In accordance with Invitation to bid under your Bid No..... M/s..... having its Registered/ Head Office at._____(Hereinafter called the "Bidder") wish to participate in the said Bid of.....and you, as a special favour have agreed to accept an irrevocable and unconditional Bank Guarantee for an amount of.....valid upto…….on behalf of Bidder in lieu of the Bid deposit required to be made by the bidder, as a condition precedent for participation in the Said Bid.

We, the.....Bank (Name) at..... (Address) having our Head Office at……..Guarantee and undertake to pay immediately on demand by West Bengal State Electricity Distribution Company Ltd. (WBSEDCL), the Amount of ..... (In words & figures) without any reservation, protest, demur and recourse. Any such demand made by said 'Owner' shall be conclusive and binding on us irrespective of any dispute or difference raised by the Bidder.

This Guarantee shall be irrevocable and shall remain valid up to and including_____.
If any further extension of this guarantee is required, the same shall be extended to such required period (not exceeding one year) on receiving instruction from M/s_____ on whose behalf this guarantee is issued.

In witness where of the Bank, through its authorized office, has set its hand and stamp on this_____ day of _____20___at _____.

WITNESS

_____ _____
(Signature) (Signature)

_____ _____
(Name) (Name)

_____ _____
(Official Address) (Official Address)

* This date shall be 30 (thirty) days after the last date for which the bid is valid.

SECTION-IV

GENERAL CONDITIONS OF CONTRACT AND LIST OF ACTIVITIES, QUANTIFICATION AND BROAD SCOPE OF WORK

GENERAL CONDITIONS OF CONTRACT

- **Definition of Terms:**

In writing these General Conditions of Contract, Specification and Bill of quantity/bidding schedule (schedule of work) the following words shall have normally the meanings here-in-after indicated unless there is something in the subject matter of content inconsistent with such construction.

The **Company/purchaser/Owner/Department** shall mean the WEST BENGAL STATE ELECTRICITY DISTRIBUTION COMPANY LTD, having its Office at Vidyut Bhavan, Block-DJ, Sector-II, Kolkata-700091

The **Engineer-in-Charge/Controlling Officer** shall mean the Engineer designated by the Company for the purpose of this contract.

Company's representative shall mean any person or persons of consulting firm appointed and remunerated by the Company to supervise, inspect, test and examine workmanship and materials of the work under this scope.

The **Contractor** shall mean the Bidder who will be awarded with the contract by the Company and shall include the contractor's executor's administrators, successors and permitted assignees.

Equipment/materials shall mean and include all type of construction equipment & materials etc. required for true and satisfactory completion of the work under this contract.

Workmanship shall mean the method/manner in which the jobs of the different items, whether included in the schedule or not but are required for true & satisfactory completion of the work under this contract, are executed.

General conditions shall mean all the clauses of General conditions of the proposed contract stated hereinafter. The specification shall mean the specification annexed to or issued with the General Conditions and shall include the schedule and drawings attached thereto.

The terms **Services** shall mean all works to be undertaken by the contractor as laid down under the head "scope of contract" or elsewhere in the specification enclosed. When the words "approved", "subject to Approval", "As directed", "Accepted", "Permitted" etc. are used, the approval, judgment, direction etc. are understood to be a function of Company.

Month shall mean calendar month.

"Writing" shall include any manuscript, type written, printed or other statement reproduced in any visible form.

The work **'Site'** shall mean the site of proposed work as detailed in the specification or any other place where the work is to be executed under the contract.

'Date of Contract' shall mean the date on which notification of award of contract/letter of award/telex award has been issued.
'Zero Date' will be reckoned as the date of date of handing over of site.

- **Scope of Work:**

Scope of work includes ***"Replacement of existing overhead 11kv distribution line with underground cables and other allied works along with supply of 11kv XLPE Cables & scada compatible 11kv out door RMU and other materials as mentioned in the BOQ in English Bazar Town Municipality area alongwith area attached to KPS 33/11 KV Substation (Malda District) under Malda Division."*** The proposed contract comprises of construction, repair and maintenance of the work during the contract period including defect liability period, as required. It includes provision of all labour, material, constructional plant, temporary work and everything whether temporary or permanent nature required for such construction, completion and maintenance so far as the necessity of providing the same is specified in or responsible to be inferred from the contract. The different items of work have been elaborated in the schedule of work.
BROAD SCOPE OF WORK: - The scope of works for aforementioned composite job has been delineated as following:

A. **New 11 kV UG CABLES.**
B. **SCADA 11 KV OUT DOOR RMU**

C. Cable Jointing and Terminations
D. SCADA 11 KV OUT DOOR RMU
E. Testing & Commissioning

A1 **Hardware:** MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of overhead structure items like cross arms, top clamps, brackets, clamps, bracing, strain plates etc.While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc shall comply withIS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633. Before shifting them to site for erection, it shall be offered for inspection and approval by the controlling Officer.

A2 **Earthing:** Follow the Earthing arrangements as envisaged for installations like 11KV RMU, etc

A3 **Laying of 11 KV grade 3 Core 185 & 400 Sq. mm XLPE cable:**

a) Based on survey drawing approved by WBSEDCL, estimation of the quantum of work involved in excavation, road cutting, filling, resurfacing of road, boring work for laying of pipe/conduit.
b) Assessment of the requirement of all materials like cable joints, CI/RCC/GI/HDPE pipe, sand, Kiln burnt bricks, connectors and other materials and submission of list of required materials to WBSEDCL Engineers for approval.
c) Transport of all materials required for execution of work to the designated locations & subsequent neat stacking at the store. The Contractor shall be responsible for the safe custody of all materials till handing over of the project.
d) The Contractor shall have to excavate trenches of sizes as per approved drawing. Any deviation, if necessary, will be intimated by Regional Manager. Care must be taken so as not to damage any existing underground utility services. The Contractor shall be liable to pay or make good any losses caused to any property due to the Contractor's negligence. Trench less boring shall be adopted in some stretches of the cable run without disturbing the railway traffic or the vehicular traffic above.
e) Long stretches of cable trenches shall not be kept open at a time exceeding 7 days without prior permission of the Regional Manager.
f) Prior approval of the Regional Manager will be necessary in case of some pits required for bailing out water manually or by pump. Bending of the cables must be made as per permissible bending radius specified by the manufacturer. During excavation, if necessary, site shall have to be shored up with timbering and shuttering.
g) Supply and installation of CI/RCC/GI/HDPE pipe, Kiln burnt bricks having proper shape and size for cable protection, sand filling, laying and dressing of 11KV grade XLPE cable in excavated cable trenches, making of straight through joint (suitable for above cable) including marking of jointing pit, putting RCC protective covers on top and beneath ofjoint, making of termination joint (both Indoor and Outdoor type wherever applicable), supply and installation of M.S. pipe for cable protection, supply and erection of cast iron cable marker on concrete foundation blocks for straight run (at feasible intervals along the route), road crossing and joint locations. The Contractor should mend good any damages done during excavation.
h) Permanent Cable Record: The Contractor shall have to prepare and submit necessary Permanent Records w.r.t the cable Installations as mentioned in specifications.
i) Preparation of route map with proper geo-orientation, drawn to scale indicating location of joints, Type and make of Joints, size of cable, distances etc and submission of the same to WBSEDCL.
j) Cable laying by microtunnelling method shall be done as per the site engineer's instructions and as per the technical specifications as annexed and as per WBSEDCL's prevailing norms.
k) Submission of Completion and Commissioning Report to WBSEDCL for approval.

. **11 KV line for underground Railway/Highway crossing:**

02 Nos. separate cables shall be laid in separate HDPE pipe enclosures in case of single circuit lines and 3 nos. cable to be laid in case of double circuit lines. One cable shall be kept idle as spare in ready to joint condition. Cable termination, cable identification, protective covering, laying of jumpering cable etc. shall all be completed in this head. This composite item shall contain following key items:

a. 3Cx400 sq.mm. XLPE armoured cable.

b. 160 mm dia. HDPE pipe 10 mm thickness.
c. Outdoor heat shrinkable cable jointing kits for main cable and jumpering cable – 4 Sets for main cable.
d. 4 Nos. GI 3-meters long pipe earthing.
e. 6 SWG GI wires with GI nuts, bolts & washers.
f. Cable markers.
g. Bi-metallic clamps.

Detailed survey of location of railway crossing be performed by contractor to avoid multi-crossing at nearby location. Prior railway permission for execution of this work shall be obtained by Project Manager for which necessary technical support shall be provided by contractor. Line crossing shall be performed using underground cabling. Block on railway traffic shall be arranged by Project Manager. Contractor should ensure timely completion of work during block period by mobilizing requisite man, materials and machine at crossing locations.
Horizontal drilling machine shall be used for horizontal bore below railway tracks.

A4. Quality & Quantity inspection and compliance to the observation: The line works, before or after commissioning/energization, shall be inspected by Quality Inspectors and State Inspection Inspectorate. Contractor shall provide all requisite details of line like approved survey report, as built drawings and joint measurement sheet etc.to the inspector. Contractor shall rectify defects/deficiencies and submit compliance to the observations with supporting photographs in digital form within one month from receipt of observations.

A5. Tree-cutting/trimming of tree: The Contractor shall count, mark and put proper numbers with suitable quality of paint at his own cost on all the trees that are to be cut/trim to obtain required tree clearance. Contractor shall pay compensation for any loss or damage for tree cutting due to Contractor's work. Wherever forest clearance is envisaged for execution of work, clearance of forest department for tree cutting, if required, shall be arranged by the Controlling Officer and compensation shall also be paid by the Controlling Officer. Necessary fee if required to pay to Govt. dept. for arranging such clearance shall paid by Controlling Officer. However, the contractor would require to provide all necessary assistance for execution of this work.

A6. Statutory clearances: During execution of 11 KV Line work, all statutory clearances shall be ensured for ground clearance, line-to-line clearance, road crossing clearance, horizontal and vertical clearances from buildings/objects etc. All road crossings and line crossings shall be guarded as per specifications. Conductor joint should not be provided in mid span length. Instead, it should be nearer to the support.

A7. Prior to setting up of a detailed scope of works for the Turnkey Contractor, the scope of the Employer is tabulated in brief hereunder:

i. Three (3phase) 415V AC power supply at one point on contractor's expense & as per prevailing electricity tariff provided LT network is available in the vicinity of the proposed job.
ii. Space for construction of office & store yard for agency free of any charge provided it is available at site

Since above works are not covered, Employer/Owner shall provide all above input before start of work by turnkey contractor. A format protocol note for handing over/taking over of site and general layout plan shall be signed between Controlling Officer and authorized representative of Turnkey Contractor.

B. Electrical works related to working premises:-

1. 11 KV 4-Way (Two incoming & Two Outgoing) & 3-Way (Two incoming & one Outgoing) SCADA Compatible RMU shall be used for protection and control of power circuits. Detailed cable schedules, termination details and circuit diagrams of 11 KV RMU shall be prepared and submitted by turnkey contractor for approval of Controlling Officer before commencing the work. **Installation and Commissioning of 11 KV 4-Way (Two LBS & Two Outgoing)& 3-Way (Two incoming & one Outgoing) SCADA Compatible RMU are to be done under direct supervision of the OEM.**

- Breaker cum control panel shall be erected on ISMC 100 (100x50x6 mm) MS channel duly welded on MS angle inserted on indoor trench. Panels shall then be properly aligned; Cables shall enter with double compression glands, codified, lugged, and dressed.
- Functional checks shall be performed on the control panel as per control wiring diagram.

- All alarm, annunciation and trip circuits / indication & alarm circuits shall be tested and made operative
- The indication lamp shall be LED type lamp as per given specifications and shall be made operative
- Indicating instruments shall be calibrated
- Grounding of panel at two different locations by 65x6mm flat shall be provided.
- Control relays shall be calibrated and checked for tripping and closing operations
- Pick up time / trip time and tripping at normal and reduced voltages shall be checked, properly adjusted and recorded
- Latching arrangement of relays shall be checked for operation, The test report of pre-commissioning checks shall be prepared and submitted. All CT terminals are to be ring type and other terminals are of fork type. 2.5 sq. mm. copper multi stands wiring 1.1 KV grade, ISI marked, IS 694 shall be used for control wiring. A terminal block be provided between CT and Meter keeping 20% spare terminals. The Junction boxes are to be earthed using GI flat 65X6 mm direct connection to the earthing. 2 Nos. Earthing bolts on the distribution box shall be provided of 10mm dia.

Fabricated steel items: Fabricated steel structures clamps, bracket, cross bracings, bracings, strain plate, guarding channels, back clamp, transformer mounting structure etc. Shall be made of MS Channels, MS angle, MS flats as per approved drawings. While fabricating, good quality electrical cutting tools and drill machine shall be used to ensure no sharp edges and perfect holes as per approved drawings. Gas cutting set shall not be used for fabrication of MS steel items. Weld material shall be distributed equally between the two materials that were joined. The weld shall be free of waste materials such as slag. The weld surface should not have any irregularities or any porous holes (called porosity). The joint shall be tight. Most welds need to demonstrate the required strength. One way to ensure proper strength is to start with a filler metal and electrode rating that is higher than your strength requirement. Fabricated steel structure items shall be hot dip galvanized and cleaned till good surface finish. Items shall be offered for inspection and approval by Controlling Officer.

- **Hardware:** MS Nuts, bolts and washers (Galvanized) shall be used for tying of overhead structure items like cross arms, top clamps, brackets, clamps, bracing, strain plates etc. While erecting, proper dimensions of nut-bolts and washers must be ensured. 2 to 3 threads only be visible of the bolt after full tightening of nut on requisite torque. The hardware shall be hot dip galvanized. The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633. Before shifting them to site for erection, they shall be offered for inspection and approval by Controlling Officer.
- **Site Testing and Pre – Commissioning Checks:** An indicative list of tests is given below. Contractor shall perform any additional test based on specialties of the items as per the Field Quality Plan/ instructions of the equipment manufacturer or owner without any extra cost to the Owner. The Contractor shall arrange all instruments required for conducting these tests along with calibration certificates and shall furnish the list of instruments to the Owner for approval. Detail test certificates duly signed by Employer's representative & agency representative of tests jointly carried out at site before putting the equipment in use, shall be submitted by the contractor in three copies. Agency shall also be responsible to prepare Single Line Diagram and an overall power distribution network of the circle upto point of metering.
- **Equipment test records, commissioning test records and drawings:** Factory test certificates of equipment, test certificates at the time of pre-dispatch inspections, pre-dispatch inspection reports, pre-commissioning check results and post commissioning check results shall be compiled and provided in three sets to Controlling Officer for his approval and records. A copy of such test record shall be offered to electrical inspector and other inspecting officials during his/her visit to worksite for inspection.
- **Electrical Inspection by state Electrical Inspectorate:** The Network shall be subjected to the inspection of state-owned Electrical Inspectorate for which payment of fees shall be made by Employer. The responsibility of contractor shall include rectification / alteration / addition of installation as per advice of electrical inspector for successful commissioning of the worksite within time limit.
- **Arrangement by the Contractor:** Contractor shall project-wise make his own separate arrangements for the following all throughout the duration of construction phase:
  a. Opening of a site office-cum-store
  b. Distributions of power supply at all work areas in the worksite premises
  c. Construction of office and store (open & covered)
  d. Construction of steel fabrication workshop and material/field testing laboratory

e. Round the clock fire protection and security arrangements for site store-cum-office

- **Basic Reference Drawings:** The reference drawings, which are indicative of the type of specifications owner intends to accept, are annexed with the specification. The contractor shall maintain the overall dimensions of the bay length, bay width, phase to earth clearance, phase to phase clearance and sectional clearances, clearances between buses, bus heights but may alter the locations of equipment to obtain the statutory electrical clearances required.
- **Commissioning spares:** The Contractor shall supply spares, which he expects to consume during installation testing and commissioning of system. The quantity of these spares shall be decided based on his previous experience, such that site works shall not be hampered due to non-availability of these spares. Contractor shall submit a complete list of such spares along with the bid, the cost of which shall be deemed to have been included in the lump-sum proposal price of the package. The contractor, if so, agreed at a cost to be negotiated, may leave the unused commissioning spares at the site for use of owner.
- **Recommended spares:** The Contractor shall provide a list of recommended spares giving unit prices and total prices for 3 years of normal continuous operation of equipment. This list shall take into consideration and shall be given in a separate list. The Owner reserves the right to buy any or all the recommended spares. The recommended spares parts shall be delivered at the site. The list of recommended spares to be furnished by the Bidder shall also contain the following:
  a. Location of each item installed along with reference drawing number.
  b. Service life expectancy of each item.
  c. Offer validity period.

  Price of recommended spares will not be used for evaluation of bids. The prices of these spares will remain valid for a period of not less than 120 days after the date on which the validity of main bid expires. Whenever recommended spares are the same as mandatory spares, then the prices of the mandatory spares and such common recommended spares shall be the same. Further, the prices of any recommended spares shall be subject to review by the Owner and shall be finalized after mutual discussions.
- **Civil works related to working premises**

- **General:** As regards specification of constructional materials, execution of work and the mode of measurement, technical specification pertaining to the instant contract the relevant PWD (Building),Sanitary& Plumbing) & PW(Roads) SOR shall be applicable. In Case specification is not available in the PWD /PW (Roads) SOR, as above, the appropriate Indian /International Standards shall be followed. Foundation design for RMU foundations etc. shall be followed as per standard drawings of WBSEDCL. All civil works shall be carried out as per applicable Indian Laws, Standards and Codes. All materials shall be of best quality conforming to relevant Indian Standards and Codes. The Contractor shall furnish all design, drawings, labour, tools, equipment, materials, temporary works, constructional plant and machinery, fuel supply, transportation and all other incidental items/charges not shown or specified but as may be required for satisfactory and completed performance of the Works in accordance with approved drawings, specifications and direction of Employer. The work shall be carried out according to the design/drawings to be developed by the Contractor and approved by the Controlling Officer based on Tender Drawings by the Controlling Officer and Original Equipment Manufacturer recommendation. The rate quoted by the bidder for all type of civil work shall be firm irrespective of the type of terrain/subsoil and depth of filling throughout the pendency of the contract.

  The Contractor shall make his own arrangement for locating the co-ordinates in field as per the information supplied to him and also for determining the reduced level of these locations with respect to the benchmark indicated by the Controlling Officer. All the work shall be carried out as per latest edition of the corresponding Indian Standard Codes/any other standard (if necessary).
- **Foundation /RCC Construction:**
  a. Concrete shall conform to the requirements mentioned in IS: 456(latest version) and all the tests shall be conducted as per relevant Indian Standard Codes as mentioned in Standard field quality plan appended with the specification Minimum grade for PCC and RCC shall be used for all structural/load-bearing members as per latest version of IS 456.
  b. If the site is sloppy, the foundation height will be adjusted to maintain the exact level of the top of structures to compensate such slopes.
  c. The foundation's plinths and building plinths shall be minimum 300mm and 800 mm above finished ground

level respectively.

d. Minimum 75mm thick lean concrete shall be provided below all underground structures, foundations, trenches etc. to provide a base for construction.

- **Design:**
  a. Foundations shall be of reinforced cement concrete (minimum M20 grade). Design requirement shall be fulfilled by the contractor and The design and construction of RCC/ PCC / Masonry structures shall be carried out as per IS: 456(latest Version) and relevant IS code/CBIP manual/NBC etc. and minimum grade of concrete shall be as per relevant IS code (latest version). Higher grade of concrete than specified above may be used at the discretion of Contractor without any additional financial implication to the Controlling officer.
  b. Limit state method of design shall be adopted unless specified otherwise in the specification.
  c. For detailing of reinforcement IS: 2502(latest version) and SP: 34 shall be followed. Cold twisted deformed bars (Fe=415 N/mm2) conforming to IS: 1786(latest version) shall be used as reinforcement. However, in specific areas, mild steel (Grade I) conforming to IS:432(latest version) can also be used. Two layers of reinforcement (on inner and outer face) shall be provided for wall & slab sections having thicknessmore than 150 mm. Clear cover to reinforcement towards the earth face shall be minimum 40 mm (All relevant construction works and details should be as per Technical Specifications and drawings).
  d. In addition to earth pressure and ground water pressure etc., a surcharge load of 1T/Sq.m shall also be considered for the design of all underground structures including channels, sumps, tanks, trenches, substructure of any underground hollow enclosure etc., for the vehicular traffic in the vicinity of the structure.
  e. Following conditions shall be considered for the design of water tank in pumps house, channels, sumps, trenches and other underground structures:
  f. Full water pressure from inside and no earth pressure & ground water pressure & surcharge pressure from outside (application only to structures, which are liable to be filled up with water or any other liquid). ii. Full earth pressure, surcharge pressure and ground water pressure from outside and no water pressure from inside.
  g. Design shall also be checked against buoyancy due to the ground water during construction and maintenance stages. Minimum factor of safety of 1.5 against buoyancy shall be ensured ignoring the superimposed loadings. 13. The foundations shall be proportioned so that the estimated total and differential movements of the foundations are not greater than the movements that the structure or equipment is designed to accommodate.
  h. The equipment foundations all other structures shall be of RCC block type foundation. Minimum reinforcement shall be governed by IS: 2974 and IS: 456(latest Version).

C. Cable Jointing and Termination

- **SCOPE:** This specification covers design, manufacturing, testing, supply of ISI mark (IS-13573:2011), 11kV XLPE Cable accessories i.e. Joints/Termination (straight through, Indoor and outdoor End termination Kits) suitable for armoured, XLPE Insulated, Aluminum conductor cables. The cable accessories shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to WBSEDCL, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble-free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and or the commercial order or not.
- **APPLICATION:** The cable accessories shall be used on armoured 11kV XLPE Aluminum conductors/ cables installed Underground Cabling works. Following points in regard to cable jointing accessories needs to be adhered to:
  a. The cable jointing accessories shall include the Indoor and Outdoor end terminating kits, straight through joints and alsoany special tools and tackles required for making these joints.
  b. The contractor shall minimize the use of straight joints.
  c. The straight through joints shall be heat shrinkable type complete with accessories. The joint shall preferably be built upfrom the same material as the main cable and shall have electrical and mechanical withstand capabilities same as or better than the main cable. The joints shall be suitable for tropical climatic conditions specified in this specification.
  d. The end termination shall be Indoor and outdoor heat shrinkable type complete with accessories. The outdoor

terminationshould be suitable for heavily polluted atmospheric conditions with total creep age distance of 25 mm/ kV and protected creep age distance of not less than 50% of the total creep age distance.

e. The detailed description on jointing procedure shall be furnished along with the bid.

f. The details of the end termination/ straight through joints in service with the period in service shall be furnished.

- **APPLICABLE STANDARDS:**
  - IS-13573 (Part –I):2011 – for working voltage from 1.1kV up to and including 3.3kV (E) - Test methods and requirements.
  - IS-13573 (Part-II):2011 – for working voltage from 3.3kV (UE) up to and including 33kV (E) – Test requirements.
  - IS-13573(Part-III):2011 – for working voltage from 3.3kV (UE) up to and including 33kV (E) – Test methods.
  - IS-13573:2011 – for LT Cable accessories, i.e., Joints & Terminations.
  - IEC: 60502-04/ 2005 VDE 0278 – Standard for cable accessories.
  - IEEE48 – for terminations of cable.
  - ESI-09-13 standards – for components used in the Kit
  - IS 1255-1983 – End termination accessories. The specification given in this document supersedes the relevant clauses of IS-13573:2011 (Part-I/II/III) wherever applicable.
- **GENERAL TECHNICAL REQUIREMENT:** Material used for construction of a joint/termination shall perfectly match with the Di-electric, chemical and physical characteristics of the associated cable. The material and design concepts shall incorporate a high degree of operating compatibility between the cable and joints. The Straight through joint kit or termination shall be complete with all accessories, jointing material, insulating stress control tube and sealing material, lugs, nuts, bolts etc. as well as an instruction booklet explaining the method of using the kit.

  In case of heat shrinkable type kit, the joint shall include a heat shrinkable dual wall tubing which shall be insulating from inside and semi conductive from outside. Detailed sectional views of the assemblies shall be submitted along with the offer. The straight through joints should be absolutely impervious to the entry of water. The manufacturer shall use the proven technologies and design to ensure a construction which will prevent entry of water or any other liquid inside the straight through joint and cable. The cable termination kit shall be suitable for terminating the cable on Indoor and outdoor installation as per requirement.

  The Straight - through joints shall be suitable for Buried / Over Head application. The heat shrinkable component shall be light in weight and shall be made of specially formulated cross linked polymeric material with excellent tracking & erosion resistance characteristic. Environmentally sealed system for splicing dielectric shielded power cables. The design of joint and termination shall be such that on completion of work, the cable can be charged immediately. The joint/termination shall have range taking feature. The Connector/ferrule used shall be range taking; Moisture entry into conductor shall be protected by providing special mastic. The termination kit offered shall provide for total environmental sealing of the cable crutch and at the lug end. The details of the same shall be submitted along with the offer.

  The heat shrinkable straight through joints shall have following function abilities.

  a. For encapsulation, environmental sealing set of heat shrink outer insulating tubes with hot melt adhesive coating are required to be provided.

  b. To reduce stress over conductor, heat shrinkable stress control tube to be provided. The stress control tube has to be in electrical contact with the outer insulation screen of the cable. Impedance of the tube shall be constant up to an operating temperature and shall be within the range 1x108 ohm-cm to 8x108 ohm-cm and with Relative permittivity shall be minimum 15.Voidsfilling and stress relief over crimped connector and cut point of the insulation screen to be provided with void filling and moisture sealing high permittivity yellow mastic and lubricant. The nested ends of the heat shrinkable tubing shall be provided with environmental sealing red mastic. Continuity of copper metallic screen of cable to be provided by Tinned copper mesh with 50% overlap. Mechanical protection of joint to be provided by roll able Metallic Strip Canister of suitable size and length for 3 core and by tinned copper mesh for 1 core cable.

  c. For joining of main conductor cores suitable size of ferrules/mechanical connectors with range taking feature should be provided. The cross-sectional area (CSA) of the ferrule/mechanical connector shall not be less than CSA of the conductor of the cable. Length of the ferrule/connector shall be sufficient to allow adequate number of crimps/shear head type bolts, to limit temperature rise at the joint. For providing insulation over the conductor area maximum three layers of heat shrinkable insulating tube are to be provided. The thickness of the heat shrinkable tube after installation should not be less than 1.2 times the

insulation thickness of the cable. For outer semiconductor screening of the joint suitable heat shrinkable dual wall tubes which are co-extruded are to be provided.

d. Earth Continuity between armour to be provided by tinned copper braid of adequate cross section. This is required for proper ear thing of the joint. Also, to support amour wire support ring is to be provided. The material of support ring to be steel (G.I.)for 3 core Cable and Aluminum for 1 core cable- Worm drive clip(jubilee/hose clips) for tightly securing the ear thing braid is required to be provided in suitable size & quantity.
e. For cleaning of cores, removing burrs on ferrules & rough insulation. Sufficient quantity of cleaning solvent &aluminum oxide cloth is required to be provided.
f. The cable termination (Indoor-outdoor) shall be of class-I type which consist of following points:
    - Stress control layer
    - Resistance against UV light environmental protection.
    - Moisture seal-for environmental sealing against ingress of moisture & aggressive gases for crutch portion sealing of cables trifurcating Heat shrinkable breakout is required.
g. To protect the cable breakout mono plast tape/non-adhesive PVC tape is required to be applied overearthingarrangement (worm drive clip installed over copper braid and Armour for suitable length of the termination part.
h. For proper sealing of Lugs at end of the termination suitable size & length of Heat Shrinkable tube is to be provided. No tape is to be provided for sealing purpose. For earthing tinned copper braid of adequate cross section is to be provided.Also, to support armour wire GI support ring is to be provided. Worm drive clip (jubilee clips) for tightly securing the earthing braid is required to be provided in suitable size & quantity.
i. Suitable size of heat stress control tubes is to be provided to reduce stress at cut back of screed Void filling yellow mastic isto be provided at semi-conducting screen. Heat shrinkable anti tracking tubes are to be provided to cover bare XLPE insulation and to provide UV resistance &environmental sealing.
j. For cleaning of cores, removing burrs on ferrules & rough insulation, sufficient quantity of cleaning solvent &aluminium oxide cloth is required to be provided. Adhesive tapes to be provided in sufficient length for marking on cables.
k. Sufficient quantities of heat shrinkable rain sheds are to be provided to increase the creep age distance and to prevent water collection over termination end portion. Heat Shrinkable Indoor Type End Termination: Terminations should be designed to withstand high humidity and surface contamination under electrical stress caused due to condensation and dust in indoor conditions.

Heat Shrinkable Outdoor Type End Termination should be designed to withstand exposure to extreme climatic variations &surface contamination, UV rays from sunlight and electrical stress caused due to heavy pollution & dust in external conditions.

Heat Shrinkable Cable Termination Kits are required for the Cables as per BOQ:

- **MARKING AND LABELING:** As per the IS 13573 (Part-I&II):2011 all kits shall be marked and labeled suitably for identification.
    a. Manufacturer's name or logo and the name of components wherever feasible;
    b. Type of jointing materials, the application;
    c. Batch number(s), where relevant;
    d. Product reference;
    e. Defined storage conditions and expiry date, if any;
    f. If relevant, the manufacturing date;
    g. Health and safety marking and handling instructions, where relevant; and
    h. Reference to compliance with this standard
- **TESTS:** The Jointing Kit offered, shall be fully type tested at NABL Lab as per the relevant standards. The applicable standards are indicated in Clause No.3. The bidder shall furnish the type test reports along with the offer. Offer without Type test reports will not be considered. For any change in the design/type, already type tested and the design/type offered against this specification the WBSEDCL reserved the right to demand repetition of type tests without any extra cost in presence of WBSEDCL's representative. Contractor shall submit type test reports for

Terminating/jointing accessories as per IS 17573:1992/ IEC 60840:1999/ IEC62067.

- **TYPE TEST SEQUENCE:** The type test shall be carried out as per the test sequence given in IS 13573/2011(Part – I, II& III).

  Acceptance & Routine Tests:

  All acceptance and routine tests as stipulated in the relevant standards shall be carried out by the supplier in presence of WBSEDCL's representative.

  The WBSEDCL reserves the right to insist for witnessing the acceptance/routine testing of the bought-out items
- **PRE DESPATCH INSPECTION:** All acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon the manufacturer and purchase at the time purchase. Manufacturer shall offer to the inspector representing the WBSEDCL, all the reasonable facilities, free of charge, for inspection and testing to satisfy him that the material is being supplied in accordance with this specification. The Client's representative/Engineer attending the above test will be carried out testing for suitable number of cable joints/terminations as per sampling procedure laid down in IS:13573(Part-I,II,III):2011(amended up to date) and issue test certificate approval to the manufacturer and give clearance for dispatch. The cable jointing/termination kit shall be sealed after the inspection.
- **INSPECTION AFTER RECEIPT AT STORES:** For Random sample testing (RST) the sample Cable Termination/jointing kit will be drawn from any one of the stores.
- **DEMONSTRATION &TRANING:** The WBSEDCL reserves the right to ask for demonstration of the equipment offered at the WBSEDCL's place. The bidder shall arrange for demonstration of installation of jointing/termination kits free of cost for giving training to WBSEDCL's representative to get acquainted with the jointing method. The jointing/termination kit along with required length of the kits to be used for demonstration purpose shall be specified the cable will be provided by the WBSEDCL.
- **GUARANTEE:**The Kits shall be suitable for storage without deteriorating at a temperature up to 50degree Celsius under normal conditions of storage and shall have unlimited shelf storage life. The bidder shall guarantee the installed cable accessories for a minimum period of not less than 5 years from the date of installation. The stores/materials found defective within the above guarantee period, shall be replaced by the supplier free of cost within one month of receipt of intimation. If the defective stores/materials are not replaced as per the above guarantee clause, the Company shall recover an equivalent amount plus 15% supervision charges from any of the supplier's bills.
- **QUALITY CONTROL:** The WBSEDCL has a right to send team of experienced Engineers for assessing the capability of the firm for manufacturing and testing of Cable jointing kit as per this specification. The WBSEDCL representative should be given all assistances and cooperation for inspection and testing at the bidder's work.
- **QUALITY ASSURANCE PLAN:** The tendered shall invariably furnish QAP along with his offer, The QAP adopted by him in the process of manufacturing shall be consist of
  a. List of Plant and Machinery available at the manufacturer's premises.
  b. List of testing equipments available at the manufacturer's premises with their calibration schedule.
  c. Organizational chart.

- **PACKING:** The Cable jointing kits shall be suitably packed to avoid damage or disturbance during transit or handling. Each Cable jointing kits maybe suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the cartoon may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning if considered necessary. The cases may then be properly sealed against accidental opening in transit.

  The following information shall be furnished with the consignment:
  - Name of consignee
  - Details of consignment
  - Destination
  - Total Weight of consignment.
  - Sign showing upper / lower side of the crate
  - Sign showing fragility of the material.
  - Handling and unpacking instructions.
  - Bill of Materials indicating contents of each component and spare materials.

- Installation instructions including drawing or other information specific to the accessories.

- **SCHEDULES:**The bidder shall fill in the following schedules which are part and parcel of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection. The discrepancies if any between the specification and the catalogs and / or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard will not be entertained. The bidder shall furnish these particulars for each size/ rating.

GTP FOR HT CABLE ACCESSORIES i.e., JOINTS &TERMINATIONS (Heat Shrinkable)

Sl. No.	Particulars	Requirement	Bidder Offer
1	Manufacturer' Name &Address		
2	Brand Name &Country of Origin		
3	Kit Storage Temperature	50 degree C max	
4	Voltage Grade(KV)	12, 24 & 36	
5	Applicable Standards	Indicated in Cl.No.4 of Technical Spec.	
6	Material to be used	cross link Polymeric	
7	Type Of Kit Offered	1)Straight throughJoint. 2)Indoor End Termination 3)Outdoor End Termination	
8	Shelf life of components in the kit	Unlimited	
9	Time Required for energisation after completion of termination/joint	Immediate.	
10	Conductor resistance test (As per cable crosssection area)	Conductor resistance shall not vary more than 10% of initial value	
11	A.C. withstand voltage ph/ground) @ 4.5 Uo	4.5 Uo for 5 min #	
12	Heat Cycle in air 8 hours total with > 2hourssteady heating and >3hours cooling	30 Cycles at 2.5Uo #	
13	Heat Cycle in water 8hours total with >2 hours steady heating and >3hours cooling	30 Cycles at 2.5Uo #	
14	Partial discharge test @1.73 Uo 10 pC max at max temp as well as room temperature	Max 10 pC#	
15	Humidity test (Only for Indoor termination)	300hours @ 1.25Uo #	
16	Salt fog test (Only forOutdoor termination)	1000hours @ 1.25Uo #	
17	Dielectric Strength for 1) Insulating Tube. 2) Anti tracking TubeDual wall tube	1)18(min) 2)18(min) 3)18(min)	
18	Dielectric constant for 1) stress control tube 2) insulating tube 3) anti tracking Tube 4) dual wall Tube stress control mastic	1)15(min) 2)3.5(min) 3)3.5(min) 4) 3.5(min) 5)9.0(min)	
19	Tensile strength for 1)stress control tube 2)insulating tube 3)anti tracking tube 4)dual wall tube 5) stress control mastic	8N/mm2(common for each)	

20	Ultimate Elongation for 1)stress control tube 2)insulating tube 3)anti tracking tube 4)dual wall tube 5) stress control mastic	1)50% 2)100% 3)100% 4)200% 5)500%	
21	Water Absorption for 1)Stress Control Tube 2)Insulating Tube 3)Anti Tracking Tube 4)Dual wall Tube 5) Stress control mastic	1)0.3% 2) 0.3% 3) 0.3% 4) 0.3% 5)0.5%	
22	Longitudinal Change for 1) stress control tube/ 2) insulating tube 3) anti tracking tube dual wall tube	1)5% 2) 5% 3) 5% 4) 5%	
23	Heat Shock for 1) stress control Tube 2) insulating tube 3) anti tracking tube dual wall tube	1)30min@2000c, 2)30min@2000c, 3)30min@2000c, 4)30min@2000c	
24	Flammability for insulating tube/anti tracking tube/dual wall tube	Pass	
25	Tracking Resistance for anti tracking tube	Non tracking	
26	Dissipation factor for stress control mastic	0.15(max)	
27	Service Temperature for stress control mastic	90^0C	
28	Heat Shrink Outer insulating tubes		
29	Canister		
30	Red mastic		
31	G.I. Solid Colet		
32	Copper Braid		
33	Co-extruded Heat shrinkDual wall tube		
34	Heat shrink insulating tube		
35	Heat shrink stress control tube		
36	Stress Grading mastic		
37	Ferrule/Connector		
38	PVC NA Tape		
39	PVC Adhesive Tape		
40	Cleaning Liquid		
41	Aluminum Oxide cloth		
42	Heat shrink break Boot(Termination)		
43	Heat stress control tube		
44	Heat shrink Anti tracking tube		
45	Rain sheds (Termination)		
46	List Of Contents OfKit(To Be Furnished Separately)		

These values are indicated in IS-13575 part –I at clause no.6.1,7.2.
IS-13573 part-II at clause no.4.4.2,4.5.2&5.1,
IS-13573 part-III at clause no.4.1(in accordance with IS -10810), 7.1,9&13

- **Activity Involved for Environment and Social Management Plan (ESMP):** Job mentioned hereunder include supply of all materials required for excavation, foundation, labour, loading, unloading, transport, dismantling of existing materials, storage of material & handling at site and necessary hire charges of machineries& all other incidental charges.
  - Environmental Management Plan
  - Traffic Management and Safety Measures
    a. Supply, fabrication, installation and maintenance of Type-IV barricades of size 2.5m long x 2.0m height on both sides of the cable trench alignment of total operational area conforming to IRC-SP:55-2014, and shifting of barricades from one place to another with all incidental charges, leads, lifts as specified by Engineer-in-charge
    b. Provision of LED strip lighting to MS barricades towards roadside as a safety measure during night hours.
    c. Supply, installation and maintenance of cautionary/warning signage, including diversion boards as per IRC specifications (SP:55, 2014) on both upstream and downstream sides of operational area; 4- nos. for each 500 meter of operational area by segment for total length of underground cable trench length
    d. Providing agile traffic wardens/flagmen in operational areas wearing orange vest and helmet and carrying a red flag (600 x 600 mm) securely fastened to a staff 1 m in length for guiding/managing the traffic at for each operation al area.
  - Provisions for Workers
    a. Adequate supply of drinking and other water at site.
    b. Mobile drinking water counter/Kiosk with necessary arrangement for supplying eater, cleaning, maintenance and shifting of counter from one operational area to another.
    c. Mobile bio toilets separately for men and women with necessary arrangement for supplying water, cleaning, maintenance and shifting of toilets from one operational area to another.
    d. Periodic health checkup of all construction labour(once in three months) and providing medical facilities.
  - Other Environment, Health and Safety Measures (As per site requirement)
    a. Information dissemination about type and schedule of civil works, planned diversions and/or partial closures, utility shifting/damage/emergency repairs, complaint handling and all such issues that affect public/road users/residents close to work zones Dissemination modes to include display of banners/notices, advertisements through local electronic and print media, distribution of handbills, organization of public meetings and other appropriate means at least once in 15 days for the entire project duration.
    b. Provision of Project Information Board in sheet steel and all supports, including fixing and maintenance during the entire project. Minimum board size should be 3 meters x 2 meters, with necessary information in English and Bangla written in white paint with blue back ground. The complete design and the information shall be approved by WBSEDCL.
    c. Deploying an on-site crew group for restoring damaged utilities comprising 3 skilled workers with 3 assistants (Carpenter, Mason and Metal sheet/fabricator for 9 months) and providing one multi utility pick-up van with 6 seats and provision for keeping tools and equipments including driver, fuel and routine vehicle maintenance. Mobile pick-up van also shall have one operational mobile number.
    d. Temporary provision of access/cross over for properties adjacent to work zones using portable planks (with length 2 to 4 mts. or as required in line with site conditions, at least 1.2 mts. width and handrail on both sides supported with vertical post at 0.5 mt. spacing)
    e. Provision for minimizing air pollution by sprinkling water on the excavated earth left around trench during excavation till filling of the trenches and making them good for regular usage/operation. Water will be sprinkled twice a day.
    f. Identifying and verification of trees along the route of the cable trench, marking, preparing the list as per the norms and obtaining clearance for cutting of trees (only in case unavoidable), paying compensation and cutting & re-planting of trees as per the norms (plantation of 5 nos. of trees against cutting of one tree or as recommended by the local authorities), removal of fallen tree to identified site as per direction of EIC & the concerned authority. This includes Plantation by use of a tall sapling (at least 5 feet), its protection, watering and maturing and maintenance. At least 80 percent should survive at the end of contract period.
    g. Disposal of extra earth/debris/similar unserviceable waste material by mechanical means, including loading, transporting, unloading to pre-approved dumping ground in line with ESMP stipulations and as approved by Engineer-In-Charge.
    h. Demolishing of unserviceable line materials by mechanical means, including crushing at approved dumping ground in line with ESMP stipulations and as per direction of Engineer- In-Charge.

i. Environmental monitoring during entire construction period (18 months) in line with parameters and frequency specified in the ESMP
j. Provision for first aid and emergency response arrangements in the camp, plants and worksites (including fire and electrical safety provisions)

COMPLETION REPORT FOR NEW FEEDER

1	Name of Division	
2	Name of Sub-station	
3	Name of Feeder	
4	Location Details	
5	Length & Size of new 11 kV Feeder Installed	Cable:
6	IR Value measured with 5000/2500 V Insulation Tester	
7	a) Line to Line	
	b) Line to Earth	
8	Continuity Checking for each Phase	
9	Pole Earthing Checking at every 10th Pole	
10	Brief description of Work:	

Tested by:	**Counter signed by:**
Signature & Contractor's Agent:	Signature of WBSEDCL Representative:
Name of Contractor:	Name and Designation:
Seal	Seal

TESTING & COMMISSIONING REPORT

(11 kV Switchgear Panel)

1	Name of Sub-station	
2	Location Details	
3	Date of Commissioning	
4	Make	
5	Makers Sl. No.	
6	Type	
7	Rated Voltage	
8	Rated Current	
9	Year of Manufacturing	
10	Meter No	
11	O/C & E/F Relay	
12	Master Trip Relay	
13	Insulation Resistance of CB :	
	a) R-Earth	
	b) Y-earth	
	c) B-Earth	
	d) Rph-Yph	
	e) Yph-Bph	
	f) Rph-Bph	
14	Insulation Resistance of CT :	Between Pr. - Earth
	a) R-Phase	
	b) Y-Phase	
	c) B-Phase	
		Between Sec - Earth
	a) R-Phase	
	b) Y-Phase	
	c) B-Phase	
15	Insulation Resistance of PT :	
	Rph-Earth	
	Yph-Earth	
	Bph-Earth	

Tested by: Signature & Contractor's Agent: Name of Contractor: Seal	**Counter signed by:** Signature of WBSEDCL Representative: Name and Designation: Seal

D. Testing & Commissioning

- **Type Test, Routine and Acceptance Tests:** All equipment with their terminal connectors, control cabinets, main protective relays, etc. as well as insulators, insulator strings with hardware, clamps and connectors, marshalling boxes, etc., shall conform to type tests and shall be subjected to routine and acceptance tests in accordance with the requirements stipulated under respective equipment sections. Contractor shall submit all type test reports/certificates according to the relevant standards and/or specifications for all the equipments/material for Owner's review as a proof of their conformity to type tests along with a certificate regarding conformity of equipments to be supplied with the type test. The test certificates submitted shall be of the tests conducted within 5 years prior to the date of bid opening. In case the test reports are of the tests conducted earlier than 5 years prior to the date of bid opening, or they do not meet the requirements of the specifications/relevant standards, or they are not available, the Contractor shall conduct these type test(s) under this contract at no extra cost to the Owner. The Owner will have the right of getting any test of reasonable nature carried out on any component or completely assembled equipment at Contractor's premises or at site or in any other place in addition to the aforesaid type and routine tests, to satisfy that the materials/equipment comply with the specifications. Failure of any equipment to meet the specified requirements of tests carried out at works or at site shall be sufficient cause for rejection of that equipment lot. Rejection of any equipment lot will not be held as a valid reason for delay in the completion of the works as per schedule. Contractor shall be responsible for removing all deficiencies, and supplying the equipment that meet the requirement.

  Test results / Test reports of various tests performed under this contract shall be furnished by the agency in two copies signed jointly by agency and representative of Controlling Officer along with a soft copy in excel file in the office of Employer.
- **General Checks:**
  a. Check for physical damages.
  b. Visual examination of zinc coating/ painting.
  c. Check from name plate that all items are as per order/ specification.
  d. Check tightness of all bolts, clamp and connecting terminals using toque wrenches.
  e. For oil filled equipment check for oil leakage, if any. Also check oil level and top up.
  f. Check ground connections for quality of weld and application of zinc rich paint over weld joint of galvanized surfaces.
  g. Check cleanliness of insulator and bushings.
  h. All checks and tests specified by the manufacturers in their drawings and manuals as well as tests specified in the relevant code of erection.
  i. Visual examination of labelling, danger board, anti-climbing device, muffing, painting, tension on stay wires, straightening of poles, alignment of line/supports etc Equipment test records, commissioning test records and drawings: Factory test certificates of equipment, test certificates at the time of pre-dispatch inspections, pre-dispatch inspection reports, pre-commissioning check results and post commissioning check results shall be compiled and provided in three sets to Controlling Officer for his approval and records.

  A copy of such test record shall be offered to electrical inspector and other inspecting officials during his/her visit to work site for inspection.
- **Circuit Breakers:**

a. Insulation resistance of each pole.
b. Check adjustment, if any, suggested by manufacturer.
c. Breaker closing and tripping time.
d. Slow and power closing operation and opening.
e. Trip free and anti-pumping operation.
f. Minimum pick up volts of coils
g. Contact resistance.
h. Interlock with other breakers/circuits,
i. Functional checking of all accessories.
j. Functional checking of control circuits, interlocks, tripping through protective relays and auto-recloseoperation.
k. Insulation resistance of control circuits, motor etc.
l. Resistance of closing and tripping coils

- **Current Transformers:**
  a. Insulation Resistance Test
  b. Polarity test.
  c. Ratio identification test-checking of all ratios on all cores by primary injection of current.
  d. Dielectric test of oil (Wherever applicable)
  e. Magnetizing characteristics test
- **Voltage Transformers:**
  a. Insulation resistance test
  b. Polarity test.
  c. Ratio test
  d. Dielectric test of oil (if applicable)
- **Surge Arrester:**
  a. Grading leakage current
  b. Resistance of ground connection
- **Phasing Out:** The phasing out of all supplies in the Sub-station system shall be carried out.
- **Station Earthing:**
  a. Check soil Resistivity
  b. Check continuity of grid wires
  c. Check earth resistance of the entire grid as well as various sections of the same.
  d. Check for weld joint and application of zinc rich paint on galvanized surface.
  e. Dip test on earth conductor prior to use.

3. **Submission of Tender:** Please refer to sl. no 6 of Instruction to Bidders

4. **Performance Bond/Security Deposit:**

The security deposits in two parts of 5% each upon ordered value should be furnished within a period of 30 days from the date of issue of the order to the paying Officer. Thereafter one part will remain vlid upto 06 (six) months from the date of completion of works and other parts will remain valid up to a period of 61 (sixty one) months from the date of completion of work. The security deposit may be in the form of bank guarantee issued by any scheduled bank of India duly approved by RBI in this regards, in which event it would be open to WBSEDCL or its designedated Officers to prefer the claim for invocation/ encashment of the concerned bank guarantee within six months from the expiry of the period of such Guarantee. Accordingly, there should be a claim period of six months in each of the Bank Guarntee from the date of expiry of the validity. The BGs are to be extended/ revalidated by the bidder to maintain the above time schedule for delay in completion of the work due to any reason whatsoever. No claim shall be made against WBSEDCL i.r.o interest on security deposit.

In addition to the Security Deposit as mentioned above:

a) Additional Performance Security equal to 10% of the ordered value for bid of the items having variation of -20% to -50% of the estimated rate should be furnished in the prescribed format, within a period of 30 days from the date of issuance of the Purchase Order,

b) Additional Performance Security equal to 20% of the ordered value for bid of the items having variation over -50% to -80% of the estimated rate should be furnished in the prescribed format, within a period of 30 days from the date of issuance of the Purchase Order,

Security Deposit a) & b) above shall remain valid upto the time of completion of supply of materials.

5. Refund of Security Deposit:

Refund of Security deposit shall be subject to Company's right to deduct/appropriate its dues against the contractor under this contract or any other contract. The Security Deposit for all type of bids shall be released only after satisfactory expiry of the guarantee period/defect liability period and certified as such by the Controlling Officer of the work upon written request by the contractor under following conditions:

a. In case of all erection works the defect liability period shall be considered **One Year** or **expiry of one full monsoon** period, i.e. from June to September **whichever is later** and any defects such as leakages in walls, dampness, defects in drainage etc. should be rectified to the satisfaction of the Engineer-in-Charge.

All types of Manufacturer's guarantee/warranty wherever applicable are to be issued/revalidated in the name of the owner by the contractual agency.

6. Refund of Earnest Money:

For unsuccessful bidders, EMD amount submitted against the tender shall be refunded automatically, through an automated process, by NIC portal on receipt of updated status of any bid.

For successful bid(s), EMD will be refunded from WBSEDCL authority after completion of tendering process and following due procedures.

The bank account used for payment of EMD by the bidders shall be maintained operative until the completion of tendering process. All refunds will be made mandatorily to the Bank A/c from which the payment of EMD has been initiated.

For any queries related to payments and refunds, bidders will have to communicate with ICICI Customer Support, viz. 33-40267512/ l3 since payment gateway facility used by E-tender portal is maintained by ICICI.

Successful bidder(s) shall have to mandatorily create vendor id through WBSEDCL Web Portal Vendor Corner if not created earlier.

Forfeiture of Earnest money/Bid Guarantee:

Earnest money/Bid guarantee shall be forfeited in case of following:

If during the period of validity, the bidder withdraws/modifies its bid as a whole or in part.

If the bidder deviates from any clarification/confirmation given by him subsequent to submission of his bid.

In case of successful bidder, if the Bidder fails:

To accept LOI/Order unconditionally and sign contract

To furnish the contract performance bond / Additional Performance Security in the form of Bank Guarantee wherever applicable.

7. Defect Liability Period:

a) The defect liability period for **against supply of materials,** shall be considered as 60 (sixty) months from the date of taking over the site by WBSEDCL and any defects should be rectified to the satisfaction of the Engineer-in-Charge. All types of Manufacturer's guarantee/warranty wherever applicable are to be issued/revalidated in the name of the owner by the contractual agency.

The defect liability period for **erection works,** shall be considered **One Year** or **expiry of one full monsoon** period, (i.e. from June to September **whichever is later) from the date of taking over the site by WBSEDCL.**

b) In case of supply of materials, it is mandatory to submit GTP, Drawings, type test, Make & Model, technical specifications from reputed manufacturer as per requirement of NIT and to be approved from the competent department of WBSEDCL. New materials & equipment to be supplied by you shall not enter WBSEDCL store. But dismantled materials pertaining to replacement, renovation etc., if any, must be returned to WBSEDCL Divisional store on compliance of standing formalities.

8. Manner of Execution:

The successful bidder has to submit acceptance of the LOI/order within 10(ten) days from the date of issue of the Letter of Intent/order. The successful bidder shall be required to execute an Agreement on a non-judicial tamp paper of Rs100/- with the company with all related documents for satisfactory execution of the work. The agreement shall be signed on a date and time to

be mutually agreed upon in the office of the controlling officer of the work and the same has to be signed by both the parties within 30 days from date of acceptance of the order. Power of attorney of the authorized representative of the contractor who will sign the contract agreement on behalf of the contractor is to be submitted before signing of the agreement. The agreement shall be signed in original and five photo copies.

The original agreement shall be retained by the Company and a copy will be handed over to the Contractor

9. General Requirement:

The contractor shall execute, complete and maintain the work as per direction of the Controlling Officer/Engineer-in-Charge of the work or his representative.

10. Contractor to submit programme:

Within 14 (fourteen) days from the date of issue of letter of intent/order, the contractor shall submit a programme showing the order, procedure and method in which he proposes to carry the work.

11. Contractor's staff at site:

The Contractor shall provide at site his authorized representative duly approved by the controlling officer (approval may be withdrawn for a person, if necessary). The contractor and/ or his authorized representative is to be constantly on the work and shall give whole time supervision of the same. Such authorized agent or representative shall receive (on behalf of the contractor) direction and instructions from the Controlling Officer/ Engineer-in-charge or his representative.

12. Removal of persons employed at site:

The Controlling Officer/ Engineer-in- Charge shall be at liberty to ask the contractor to remove from the site any person, employed by the contractor in the execution of work, who in the opinion of the Controlling Officer/ Engineer-in-Charge misconducts himself or is incompetent or negligent in the proper performance of his duties and such persons shall not be again employed upon the work without the permission of the Controlling Officer/Engineer-in-Charge.

13. Setting out:

The contractor shall be responsible for the true and proper setting out of the work and for the correctness of the position, levels, dimensions and alignments of all parts of the work. If any time during the progress of the work any error shall appear or arise in the positions, levels, dimensions or alignments of any part of the work, the contractor on being asked to rectify by the Controlling Officer/ Engineer-in-Charge or his representative shall at his own expense rectify such error to the satisfaction of the Controlling Officer/ Engineer-in-charge.

14. Protection of work:

The Contractor shall in connection with the work provide and maintain at his own cost all lights, guards, fencing and watching when and where necessary if required by the company or by any competent authority for the protection of the work or for the safety and convenience of the public or others.

15. Care of works:

From the commencement to the completion of the works, the contractor shall take full responsibility for the care of permanent works, therefore and of all temporary works and in case of any, loss, or injury to works or to any part thereof or any temporary works due to any cause whatsoever shall at his own cost repair and make good the same, so that at completion the works shall be in good order and condition and in conformity in every respect with the requirements of the contract. The contractor shall take every practicable precaution not to damage or to cause injury to any adjoining or other properties or to any persons. However even if any damage or injury occurs, the contractor shall be responsible in meeting the necessary claims and demands as may be required.

16. Workmen's Compensation for accident or injury to any workman:

The Company shall not be liable for damages or compensation payable as per provision of law in respect or consequence of any accident or injury to any workmen or other person in the employment of the contractor. The contractor shall have to pay all claims, demands, last costs, charges and expenses whatsoever in respect thereof or in relation thereto. Insurance policy covering provisions for workmen's compensation for all the workmen to be engaged by the contractor is to be made by him.

17. Facilities for other Contractors:

The Contractor shall afford all reasonable facilities for any other contractor employed by the company in execution on or near the

site of any work not included in the contract.

18. Clearing site on completion:

On Completion of the work the Contractor shall clear away and remove from the site all constructional plant, surplus materials, rubbish and temporary work of every kind and leave the whole of the site and work clean and in good and tidy condition to the satisfaction of the Controlling Officer/ Engineer-in-charge.

19. Change Of Quantity:

The quantity mentioned in the schedule of work is provisional. The company reserves the right to vary the quantities as may be necessary but such variation shall be limited to+25%(plus twenty five percent) of the contract price. Payment shall be made as per execution

20. Goods & Services Tax (GST):

Goods and Services Tax shall be paid extra as per prevailing statute.

21. Labour License:

Contractor will have to obtain Labour License in respect of the above work as per Contract Labour (Regulation & Abolition) Act, 1970 as early as possible.

22. Compliance Of Labour Laws:

The contractor shall be complying all statutory labour laws to protect the laborers engaged by them.In this connection the contractor will be required to execute an indemnity bond (as per specimen enclosed as Annexure-B) after placement of letter of intent/order.

23. Night And Holiday Work:

If any work of permanent nature is to be carried out in three shifts and/or in Sundays & Holidays, prior written permission of the Controlling Officer shall have to be obtained.

24. Deductions of Provident Fund and remittance thereof in respect of contract labourer:

In respect of casual workers or workers engaged for any job for a very short duration or sporadic nature having no employer-employee relationship (for example Soil testing, repair of transformer etc. done by outer agency) and engaged in works which are neither preparatory, nor incidental, nor any way connected with the main operation of the establishment, deduction of provident fund and remittance thereof in respect of the contract labours will not be applicable. However, it is further clarified that no mechanical approach should be adopted in deciding the applicability of the Act and each case should be considered on its own merits.

25. Variation, Omission, Addition &alteration:

The Contractor shall not modify the work except under direction in writing by the Company. The quantities provided in the Schedule of work are provisional only, which may vary up to any extent or may be deleted altogether. The quoted rate of each item shall remain firm till completion of contract. The Company reserves the right to alter, amend, and omit or other vary the quantities as may be necessary but such variation will be limited to + 25% (plus twenty five percent) of the contract price.Payment shall be made as per actual execution.

26. Paying Authority: **The Manager (F&A), Malda Region, WBSEDCL** shall be the paying authority.

27. Supplementary Works:

Whenever supplementary work becomes unavoidable for completion of the work in all respect, the Contractor shall bring the matter to the notice of the Controlling Officer and submit their proposal. However, the controlling officers shall have the right to advise the contractor to proceed with such item (s) of work. Rates for supplementary item shall be arrived at as given hereunder:

The rates of all supplementary items shall be decided on pro-rata basis from the existing items in the contract.

When above clause no 19 shall not be applicable the rates shall be taken from P.W.D (WB) schedule of rates for building works, sanitary & plumbing works &PWD (WB)(Roads) scheduleprevailing at the time of submission of bids plus/minus the contractual rate of quotation.

When clause no 19 above shall not be applicable, the rates should be analyzed, to the mutual acceptance from present market

rates of different elements involved in the item, against documentary evidence, with contractor's profit as 10% and 1% cess towards BOCWWC Act,1996. In that case contractual rate of quotation will not be applicable.

Controlling Officer's decision regarding finalization of rate of non-scheduled item(s) shall be final and binding upon the contractors.

28. Measurement and Terms of Payment:

All items of work carried out by the contractor in accordance with the provision of the contract having a financial value shall be entered in the measurement book/ log book etc. as prescribed by the company so that a complete record is obtained of all works performed under the contract and the value of work can be ascertained and determined there from.

Measurement shall be taken jointly by the supervisory officer or his authorized representative and by the contractor or his authorized representative. Every measurement thus taken shall be signed and dated by both theparties.

In the event of failure on the part of the contractor to attend or send his authorized representative after receiving the information to countersign or record objection within a week from the date of measurement, the measurement taken by the Engineer-in-charge/controlling officer or his authorized representative shall be taken to be correct measurement of the work done.

Progressive R/A bills for erection work shall be processed against the prayer of the contactor, for an amount of minimum 20% (twenty percent) of the erection part or as deemed justified by the Controlling Officer shall be released against certification by the Controlling Officer after deducting the amount already paid or other amounts as may be applicable as per contract & statutory rules. The bill shall be released within 45 (forty five) days of its submission if all formalities as per terms of contract is maintained. The final bill shall be released on completion of the work in all respect and fulfilment of all contractual obligations by the contractor.

If it is obligatory under the provision of Income Tax Act 1961 and Goods & Service Tax (GST) Act and subsequent amendments to deduct tax at source then the same will be deducted from the bills as applicable. The Contractor is required to follow the Building and other Construction Worker's Welfare Act, 1996. Registration of his establishment under section-7 of the Building and other Construction Worker's (Regulation and condition of Service) Act, 1996 is to be made after the contract is awarded. 1% cess towards BOCWW Act, 1996 will be deducted from its total amount of each bill. For these deductions certificate will be issued as per rules.

In respect of supply of plant and equipment (including mandtory spare parts), the payments shall be made in the following manner. Seventy percent (70%) of the Ex-works of materials delivered at contractors' storage location (declared with the bid), within sixty (60) days after receipt of invoice and on submission of following documents:

i) 6 copies of supplier invoice showing contract no. goods description, quantity, unit price and total amount.

ii) 6 copies of detailed packing list identify contents of each package.

iii) Insurance Policy/ certificate.

iv) Manufacturer's/ supplier's warranty certificate.

v) Factory inspection report issued by the employer in the form of Dispatch Authorization.

vi) Proof of GST payment and e-way bill along with invoice.

vii) Certificate from the site officer on the specified format indicating that the material is required sequential to related erection and civil activities.

Balance payment will be made on submission of bills with relevant documents after completion of the project.

The company reserves the right to recover/ enforce recovery of any overpayments detected after payment as a result of post-payment audit or technical examination or by any other means, notwithstanding the fact that the amount of disputed item, if any, of the contractor exceeds the amount of such overpayments and irrespective of the fact whether such disputed claims of the contractor are subject matter of arbitration or not. The amount ofsuch over payment may be recovered from subsequent bill, under the contract, failing that from contractor's claim under any other contract with the company or from contractor's securitydeposit or from the amount retained or the contractor shall pay the pay the overpayment on demand. All payments shall be made against submission of GST prescribed invoice incorporating GSTIN number, SAC Code and other necessary particulars.

29. Completion Of Contract:

All works under the contract must be completed by period of completion mentioned in NIT while portions of work as per

programme settled in consultation with the controlling officer shall be completed by the date stipulated in the programme. It is to be noted that time is the essence of the contract and any default on the part of the contractor to complete the work within the stipulated date/dates aforesaid or within the time as may be extended in writingbythe controlling officer subject to the payment of liquidated damages, the company shall have the right, without prejudice to any other clauses, to terminate the contract forthwith and to take possession of balance work/ materials and have the same allotted to any other agency and the contractor shall be liable to compensate the loss that may be occasioned to the Company on that account. Any letter in writing by The Controlling Officer shall be treated as conclusive on behalf of the Company.

30. Defective Material:

If in the opinion of the Engineer-in-Charge/Controlling Officer, any of the materials brought to the site for use are not of the quality or kind specified in the contract and/or are unfit for work, he shall be at liberty to order the removal of the said materials and the contractor shall remove the same within 24(twenty four)hours after notice has been given to him, and if he fails to remove themwithin the time the Engineer may cause them to be removed anywhere at the risk of the contractor and any cost incurred in so doing shall be deducted from the dues to the contractor under the contract.

31. Drawings:

The work shall be carried out in accordance with the instruction and to the satisfaction of the Engineer-in charge in accordance with the signed drawings, the specifications and schedule of quantities and also as per any further drawings which may be supplied, all instruction which may be given by the Engineer-in-charge/Controlling-Officer from time to time

32. Material And Workmanship: All the work shall be executed with the materials as specified and with best workmanship and/or in the best manner to the satisfaction of the Engineer-in-Charge/Controlling Officer.

33. Extension Of Time: If the work is suspended due to reasons beyond the control of the contractor, the contractor shall immediately give notice in writing within 7(seven) days to the controlling officer for each occasion. On receipt of such notice, the controlling officer may verify the matter and agree to extend the completion period as may be reasonable but without prejudice to other terms and conditions of the contract as the case may be if the reasons behind the suspension of work are found to be justified.

34. Liquidated Damages:

If the contractor fails to complete the work successfully within the time specified in the contractor any extension thereof ,the company shall recover from the contractor as liquidated damages a sum of half percent (0.5%) of the contract value of works for each calendar week of delay or part thereof of delay subjected to Force Majeure. The total recovery against liquidated damage shall not exceed ten percent(10%)of the contract value of the work.

An extension of time without imposition of liquidated damage, may be granted for delay in execution of work provided there is no fault whatsoever on the part of the contractor. Such extension may only be granted on the basis of application to be submitted by the contractor who has to establish that the extension of time required by him was not due to his fault.

35. Company's Right To Terminate The Contract:

If the contractor neglects or fail to proceed with the work proportionate to the scheduled time of completion or fails to complete the work within scheduled time of completion or within extended time approved by the company, the company shall have right to terminate the order, Letter of intent, after giving notice in writing to the contractor. If the contractor fails, after 14(fourteen) days of such notice, to proceed with the work in the manner notified, the company shall terminate the contract and call the contractor to take joint measurement along with the Engineer for finished portion of work. If the Contractor does not appear for a joint measurement ,ex-party measurement taken by the company will be taken as final.

In that case, the company shall take possession of the work site and may engage other agency to complete the work. Extra cost, if incurred to get the unfinished work done through other agency, will be realized from him, from his pending bills and security deposit. If the contract is terminated as above, the contractor shall have no claim for compensation against the company for any loss or deterioration of any materials that he may have collected or engaged or entered into on account of the work.

36. Quality Of Work/Material and Mode Of Measurement:

As regards to the specification of materials, execution of work and the mode of measurement relevant stipulation of P.W.D schedule of rates (applicable at site of work) in this respect shall be applicable. The Contractor shall arrange and provide all necessary facilities along with necessary manpower for inspection, testing and measurements at his own cost.

37. Departmental Materials:

Departmental materials shall not be issued to the contractor for the work except under special circumstances.

38. Deduction Of Taxes and Cess for Bocwwc Act, 1996:

If it is obligatory under the provision of Income tax Act 1961 to deduct tax at source then the same will be deducted from the bills as applicable. The contractor is required to follow the Building and other Construction Worker's welfare Act, 1996.Registration of his establishment under section-7 of the Building and other Construction Worker's (Regulation and condition of service) Act, 1996 is to be made after the contract is awarded. 1% cess towards BOCWWC Act, 1996, will be deducted from its total amount of each bill. For this deductions certificate will be issued as per rules.

39. Force Majeure:

The Contractor shall not be liable to pay any liquidated damage for delay/failure to perform the contract for reasons of force majeure such as acts of God, acts of the public enemy, acts of Governments, fire, flood, epidemics, quarantine restriction, strikes, freight embargos and provided that the contractor shall within 10(ten) days from the beginning of such delay notify the Company in writing of the cause of delay. The Company shall verify the facts and grant such extension as found to be justified without imposing liquidated damage. The department shall not be responsible or liable to pay any compensation for any interruption in your work at the site due to strike, lockout, riot, earthquake, flood, cyclone or civil commotion or any other force of accident due to any reason beyond control. The department shall not be held responsible to or liable to pay for any interruption in your work at the site arising out of resistance from the local public due to any resistance towards work.

40. Sub-Letting of Contract:

The contractor shall not, without the written consent of the Company, assign or sublet his contract or any part thereof, other than for raw materials, or for any part of the work provided that any such consent shall not relieve the contractor form any obligation, duty or responsibility under the contract. In the event of sub-letting of contract or any part thereof is permitted, the fact that such permission has been accorded shall not establish any contractual relationship between the approved Sub-vendor and WBSEDCL of any of his liabilities and obligations under the contract.

41. Engineer's Decision:

Controlling Officer's decision is final in respect of all matters which are left to the decision of the Controlling Officer including the granting or withholding of certificates. If, in the opinion of the contractor, a decision made by the Controlling Officer is not in accordance with the meaning and intent of the contract, the contractor may file with the Controlling Officer, within 7 (seven) days after receipt of the decision, a written objection to the decision. Failure to file an objection within the allotted time will be considered as an acceptance of the Controlling Officer's decision and the decision shall become final and binding.

42. Liability of Accidents and Damage:

The Contractor shall be responsible for the loss, damage or depreciation of the Company's materials while in their custody and until the same is taken over by the Company. Until the completed work is taken over by the Company the contractor shall also be liable for and shall indemnify the Company in respect of all injury to person or damage to properly resulting from the negligence of the contractor or his workmen or sub-contractor or from defective workmanship etc.

43. Language and Measurement:

All documents pertaining to the contract including specifications, schedule notices, correspondences, operating and maintenance instruction, drawings or any other writings be written shall in English language. The metric system measurement shall be used exclusively in this contract.

44. Settlement of Disputes:

All disputes concerning question of act arising under the contract shall be decided by the owner/company on receipt of written appeal by the contractor.

Any dispute or differences arising out of or in connection with this contract shall to the extent possible be settled amicably and where settlement cannot be reached then such disputes shall be subject to settlement under the jurisdiction of CalcuttaHighCourt,Circuit Bench at Jalpaiguri.

45. Completion of Work:

Completion of the work means completion of the work in totality and acceptance/takeover of the same by the Company. Partial or phase wise completion will have no bearing towards consideration of guarantee/defect liability period.

46. Controlling Officer:

The **Regional Manager, Malda Region** shall be the Controlling Officer for the work.

47. Supervising Officer:

The Divisional Manager/ Assistant Engineer (E) Malda Division or any other officer as assigned by the Controlling Officer for electrical works shall be the Supervising Officer respectively.

48. Nodal Officer:

The **Manager (HR &A), Malda Region** shall be the Nodal Officer for the coordination of work and verification of Satutory obligation of the work.

49. Idle Labour/Machinery:

Whatever the reasons may be no claim for idle labour and machinery, additional establishment cost, hire and labor charges of tools & plants would be entertained by the Company, under any circumstances.

50. Safety Rules:

The bidder shall also provide necessary fencing and lights to protect the public from accident. Fire extinguishers shall be kept by the bidder at the side of works where there is risk of fire hazard. Adequate washing facilities shall be provided near the place of work. When the work is done near any place where there is risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provisions shall be made for prompt first aid treatment of all injuries likely to be sustained during the course of work. These safety provisions shall be brought to the notice of all concerned by displaying on a notice board at a prominent place at the work spot. The persons responsible for compliance of code shall be named by the bidder. To ensure effective enforcement of the rules & regulations relating to safety precautions, the arrangement made by the bidder shall be open to inspection by the employer and WBSEDCL. Notwithstanding the above clauses there is nothing in those to exempt the bidder from the operations of any other Act or Rule in force in the Republic of India. All storage, handling & use of flammable liquids shall be under the supervision of qualified persons. First aid arrangements with the degree of hazard and with no. of workers employed shall be maintained in area accessible place throughout the whole of working hours.

51. Reporting Of Accident:

All accidents, major or minor, must be reported immediately to WBSEDCL and the contractor will provide first aid to the injured person immediately. The injured person shall report to the First Aid Station along with the 'Injured on work' form as per appropriate pro-forma duly filled in quintuplicate and submit to the Medical Officer of the First Aid Station.

i. Serious Injuries:

In case of serious injuries, the following procedure shall be adopted by the contractor to provide first aid at his own First Aid Station. To take the injured person to the hospital along with the injured on work form duly filled in to report the accident to WBSEDCL.

ii. Fatal Accident:

Fatal accidents must be reported immediately to WBSEDCL as well as to the Police.

iii. Penalty:

Failure to observe the Safety Rules will make the contractor liable to penalty by way of suspension of work and termination of contract. Adequate arrangement for proper lighting & guarding shall be made at the work site.

iv. Equipment & Machineries:

For timely completion of the work the bidder/contractor must have to deploy all necessary equipment, tools & tackles and machineries e.g. J.C.B, Hot-mix-plant, Boiler, transit mixer etc. to execute the work at a time to perform all works simultaneously as per requirement of WBSEDCL.

v. Risk Purchase:

In the event of failure of the contractor to execute the work timely and/or to the satisfaction of WEST BENGAL STATE ELECTRICITY DISTRIBUTIONCOMPANY LTD., the order/Letter of Award may be terminated prematurely and the balance work may be got done through any other agency at risk and cost of the contractor.

52. Additional Conditions of Contract:

52.1 The work shall be inspected time to time by WBSEDCL representatives. The contractor shall provide all facilities for such inspection free of cost. Notwithstanding any inspection of site, WBSEDCL shall have the right to reject any work not conforming to the specification without being liable for any explanation or compensation. The authorized representative of WBSEDCL shall have the free access to the work site, contractor site and store.

52.2 During the execution of work, if any problem arises which is not covered by the specification, the contractor shall seek necessary clarification and instruction from WBSEDCL, such instruction shall be binding on the contractor and shall be observed in full.

52.3 The contractor shall make his own arrangement for labour, construction equipment, tools and tackles and construction materials, construction water, office/ labour accommodation, water supply, sanitation etc.

52.4 Electricity for construction purpose, is supplied by WBSEDCL, the charge shall be borne by the contractor at the rate specified by the WBSEDCL. The contractor can't claim any compensation for any failure in such supply caused due to any reason whatsoever in case of non-availability of electricity for construction purpose from WBSEDCL. The contractor will have to arrange for the same at his own cost.

52.5 The contractor shall strictly follow the construction safety rules, regulations, and instructions issued from time to time in absence of any particular reference the contractor shall refer to relevant Indian standard and also the State Government rules and regulations.

52.6 The contractor shall take all precautions during execution, especially while excavating underground works, such as cables, pipe lines, drains etc. and provide all possible protection to these works and in case any materials got damaged,rebuilt them at his own cost.

52.7 All guarantee sand test certificates obtained by the contractor during the execution of work shall be transferred to the WBSEDCL before issue of final payment.

52.8 The contractor shall provide all necessary storage at the site in specified areas for all the materials such as timber, cement, lime and such other materials which are likely to deteriorate by the action of Sun, winds, rain or other natural cause due to exposure in the open in such manner that all such materials shall be duly protected from damage by weather or any other cause. All such stores shall be cleared after completion of the work and the entire site shall be clean and free from debris. All materials shall be stacked in such a manner asto facilitate rapid and easy checking of such materials.

52.9 The cost of testing materials shall be borne by the contractor.

53.0 All works are to be carried out with due regard to the convenience of the occupants of the premises or road users and with close coordination with other contractors who may be working in the area. All arrangements/ programs of work must be adjusted accordingly. All precautions must be taken to guard against chances of injury or accidents to other occupants, users and workers. The contractor must see that all damages to any property, which in the opinion of the controlling officer are due to work of the contractor, are promptly rectified as per direction and to his satisfaction. The construction work must be done in such a way as not to dislocate or disturb any sewerage system and other existing structures."

53.11 It must be clearly under stood that WBSEDCL is indemnified by the contractor against payment of any compensation or award on account of any accident, injuries and damages and if any such payment has to be made by WBSEDCL under order of appropriate authorities, the same shall be recovered from the contractor.

53.12 Any services if affected by the work must be restored by the contractor on emergency basis at his own cost.

53.13 After completion of the work, the finishes shall be of high quality and of an approved standard.

53.14 No omission or ambiguities in the drawing or in the specification will relieve the contractor from responsibility for material and completeness of the work.

53.15 The contractor shall not off-load the contract or part thereof to any subcontractor without obtaining written permission from the controlling officer of the work. In the event of sub-letting of contract or part there of. In the event sub-letting of contract is permitted, the fact that such permission has been accorded shall not establish any contractual relationship between approved sub-contractor and WBSEDCL of any of his liabilities and obligations under the contract.

53.16 A complete list of execution/ deviation from the bidder's scope of work shall be clearly indicated. Similarly, if any departure, commission of substitution from stipulated specification is made. This fact should be clearly indicated in the offer with reasons. However, WBSEDCL shall have the absolute discretion to summarily reject such offers.

53.17 WBSEDCL's representative may during progress of work, order for re-execution of part or whole of the work executed, found not in accordance with the approved drawings / specifications/ instructions. No extra claims shall be entertained for re-execution or altering or such work

53.18 The contractor shall provide sufficient strong and stable staging as to ensure safety of the labourer and structures.

53.19 The contractor shall dismantle and remove the staging and other temporary structures like stores, offices, labour camps etc. on completion of work, clear and clean the site where such temporary facilities were built and restore the same to original condition.

53.20 Materials brought to the site shall not be removed from the site without the written consent of the WBSEDCL. The contractor shall submit well in advance for approval of samples, specimens as the WBSEDCL may demand from time to time. Any materials brought to the site and rejected by the WBSEDCL shall be removed by the contractor from the site of work immediately.

53.21 All materials, including reinforcing steel, cement for concrete work, sanitary, plumbing, and carpentry fittings, shall be procured after approval of the brand and make by WBSEDCL

53.22 The contractor has to make arrangement for temporary cover to enable civil construction works to continue if interrupted due to rains during monsoon.

53.23 If necessary extra items beyond S.O.W are executed the unit rate shall be as per the rates of PWD, West Bengal on the date of bid opening. Those items which are not covered under PWD rates shall be based on analysis of rate as applicable, on mutual agreement.

53.24 A bar chart showing all activities needs to be submitted before commencement of work.

53.25 Depth of the tube well, if any shall be complied with Public Health Engineering Directorate recommendations.

53.26 All drawings supplied with the bid documents are tentative/ for guidance only.

53.27 WBSEDCL shall not be liable under any circumstances for any accident/ untoward incidents, if happened during execution of works.

53.28 The contractor shall submit test certificate from the appropriate authority for potable of drinking water indicating presence of arsenic and other chemicals, if any.

53.29 If specification of any items of work is not covered in the bid documents the same shall be guided from PWD schedule of rates.

53.30 All dismantled departmental materials shall have to be returned to store/ disposed and stacked in a place (within 200m lead) provided by the purchaser without any extra cost to WBSEDCL.

53.31 Mode of measurement shall be followed as described in PWD SOR, unless otherwise stated.

SECTION-V
SPECIAL TERMS AND CONDITIONS:

1. **Statutory Compliances:**

   1.1. Issue of Work Permit: It has to be ensured that no contract labour shall be engaged without a Work Permit to be issued by an official not below the rank of Assistant Engineer to those contract labours having requisite license / authorization to do such work. In the work permit name of the contract labour(s) engaged shall be provided. All such work permits shall contain certification regarding compliance of requisite safety precautions in regard to such work.

   1.2. Each and every employee / worker engaged for the work shall be issued with Prescribed Photo Employment Card and their names shall be maintained in a separate Register. Copies of the same shall have to be submitted to this end for reference.

   1.3. Wages of the workmen shall have to be disbursed as per minimum wages Act vis-à-vis revised from time to time by Notification of the Labour Department, Govt. of West Bengal and reimbursement of difference of wages beyond the usual half yearly revised rate and / or at any point of time by Govt. of West Bengal shall be made subject to production of authenticated documents towards payment of the same to the labourers along with statutory compliances. Necessary wage Register for this purpose shall have to be maintained by the Contractor. Payment of wages to the workmen engaged by the Contractor should be made in presence of the authorized representative as may be specified by the Controlling Officer who shall in turn duly authenticate and sign the Payment Register.

   1.4. Payment of wages to each and every labour shall have to be ensured by 7th of each month against dated receiptthereof.

   1.5. The successful tenderer shall have to comply with the provisions of Employees Provident Fund Act and shall be liable for deduction of Provident Fund Contribution of their workmen & deposit the same with the P.F. Authorities along with equal share of Employer's contribution. Related documents authenticating deposition of PF in case of individual contract labour engaged shall have to be submitted once for the financial year (total or part, as the case maybe).

   1.6. The employees / workers engaged for the work shall have to be paid minimum payment of Bonus one time as per provision of the Payment of Bonus Act in each year and dated receipt of the same shall have to be submitted once in a year soon after disbursement of the same along with the monthly bill of the concerned period.

2. **Risk &Coverage:** The Company (WBSEDCL) will be in no way held responsible/liable for any accident/mishap, if caused to any personnel of the agency during execution of work. The contractor shall ensure for workmen's compensation as per W.C. Act with an insurer approved by the owner and shall confirm such insurance during the contract period that any persons employed by him on the work are covered by insurance and shall produce to the concerned authority such policy or policies of insurance and receipt for payment of the current premium. If the contractor fail to effect and keep in force the insurance which he may be required to effect under the terms of the contract then and in any such case the owner may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for the purpose and from time to time deduct the amount so paid by the owner as aforesaid from any money due or which may become due to the contractor or recover the same as a debt due from the contractor.

SECTION-VI

GENERAL TECHNICAL SPECIFICATION FOR ELECTRICAL WORKS:

GENERAL CONDITIONS OF CONTRACT AND SPECIFICATION FOR ELECTRICAL WORKS:

1. **GENERAL:** These Special Conditions of Contract supplement the preamble and General Instructions, General Condition of Contract, Bill of Quantities and basic rates and Technical Specifications and tender drawings (if any) enclosed thereto, and shall be considered as part of the Tender Papers. Where the provisions of these Special Conditions of Contract are at variance with General Conditions of Contract, the Provisions of these Special Conditions of Contract shall prevail. The several documents forming the tender are to be taken as mutually complementary to one another. Detail drawings (if any) shall be followed in preference to small-scale drawings and figured dimensions in preference to scaled dimensions. If there are varying or conflicting provisions and the documents forming part of the contract, the Engineer-in-Charge shall be the deciding authority with regard to the intentions of the provisions and his decision shall be final and binding on the contractor. The Employer reserve the right to exclude any of the Schedule Items on reasons of the rates not being reasonable or subsequent change of design for evaluation of tender and deciding the contract. The Contractor may be required to carry out any additional or alteration work other than the specified in the Schedule of work/bill of quantities as and when required, by the 'Employer' within the completion period of the project.

2. **SCOPE OF WORK:** The works to be governed by this contract shall cover designing and transportation up to destination, safe custody at site, insurance, erection, testing and commissioning of the following:
   2.1. Main Switchgear panel connecting cables of both incoming and outgoing feeder's etc.
3. **DRAWINGS:** Contractors shall prepare all the detailed design and working drawings and submit them to the Employer for approval within, 15 days from the date of award of contract. The working drawings shall be furnished in triplicate furnishing physical dimensions of the equipment, constructional details, disposition of bus bar, terminal connection etc.The electrical layout, clearly indicating the electrical clearances, cable run layout with Schematic diagram shall be furnished in triplicate for approval.

4. **EXECUTION OF WORK:** All the works included in electrical schedule of works i.e. power panels, equipment layout, conduits layout, electrical wiring, street lighting, cable laying, earthing etc., have to be done as per approved drawings and directions given at site by the Engineer-in-Charge.

5. **ELECTRICAL LICENSE:** Valid Electrical Contractor's License issued by the Licensing Board, Government of West Bengal/India under Act with valid Electrical Supervisor's Certificate of Competency (SCC) Part No. . 1,2,3,4,5,6A,6B,7A, 7B, 11 & 12 issued by the Licensing Board, Government of West Bengal/India (current engagement of electrical Supervisor at prospective bidders' firm needs to be established).
6. **INSPECTION:** The inspection officer(s) for this contract shall be nominated by the Employer and notified to the contractor. The cost of the inspection will be on Employer's account subject to any other provisions contained hereunder elsewhere in the contract. One week's notice must be given by the Contractor to the Inspecting Engineer to take Inspection. The Contractor shall provide without any extra cost of the Employer all materials, equipment, tools, labour maintenance of every kind which the Employer's Inspecting Engineer may consider necessary for any test examination to be made at the Contractor's premises and at site and shall pay all attended thereon. All the equipment and materials shall be tested / inspected by the Employer or its authorized Inspecting Engineer approved before they are installed / used in the execution of the works covered in the contract. If the Contractor any equipment / materials without the prior approval of Employer, those are liable to be rejected. The exact position of all switch boards, OPDs and all runs-of-mains, sub-mains and distribution wiring to individual points including exact positions of all light fittings and switch-boards shall be first worked on the buildings and shall have t1 approved by the Engineer-in Charge before actual commencement of work.

   The Inspecting Engineer or his authorized Representative shall have at all times access to the Contractor's premises and shall have the power to:

   6.1. Inspect and examine the materials and workmanship of the work at any time during manufacture, at the manufacturer's premises, the contractor's premises, or at the site of erection.

   6.2. Reject any part of the work submitted by the Contractor as not being in accordance with the contractor.

   6.3. Reject the whole of the work, including equipment tendered for inspection, if after inspecting such portions as he may, in his discretion, think fit, he is satisfied that the same is unsatisfactory.

6.4. Mark the rejected equipment with a rejection mark so that the same may be easily identified.

6.5. Re-inspect at the time of erection at site any equipment both previously inspected and approved by the inspecting Engineer at the Contractor premises. Notwithstanding any approval given earlier, the Contractor shall make good such rejections made based on such re-inspection at site to the satisfaction of the Engineer.

6.6. The decision of the Inspecting Engineer as regards to the acceptance or rejection of equipment/work shall be final and binding to the Contractor.

7. CONSEQUENCE OF REJECTION: On the equipment /assemblies being rejected by the Inspecting Officer of the Employer at destination the Contractor shall replace such rejected equipment/assemblies of the work forthwith but in any event not later than a period of 2 (two) weeks in the case of minor equipment and 4 (four) weeks in the case of major equipment from the date of rejection. The Contractor shall bear all the costs of replacement including freight, etc., but without being entitled to any extra time on this account. The decision as to whether the equipment is to be classified as Minor or Major for the purpose of this clause shall be that of the Engineer and it is not questionable.

8. INSTALLATION: All works connected with and inclusive of installation and erection under this contract shall be done in accordance with the standard and established methods of installation and erection of electrical equipment and shall comply with relevant Indian Electricity Rules, National Electrical Code, BIS Codes of Specifications and Standards. The work shall also be strictly in accordance with the instructions / recommendations of the manufacturers. The equipment shall be leveled carefully before being fixed finally in position- All fragile and sensitive equipment shall be protected adequately and handled carefully during installation and erection.

9. COMMISSIONING TESTS: As soon as the installations are ready for commissioning/sub-station, the ContractorshallarrangeforallthetestsinspectionasrequiredbytherelevantISS and/or IE Rules and advise the Employer and others concerned. Employer shall depute their Inspecting Officer for witnessing the tests and to carry out inspection independently and also jointly with other concerned agencies where ever necessary and only after the installation passes the required tests and inspection, it should be commissioned /energized. The Contractor shall take full responsibility for these tests. For site tests the Employer where possible, may permit the Contractor for the purpose of testing, the use of any instruments/apparatus and electric power which the Employer can conveniently work not complying with the specifications, the Employer at their discretion ask the Contractor to pay the cost of providing the additional energy required. The Contractor shall provide all apparatus and energy, which may be required fordryingouttheequipmentinamannerapprovedbytheEmployer.Ifbyanyreasonsthe Contractor is failing to comply with any of the provisions of this clause, any of the said tests are to be repeated and the Contractor shall pay all fees and expenses in connection therewith.

9.1. Visual Inspection shall include checks for satisfactory workmanship, all connections, painting, plastering, cleanliness of all fittings etc., and compliance with Indian Electricity Rules.

9.2. The ammeters, voltmeters, and energy-meters shall be checked for their calibration, scale, accuracy, etc. for compliance with the specified requirement.

9.3. Manufacturer's Test Certificates shall be furnished as evidence that type tests have been made in accordance with IS: 3231. Type test results together with appropriate drawings and records of any relevant alteration, which may have been made to any relay after the type test, shall be made available.

9.3.1. Certificates of compliance to routine test shall also be furnished.

9.3.2. Routine tests shall! be carried out at manufacturer premises before commissioning in compliance with IS:3231

9.3.3. Routine-tests are to be carried out on presence of Engineer-in-Charge and test certificates are to be submitted.

9.4. All cables shall be tested at manufacturer's works in compliance with relevant standards. All cables and connections after erection shall be tested as required by the Employer for:

9.4.1. Pressure Test,

9.4.2. Insulation Test.

9.5. Earth resistance shall be measured separately for each earth electrode and when they are Connected together and to the equipment recorded.

10. WARRANTY:

10.1. Contractor shall guarantee that all the equipment and the works executed under this contract shall be free from all defects and faults in materials, design, workmanship and manufacture and shall be of acceptable standards for the contracted work and in full conforming to the technical specifications, drawings and other contract stipulations.

10.2. The Contractor's liability in respect of any complaint defect and/or claim shall be limited to the execution, installation and erection of replacement parts free of charge, or the repair of defective parts only to the extent that such replacement or repairs are attributable to or arise from faulty workmanship or design or material in the manufacture of the equipment/stores, and or negligence in any manner and also in the event of failure of the equipment to perform as intended.

10.3. The Contractor shall, if required, replace, repair, execute and/or install the goods or such portion thereof as in rejected by the Employer free of cost at site or at the option of the Employer the contractor shall pay to the Employer the value thereof and such other expenditure and damage as may arise by reason of the breach of the conditions therein specified.

10.4. If, any defect is not rectified satisfactorily within the above mentioned one month, the Employer may proceed to do the work at Contractor's risk and cost and without prejudice to any other rights of the Contractor under this contract.

10.5. If the Contractor so desires, the replaced parts can be taken over by him or his Representative for disposal as he deems fit within a period of one month from the date of replacement of goods/parts. At the expiry of this period, no claim whatsoever shall lie on the Employer.

10.6. The Employer may, at their discretion recover the ground rent for the goods/parts which have been rejected during the warranty period for the specified period of one month, if the rejected materials are not taken over within that period one month, by the Contractor or his Representative.

10.7. The warranty herein contained shall not apply to any material which have been repaired or altered by the Employer, or on their behalf in any without the consent of the Contractor so as to affect its strength, performance and reliability or to any defects to any part due to misuse negligence or accidents and to items of normal wear and tear to be specifically mentioned by the Contractor in his offer and got accepted by the Employer. The decision of the Employer concerning Contractor's liability and the amount if any payable, under this warranty, shall be final and conclusive.

11. SUPERVISION OF ELECRICALWORKS: The said works will be supervised by the concerned Officers of the Electrical Wing of WBSEDCL.

12. MODE OF MEASUREMENT: Measurement of Electrical works should be done by the competent officers of the Electrical Wing of WBSEDCL in Measurement Book according to Priced Schedule and Agreement.

13. SPECIFICATION FOR 11KV GRADE CABLES, PVC INSULATED AND SHEATHED WIRING CABLE AND TERMINATIONS OF POWER CABLES:

13.1. All power cable shall be procured from reputed manufacturer. The cables must be manufactured under IS: 1554 (part-IT) 1976 and latest amendments thereafter. The supplier also obtains manufacturer's test certificate. The cables even in a smaller length should be supplied in a coil formation either in cable drums or duly protected with proper packing so that the same is not damaged during rough handling in transport or at site on work. The both ends should be properly sealed with PVC caps and adhesive so that no moisture can penetrate in side cables.

13.2. Termination of above cables, including supply of suitable brass compression cable glands for respective size of heavy-duty type including solder less copper cable sockets (Dowell's make) and necessary anti oxide pest (Dowell's make) required during cramping of sockets by suitable section of crimping dice and tools etc.Mention may be made that beyond 120 Sq. mm. size, hydraulic type machine to be used for proper crimping of cable sockets. The sockets must be tinned properly and should be cleaned before insulating the conductors, applying anti-oxide paste for proper surface bonding.

13.3. Wiring cable shall be manufactured under IS: 694/ 1900 or BS: 2004 for PVC insulated sheathed/unsheathed with copper conductor stranded of 1.1KV or 650 volts grade having colour code as required for electrical use.

14. POWER CABLES -LAYING:

14.1. Sizes of cables required are given in the bill of quantities.

14.2. Cables are to be laid both inside and outside the buildings. Lying of cables shall be in accordance with IS: 1255. Inside

the buildings, cables shall be laid in G. I. pipes / Polythene Pipes of suitable sizes or open trench as required. Outside the buildings, the cables shall be laid in the ground at a depth of 1 meter from the ground level along the approved routes with necessary brick and G.I. protection for vertical riser / road crossings.

14.3. Lying of cable includes excavation of earth i.e. making the required trench, placing the cables in trenches, providing the necessary sand cushioning below and above the cables and brick protection at top. Identification -tags shall be provided on the cables at regular intervals where more than one cable is laid. After the laying of cables as approved by the Engineer-in-Charge, the trenches shall be filled with shifted earth and well rammed to bring the surface in level with the surroundings. Sand shall be of good quality river sand and the bricks B-class burnt. Sand and bricks shall be laid continuously on the cables to cover the cables fully. Cable identification makers made of galvanized steel places incorporating the information such as the line voltage, size of cables. Cable identification no. shall be provided at intervalsof 10 meters along with entire cable route in an approved arrangement.

14.4. Wherever the cables are crossing the roads, drains, and water/sewerage pipes or entering/leavingthebuildingsthecablesshallbelaidingrade-BG.I.pipesofsuitable size as directed by theEngineer-in-Charge.

14.5. Straights through joints are not normally permitted. In cases of unusually long distances of cable, laying work straight through joints would be considered on permission only if the kits of specified make are used. No extra payment will be permitted for such joints.

15. EARTHING:

15.1. All non-current carrying metal parts of the electrical installations such as switch gears, LT panel, distribution boards, power plugs, exhaust fans, air conditioners, cable glands, MS conduits, switch boxes etc. shall be bounded together suitably and connected to earth-stations in accordance with the requirements of Indian Electricity Rules and IS:3043.

15.2. All earth stations shall be of the same type similar to one illustrated in IS: 3043, using pipe electrode 3 mtr length of galvanized steel Class-B having 40 mm inner dia & 50 mm outer dia buried vertically in the ground and providing layers of charcoal/coke and salt as necessary. The top end of the pipe electrode shall have suitable arrangements for making connections of earth wire/flats in the manner approved by the Engineer-in Charge. The earth stations snail is located at least 2 M away from the buildings and not less than 6 M apart. Nearby earth stations (at least two) shall be interconnected with suitable size GIflat.

15.3. The earth inspection pit should be provided with brick and cement work of 254 mm (10") thick with 1st Class bricks in cement mortar (6:1) both inside and outside plastered 19 mm (3/4") thick and including neat cement finish 1.6 mm in thickness both inside and top outside & C. 1 manhole 0.46 Mt. dia. complete with C. I. cover (weight being 32 kg) fixed flush with ground surface. The inside dimension whenfinishedshouldbe0.60mx0.60m(2x2)and0.40m(1-3"indepth).

16. EARTH CONNECTIONS SHALL BE AS FOLLOWS:

16.1. Double connections shall be made formed minimum voltage supply.(251to650V).

16.2. All earth wires and flats from one end to the other shall be continuous and without any joints and so laid to protect them against mechanical damage.

16.3. If the required earth resistivity is not obtained with the earth-pits, additional pits shall be made for improving the system resistivity. The rates payable for additional pits shall be same as the rates quoted in the tender.

16.4. Earthing Schedule includes supply of all required material, digging pits, providing charcoal / cake and salt, filling up the pits (providing cement concrete chamber withcoverforsub-stationearthingonlyforlayingofearthwires/flatmakingconnection with proper fasteners, finishing machinery works that have been disturbed for electrical works, testing etc.

17. MODE OF MEASUREMENT: Measurement of Electrical works should be done by the competent officers of theElectrical Wing of WBSEDCL in Measurement Book according to Priced Scheduleand Agreement.

THE FOLLOWING INDIAN STANDARD CODES ARE APPLICABLE

i. IS: 732/1989 - Code of practice for elec.installation.
ii. IS:1646-1961-CodeofpracticeforsafetyofBuilding(GeneralElectricalInstallation)

iii. IS: 3646 Part -I - Code of practice Principles Part - H and Port - m for good lighting andaspectsofdesign, scheduleforvaluesofilluminationandglarelevelandcalculationof Coefficient of utilization.
iv. IS: 4347-Code of practice for Hospitallighting.
v. NEC - 1985 - National Electrical Code for hospital and-OperationTheatre.
vi. IS: 3480 - Flexible Steel Conduits for ElectricalWiring
vii. IS: 2667 - Fittings for rigid Steel Conduits for ElectricalWing
viii. IS:3837-AccessoriesforrigidSteelConduitsforElectricalWiring.
ix. IS:9537Part-I-s1983-PVC Conduits for Electricalwiring.
x. IS:694-1977-SpecificationsforPVCinsulatedCableforworkingvoltageuptoandincluding1100Volts.
xi. IS:8130-1984-SpecificationforConduitsforinsulatedElectricalCableandFlexibleCords.
xii. IS-5563 -Electrical PowerConnectors.
xiii. IS: 3854-19S8 - Flush typeswitches.
xiv. IS: 1293-198S - 3Pin Sockets.
xv. IS:6538-1971-3pinpianotop.
xvi. IS: 371-1979-CeilingRoses.
xvii. IS: 374-1979-CeilingFan.

SECTION VII

ANNEXURES

ANNEXURE-A

Pro-forma for Contract Agreement
(To be executed on Non-Judicial Stamp Paper of Rs. 100/-)

Articles of agreement made on this ----------day of ---------- in the year ------ between West Bengal State Electricity Distribution Company Limited (WBSEDCL), a statutory Body constituted by the Govt. of West Bengal having its head office at "Vidyut Bhaban" , Block-DJ, Sector-II, Salt Lake City, Kolkata-700091 hereinafter referred as the 'Company' (which expression shall unless excluded by or repugnant to the context be deemed to include its successors and assigns) of the ONEPART.

AND

---

hereinafter referred to as the 'CONTRACTOR' (Which expression shall unless excluded by or repugnant to the context be deemed to include his heirs, executors, administrators, representatives and assigns) of the OTHERPART.

WHEREAS the Company invited tenders vide Tender Notice No ……(annexed hereto) for "……
……..……..…"

AND WHEREAS in pursuance of such invitation for tenders, the contractor submitted a tender vide no ----------dated ---------- , technical bid of which was opened on …… and the Price-bid was opened on……. (The tender offer is in custody of the Company at present).
AND WHEREAS AFTER consideration of the tender submitted by the contractor with clarification(s), the Company accepted the said tender submitted by the contractor and placed Letter of Award no
……

NOW, THEREFORE, the Company and the contractor agree as follows:

The Contractor agrees to undertake the work of "……

……..…" as per Letter of Award No……dated:……, referred to above.

The Company agrees to pay the Contractor asper Letter of Award No……dated:……, referred to above.

Both the Contractor and the Company agree that for the purpose of jurisdiction in the court in regard to any dispute arising out of this agreement, this agreement shall be deemed to have been executed within the jurisdiction of the original side of the High Court, Kolkata.

IN WITNESS WHEREOF the parties have hereunder affixed their signature on the day, the month and year written as above.

Contractor **Company**

1)…… Witness

2)…… Witness

1)…….…….. Witness

2)…….. Witness

ANNEXURE-B

SPECIMEN COPY OF INDEMNITY BOND
(To be executed on Non-Judicial Stamp Paper of Rs. 100/-)

BY THE PRESENT INDEMINITY BOND EXECUTED by me / us on this Day of……,20…..I/We having Registered Office/ residing at…… (hereinafter called "OBLIGOR/OBLIGORS" which expression shall mean and includes my/our Successors legal representatives, assigns) do hereby binds myself /ourselves and also our Company/firm.....

after having the power to bind so with the promise and undertaking in favour of the West Bengal State Electricity Distribution Company Limited., a government Company within the meaning of sec.617 of the Indian Company's act having registered office at Bidyut Bhavan, Block-DJ, Sector-II, Salt Lake City, Kolkata-700091 (hereinafter called as OBLIGEE, which expressionshallmeanandincludeitslegalrepresentative,administratorsassign.

WHEREAS OBLIGOR/OBLIGORS has /have been awarded to execute the job/works under letter no……Dated…….issued by the OBLIGEE after having observing necessary formalities the details of which is described in the schedule given hereunder as per letter mentioned hereinabove and whereas the said job/works will be/likely to be done in places covered under Employees' State Insurance Act(ESI) and/or the Workmen Compensation Act(W.C. Act) and/or other laws relating to the Labour Management and Welfare.

AND WHEREAS according to the condition of the contract the OBLIGOR/OBLIGORS is under obligation to execute this Indemnity Bond before the commencement of actual execution and OBLIGOR/OBLIGORS is/are aware that unless this Indemnity Bond is executed in accordance with the condition of contract before the actual execution in accordance with law the OBLIGEE shall have the power to deem that actual work has been started within the meaning of the contract before the execution of this Indemnity Bond.

NOW THIS INDENTURE WITNESS THAT I / We the OBLIGOR/OBLIGORS do hereby undertake

1. THAT the OBLIGEE shall not be held responsible for any type of accident which may take place during the course of work undertaken by the OBLIGOR/OBLIGORS.
2. THAT the OBLIGOR/OBLIGORS will take adopt all safety norms in respect of each and every workmenlabour personnel according to the rules or to the satisfaction of the OBLIGEE in all cases.
3. THAT the OBLIGOR/OBLIGORS undertakes to engage only those labour worker or any other personnel whether skilled or unskilled or any other person whether in technical management or non-managerial or any other capacity in the area covered under Employees' State Insurance Act, 1948 who has/have insurance coverage within the meaning of Employees State Insurance Act and further undertakes NOT to engage any person in the area covered under the Employees State Insurance Act, who does / do not has/have insurance coverage within the meaning of Employees State Insurance Act.
4. THAT the OBLIGOR/OBLIGORS further undertakes to engage only those labour worker, or any other personnel, whether skilled or unskilled, whether in technical, managerial or non- managerial or any other capacity in the area NOT covered under Employees' State Insurance Act who has life insurance for the sum assured equivalent to the amount of Compensation under the Employees' Compensation Act in case of accidental death or inquiry and such insurance has been effected by the OBLIGOR/OBLIGORS.
5. THAT the OBLIGOR/OBLIGORS undertakes / undertake to indemnify and keep harmless the OBLIGEE from all claims action proceedings and of risk damage danger to any person whether belonging to/or not belonging to OBLIGOR/OBLIGORS.
6. THAT the OBLIGOR/OBLIGORS shall keep harmless the OBLIGEE from all claims compensation damages any proceedings in respect of any of its employee/workmen under the Workmen Compensation Act. Or any other laws for the time being in force.
7. THAT if during the course of execution of work as stated in the letter mentioned hereinabove issued by the OBLIGEE, it is found that the OBLIGOR/OBLIGORS has/have not complied with guidelines/formalities within the meaning of Employees' State Insurance Act or Workmen Compensation Act or any other laws relating to the Labour Welfare for the time being in force, and also has not observed the safety norms in accordance with the law to the satisfaction of the OBLIGEE, the OBLIGEE shall have the right to stop the execution of work/job and the period of such stoppage shall continue till adequate safety and other compliance mentioned herein above under the labour welfare legislation have been observed and such period of stoppage shall not be taken into account for the calculation of the total period of completion of work for which the OBLIGOR/OBLIGORS is responsible to complete the work/job and it will be deemed that discontinuance was due to default of OBLIGOR/OBLIGATOR.

8. THAT, if at any time due to exigency, the OBLIGEE i.e. the West Bengal State Electricity Distribution Company Limited as the Principal Employer, becomes liable to pay any such compensation mentioned herein above, whether on failure of the OBLIGOR/OBLIGORS or for any other reason, the OBLIGEE shall have the right to recover the said amount from any amount receivable by OBLIGOR/OBLIGORS or any bank guarantee deposited or anything payable whether in connection with this contract or other contract by the OBLIGEE to the OBLIGOR/OBLIGORS.

9. THAT the OBLIGOR/OBLIGORS is/are aware and accept that for the persistent or repeated violation of any condition mentioned in this Indemnity Bond, the OBLIGEE shall have right to terminate the contract of work issued by the OBLIGEE to OBLIGOR/OBLIGORS.

SIGNED AND DELIVERED
BY THE OBLIGOR/OBLIGOR ……..

Signature of WITNESS

1. Name, ……
   Designation ……
   Signature ……

2. Name, ……
   Designation ……
   Signature ……..
   .

ANNEXURE-C

PROFORMA OF BANK GUARANTEE FOR CONTRACT PERFORMANCE

(The non-Judicial stamp paper of Rs.100.00 should be in the name of issuing bank)

Ref:..... **Bank Guarantee No.....**

Date.....

To
The Regional Manager,
Jalpaiguri Regional Office, Jalpaiguri
West Bengal State Electricity Distribution Co. Ltd.

Dear Sirs,

In consideration of West Bengal State Electricity Distribution Company Limited (herein after referred to as the "Owner" which expression shall unless repugnant to the context or meaning thereof include its successors, administrators and assigns) having awarded to M/S …… with registered/Head office at……. (hereinafter referred to as "Contractor" which expression shall unless repugnant to the context or meaning thereof include its successors, administrators, executors and assigns), a Contract issued by Owner's Letter of Award No…… Dated…… for……..(scope of work) and the same having been acknowledged by the Contractor, resulting in a Contract bearing No…….Dated……Contractor having agreed to provide a Contract Performance Guarantee for the faithful performance of the entire Contract equivalent to Rs……. Being (5% in two Parts)/ (10%)(Ten Percent) of the said value of the Contract to the Owner.

We …… (Name & Address) having its Head Office at ……..(hereinafter referred to as the "Bank", which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Owner, on demand any or all monies payable by the Contractor to the extent of Rs…….as aforesaid at any time upto……* (day/month/year) without any demur, reservation, contest, recourse or protest and/or without any reference to this Contractor.

Any such demand made by the Owner on the bank shall be conclusive and binding notwithstanding any difference between the Owner and the Contractor or any dispute pending before any Court, Tribunal, arbitrator or any other authority. The Bank undertakes not to revoke this guarantee during its currency without previous consent of the Owner and further agrees that the guarantee herein contained shall continue to be enforceable till the Owner discharges this guarantee.

The Owner shall have the fullest liberty without affecting in any way the liability of the Bank under the guarantee from time to time to extend the time for performance or the Contractor. The Owner shall have the fullest liberty, without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or any right which they might have against the contractor and to exercise the same at any time in any manner and either to enforce or to for bear to enforce any covenants, contained or implied in the Contract between the Owner and the Contractor or any other course or remedy or security available to the Owner. The Bank shall not be relieved of its obligations under these presents by any exercise by the Owner of its liberty with reference to the matters aforesaid or any of them or by reason of any other act of omission or commission on the part of the Owner or any other indulgences shown by the Owner or by any other matter or things whatsoever which under law would, but for this provision have the effect of relieving the Bank.

The bank also agrees that the Owner at its option shall be entitled to enforce this guarantee against the Bank as principal debtor, in the first instance without proceedings against the Contractor and not withstanding any security or other guarantee the Owner may have in relation to the Contractor's liabilities.

Notwithstanding anything contained herein above our liability under this guarantee is restricted to Rs…….and it shall remain in force upto and including……**(day/month/year) and shall be extended from time to time for such period may be desired M/S …… on whose behalf this guarantee has been given unless a demand or claim is lodged on us within and including …… *(day/month/year) we shall be discharged from all liabilities thereafter.s

Dated this…….. day of……..20……at……

WITNESS

……	……
(Signature)	(Signature)
……	……
(Name)	(Name)
……	……
(Official Address)	(Official Address)

Attorney as Power of Attorney No…….

Date…….

Notes :-

1. *The Stamp Paper of appropriate value shall be purchased in the name of issuing Bank.*
2. *The sum shall be 10% (Ten Percent) of the Contract Price.*

The validity and claim period Performance Bank Guarantee /Security Deposit Bank Guarantee shall be followed as per terms of contract.

ANNEXURE-D

FORMAT OF THE BANK GUARANTEE FOR ADDITIONAL PERFORMANCE SECURITY DEPOSIT

To,

_____
_____
_____

WHEREAS…….……(NameandAddress of the Contractor) (here after called "the Contractor") has undertaken, in pursuance ofContract No……..Dated……to execute…… and briefDescription of Works (hereinafter called "the Contract").
(name of Contract)

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a Scheduled Commercial Bank for the sum specified therein for 'ADDITIONAL PERFORMANCE SECURITY DEPOSIT' for compliance with his obligation in accordance with the Contract.

NOW THEREFORE we……..(indicate the name of the bank & branch) have agreed to give the Contractor such a Bank Guarantee.

NOW THEREFORE we…….(indicate the name of the bank & branch) hereby affirm that we are the Guarantor and responsible to you on behalf of the Contractor, upto a total of Rs……(amount of guarantee)……(in words). We undertake to pay you, upon your first written demand and without cavil of argument, a sum within the limits of……..(amount of guarantee) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.
We……(indicate the name of the bank and branch) hereby waive the necessity of your demanding the said debt from the contractor before presenting us with the demand.
We……(indicate the name of the bank and branch) further agree to pay to you any money so demanded not withstanding any dispute or disputes raised by the contractor(s)in any suit or proceeding pending before any court or Tribunal…….. the present absolute and unequivocal.

The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the contractor(s) shall have no claim against us for making such payment.

We……..……..(indicate the name of the bank and branch) further agree that no change or addition to or other modification of the terms of the Contract or of the works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.
We ……(indicate the name of the bank and branch) lastly undertake not to revoke this guarantee except with the previous consent of you in writing.

This Guarantee shall be valid upto……..It comes into force with immediate effect and shall remain in force and valid for a period upto the time of completion of the work under the stated contract plus claim period of Six months for the Bank Guarantee. Notwithstanding anything mentioned above our liability against this guarantee is restricted to Rs……..(Rupees……) and unless a claim in writing is lodged with us within the validity period i.e. upto…… of this guarantee all our liabilities under this guarantee shall cease to exist.

Signed and sealed this day……of……..2025, at……..

SIGNED, SEALED AND DELIVERED
For and on behalf of the BANK

(Signature) (Name)

by:

(Designation) (Code Number) (Address)

NOTES:

1. The bank guarantee should contain the name designation and code number of the officer(s) signing the guarantee.
2. The address, telephone number and other details of the Head Office of the Bank as well as of issuings Branch should be mentioned on the covering letter of issuing Branch.

SECTION VIII

TECHNICAL SPECIFICATION FOR ELECTRICAL EQUIPMENT & ACCESSORIES

Technical specifications of some items are given below. However, technical specification of items not covered needs to be followed as per latest technical specification available in WBSEDCL website. In case of any difficulty regarding obtaining the same, it may be collected from the office of the Regional Manager, Malda Region, WBSEDCL

In case of supply of materials, it is mandatory to submit/upload GTP, Drawings, Make & Model, technical specifications from reputed manufacturer as per requirement of NIT and to be approved from the competent department of WBSEDCL.

TECHNICAL SPECIFICATION FOR
XLPE ARMOURED ALUMINUM CABLE SUITABLE
FOR 3Core & 1 Core

a) NON-EFFECTIVELY EARTHED 33KV SYSTEM

AND

b) EFFECTIVELY EARTHED 11KV SYSTEM

TECHNICAL SPECIFICATION

FOR

XLPE CABLE SUITABLE FOR USE IN NON-EFFECTIVELY EARTHED 33 KV SYSTEM

AND EFFECTIVELY EARTHED 11 KV SYSTEMS

1. SCOPE :

a. The specification covers the design, manufacture, testing, supply and delivery in proper packed condition of different grades of 1 or 3 core, Aluminum Conductor, Cross-linked polyethylene (XLPE) insulated, PVC sheathed, Armoured, screened Power Cables.

2. DEVIATION:

Normally the offer should be as per Technical Specification without any deviation. But any deviation felt necessary to improve performance, efficiency and utility of equipment must be mentioned in the 'Deviation Schedule' with reasons duly supported by documentary evidences and advantages of such deviation. Such deviation suggested may or may not be accepted. But deviations not mentioned in 'Deviation Schedule' will not be considered afterwards.

3. LOCATION :

3.1 The Cables may be laid buried directly in ground at a depth of one meter in average, anywhere in West Bengal and terminated for outdoor connection to a power transformer or to overhead lines.

3.2 The Cables may also be laid within covered cable trenches, in cable racks or open air ladder trays etc. for certain portions of lengths.

4.0 SYSTEM DEAILS :

4.1	*Voltage grade (KV) of cable required*	*::*	***19/33***	***6.35/11***
4.2	*Service Voltage*	*::*	*33 KV*	*11 KV*
4.3	*Highest Voltage*	*::*	*36 KV*	*12 KV*
4.4	*Earthing System*	*::*	*Delta connected system earthed through Earthing transformer*	*Solidly Earthed*
4.5	*B.I.L. For Cable*	*::*	*170 KV for 33 KV Grade*	*75 KV for 11 KV Grade*

4.1	*Voltage grade (KV) of cable required*	*::*	***19/33***	***6.35/11***
4.6	*Fault Level (Maxm.)*	*::*	*See Clause 7.06*	*See Clause 7.06*
4.7	*Frequency*	*::*	*50 C./S*	*50 C/S*

5.0 <u>WEATHER CONDITION</u> :

5.1 Monsoon prevails generally from the month of June to October with showers sometimes heavy, acidic, smoky, industrial and foggy.

5.2 Maximum ambient temperature :: 50 degree C.

5.3 Minimum ambient temperature :: 4 degree C

5.4 Thermal resistance of soil :: 150 degree C-Cm/Watt

5.5 Maximum Daily average ambient temp :: 40 degree C

5.6 Maximum relatively humidity :: 100.00%

5.7 Average rainfall per annum :: 200 cm

5.8 Maximum height above the Sea level :: 1000 Meters

6.0 <u>STANDARDS</u>:

a. The Cable shall conform to the following standards to the extent of WBSEDCL's requirement is fulfilled.

*1) IS: 7098 (Part-II) (**2011**)and its latest amendment : Specification for cross-linked polyethylene Insulated PVC Sheathed Cables for working Voltages from 3.3 KV up to and including 33 KV*

2) IS:8130-1984 : Specification for Conductors for insulated electric cables and flexible cords

3) IS:5831-1984 : PVC insulation & sheath of electric cables

1) *IS: 7098 (Part-II) (**2011**)and its latest amendment* : *Specification for cross-linked polyethylene Insulated PVC Sheathed Cables for working Voltages from 3.3 KV up to and including 33 KV*

4) IS: 3975-1970 : *Armour for cables (for 3 Core)*

5) *IS:10810-1984* : *Methods of test for Cables.*

6) *IS:10418-1982* : *Cable Drums for Electric Cables.*

b. The cable, joints, outdoor termination and their accessories and fittings may conform to other Indian and/or equivalent Standards or important publications to improve upon their performance, but shall not fall short of the requirement of this specification. The tenderer shall clearly indicate such standards in their offers.

7.0 ELECTRICAL CHARACTERISTICS & PERFORMANCE:

7.01 Description of Cables:

a) 19/33 KV Grade: Stranded compacted circular Aluminum (H4 Grade) Conductor, shielded with black extruded semi-conducting compound XLPE insulated, core shielded with black extruded semi-conducting compound, black semi-conducting tape and a copper tape, coloured strips having Red, Yellow & Blue for core identification, shielded cores laid up with fillers, binder taped and **Black extruded PVC (Type ST-2) inner sheath,** single layer of galvanized **flat steel strip armoured** and **Green extruded PVC (Type ST-2)**, **overall sheathed**, conforming generally to IS:7098(Part-II) and its latest amendments.

b) 6.35/11KV Grade: Stranded compacted circular Aluminum (H4 Grade) Conductor, shielded with black extruded semi-conducting compound XLPE insulated, core shielded with black extruded semi-conducting compound, copper tape, coloured strips having Red, Yellow & Blue for core identification, shielded cores laid up with fillers, binder taped and **Black extruded PVC (Type ST-2) inner sheath**, single layer of galvanized **flat steel strip armoured** and **Blue extruded PVC**

(Type ST-2) overall sheathed, conforming generally to IS:7098(Part-II) and its latest amendments.

7.02 Voltage Grade : 19/33KV (For 33 KV System) 6.35/11KV (For 11 KV System)

7.03	Size of Cable	:	95 sq. mm. 95 sq. mm. 185 sq.mm. 185 sq.mm. 240 sq.mm. 240 sq.mm. 300 sq.mm. 300 sq.mm. 400 sq.mm. 400 sq.mm. 500 sq.mm. 500 sq.mm.
7.04	Service Voltage	:	33 KV 11 KV

7.05 Maxm.Conductor temp. : 90 degree C at maxm. continuous current.

7.06	Permissible Maxm. Short Ckt. Current for conductors	***33 K.V System***	***11K.V. System***
		1) 47.1 KA for 1Sec for 33 KV 500 sq.mm	*1)* 47.0 KA(895.47MVA) for 1 sec for 11 KV 500 sq.mm
		2) 37.6 KA for 1Sec for 33 KV 400 sq.mm	2) 37.6 KA (716.37MVA) for 1 sec for 11 KV 400 sq mm
		3)28.2K.A(1612 MVA)for 1Sec for 33 KV 300 Sq mm	*3)28.2K.A(537MVA)for 1Sec for 11KV 300 Sq mm*
		4)22.56 K.A(1289 MVA)for 1Sec for 33 KV 240 Sq mm	*4)22.6 K.A(429MVA)for 1Sec for 11KV 240 Sq mm*
		5)17.39 K.A(994 MVA)for 1Sec for 33KV 185 Sq mm	*5)17.39 K.A(331 MVA)for 1Sec for 11KV 185 Sq mm*
			6) 8.93 KA(170 MVA) for 1 sec. for 11 KV 95 Sq.mm.
	Short Ckt. Current – Single Phase to Earth	*2 KA for 3 Secs for all ratings combined with armour and screen without altering of copper tape thickness as per clause no. 7.12.*	*Combine Earth Fault Current of Screen & Armour (KA for 1 sec.)* *1. 4.85 for 3C x 95 sq. mm.* *2. 5.81 for 3C x 185 sq. mm.* *3. 6.76 for 3C x 300 sq. mm.* *4. 7.32 for 3C x 400 sq. mm.* *dering **Cu tape width & thickness as 50** and **0.06** mm (**min**)respectively. Steel Strip Armour of Trapezium cross section with dimensions 4.0, 3.4 & 0.8 (distance between parallel sides) mm and 30,37,44 & 47 numbers of strip.* *ndicative only, bidder shall design for type A armouring with E/F current. **However WBSEDCL also request the bidders to furnish their calculations of Earth Fault current for combined screen & armour***

			considering Cu tape thickness 0.06 mm (min) as mentioned in Cl. No. 7.12

7.07	Maximum Permissible emergency overload temp. at 25% overload to 100 hrs. per year or 500 hrs. in life of Cable	:	130° C.
7.08	Maxm. Permissible short circuit Temperature	:	250° C
7.09	Conductor Material	:	Material to IS: 8130, H4 Grade Aluminium Conductor, stranded compacted circular
7.10	Conductor screening	:	Extruded, cross linked, semi-conducting compound of **1.0 mm.(minimum)** thickness for 33 KV and thickness of conductor screening shall be **0.5 mm (nominal)** thickness for 11 KV Cable.
7.11	Insulation	:	XLPE of thickness, **8.8 mm. (Nominal)** for 33 KV and **3.6 mm. (Nominal)** for 11 KV.
7.12	Insulation Screening : For 33 KV	::	Combination of black extruded semi-conducting compound & semi-conducting tape as the non-metallic part and annealed copper **0.06 mm (minimum)** thick tape For 1 Core Cable, the non-magnetic metal armour will act as metallic part insulation screening.
	For 11 KV :	:	It is same but semi-conducting tape is not required for 11 KV cable. (**Minimum thickness** of Extruded Semi-Conducting compound shall be **0.3 mm**.) Thickness of Copper tape should be **minimum 0.06 mm.**
7.13	Inner Sheathing	:	Black extruded PVC Type ST-2 compound for 33 KV and **Black extruded PVC (Type ST-2) inner sheath** for 11 KV and thickness as per ISS. For 1 Core there will be no inner sheath.
7.14	Armouring	:	Single layer of galvanized flat steel strips for 33 KV (3 Core) and 11 KV (3 core) as per IS. For 1 Core, there will be flat galvanized steel armour made of non-magnetic metal. Armour Coverage Percentage for cables shall be **minimum 90%** as per IS: 7098: (Part-2) 2011 with Amendment no. 1 March 2015.
7.15	Overall Sheathing	:	Coloured PVC Type ST-2 compound to IS:5831, extruded for both 33 KV (**green**) and 11 KV **(blue)**. Thickness shall be as per ISS.

7.16	Approx length of Cable in a Drum & tolerance in quantity.	:	250 meters with a tolerance of ± 5% per drum for 3-Core. 500 Meters ±5% per drum for 1 Core. However the tolerance shall be restricted upto ±2% on the quantity mentioned per lot in the delivery schedule of purchase order except the last lot. But **overall tolerance limit of the total delivered quantity** shall be **minus (-) 1%** against item wise purchase ordered quantity for each Purchase Order and the same shall be taken care of **while offering last lot of inspection.**
7.17	End Sealing	:	H.S. Caps (See Clause 8.11) (Heat Shrinkable)
7.18 a)	Max. tan-delta at room temp., at nominal Phase to Neutral Voltage (Uo)	:	0.004
b)	Maxm. Increment of tan-delta between 0.5 Uo to 2 Uo at room temp	:	0.002
7.19	Partial Discharge Value	:	10 pc (max.) at 1.73Uo (for routine test)
7.20	Impulse Tests	:	**170 KV for 33 KV** and **75 KV** for **11 KV** as per IS: 7098 (Part-II)/ 2011.
7.21	H.V. Tests between Conductors & Screen/Armour	:	**48 KV (rms)** for 33 KV for 5 minutes and **21 KV (rms)** for 11 KV for 5 minutes as per IS7098 (Part-II): 2011 for all sample . And 4Uo for 4 hours for 1 sample.
7.22	Maximum D.C Resistance per KM	:	As per relevant I.S.S

* N.B. : The above parameters are applicable for 3-Core and 1-Core Cable, if not otherwise specified.

8.0 **CABLE CONSTRUCTION**:

XLPE Underground Cable is to be manufactured in continuous catenary process at controlled elevated temperature and pressure in inert atmosphere with use of suitable materials for XLPE main insulation with semi-conducting screen. The inner and outer semi-conducting sheaths and main polyethylene insulation between the sheaths are to be simultaneously extruded during the Tripple Extrusion Process of manufacturing and main insulation of the Cable is to be extruded unfilled. The XLPE Cable in this specification does not have any metal sheath and the short circuit rating of the cable will depend on the conductivity and continuity of the strands of the armour wires which shall be ensured by guarding against corrosion.

8.2 **CONDUCTOR SCREEING**:

A semi-conducting cross-linked polyethylene (XLPE) screening shall be extruded over the conductor to act as an electrical shield which together with the elimination of the so called "Strand Effect" prevents to a great extent air ionization on the surface of the conductor.

8.3 **INSULATION**:

The main insulation of the Cable shall be extruded unfilled, chemically cross-linked polyethylene (XLPE) inert gas cured satisfying the requirement of IS: 7098(Part-II).

8.4 **INSULATING SCREEN**:

The screen shall be made up as given in 7.12. The metal screen eliminates tangential stress of rotating electrostatic field surrounding the conductor and uniform electrical stress in the insulation.

The semi-conducting polyethylene (XLPE) screen shall be extruded over the main polyethylene insulating wall to prevent partial discharge at the surface of the insulation. The copper tape shall be wrapped over the semi conducting tape or extrusion as mentioned earlier for 3 core cables. The metal screen so formed around the cores shall be in contact with one another as the cores are laid up at triangular configuration. For single core cable, Aluminium wire armouring shall constitute the metallic part of insulation screen. Conductor screening, insulation and insulation screening shall be extruded in triple extrusion processes so as to obtain continuously smooth interfaces.

8.5 The mechanical and chemical properties of the materials for semi conducting screens are much more important than their electrical properties, but for obtaining the high overall degree of electrical properties of an E.H.V. cable, the inner and outer semi conducting screens and the main polyethylene insulation between the screens shall be simultaneously extruded during the manufacturing process known as "tripple extrusion". The advantages are:

i) The partial discharge level at the surface of the insulation is brought to a minimum.
ii) There will be no displacement of the semi conducting screen and insulation during expansion and contraction due to load cycles and bending.
iii) The semi conducting screens are easily removable during jointing and termination operations.

8.6 **LAYING UP:**

The phase identification of the cores shall be by colour **strip** as per I.S.S. for 3 core cables only.

Core Colour

Red

Yellow

Blue

The screened cores shall be laid up with interstices filled with PVC fillers and taped with a binder tape as to obtain a reasonably circular cable.

8.7 **INNER SHEATH**:

The cable core shall be supplied with bedding of PVC (inner sheath) in the form of extruded PVC sheath for 33KV cables. **Black extruded PVC (Type ST-2) inner sheath** shall be used for 11 KV Cable and thickness as per Para 7.13 and as per ISS.

8.8 **ARMOUR**:

The cable shall be Steel strip armoured in case of 33 KV and 11 KV, 3 Core cables to ensure an adequate return path for the flow of fault current and also to provide suitable mechanical protection. The Steel Strips of required size in requisite number as per para 7.14 shall be laid closely in the spiral formation to protect the circumference of the cable fully and to provide adequate cross sectional area for flow of maximum fault current within limits of specified temperature rise and duration of fault. The direction of the lay of the armour shall be opposite to that of the cable cores. In case of Single Core Cable the armour should be of non-magnetic material.

Armour Coverage Percentage for cables shall not be less than 90% as per IS: 7098: (Part-2) 2011 with its Amendment no. 1 March 2015.

8.9 **OUTER SHEATH**:

A reliable serving shall be necessary for maintaining conductivity of the armour particularly under corrosive condition in the form of jacket. The cable shall therefore be finished with an extruded PVC over sheath of thickness as per para 7.15.

The quality of PVC over sheath (Jacket) shall be ensured for service reliability against moisture intrusion and shall conform to type ST-2 of IS:5831.

The colour of the outer sheath shall be as follows :

For 33 KV Cable : **GREEN** & For 11 KV Cable : **BLUE**

The sheaths shall be protected against white ants, vermin and termites by suitable, reliable and durable measures.

The supplier shall suggest suitable materials for use, in the event of damage to the over sheath to prevent passage of moisture along the cable.

8.10 **CABLE IDENTIFICATION**:

The following shall be embossed on the outer sheath for the identification.

a) Manufacturer's Name or Trade Mark.
b) Type of Cable / Cable Code
c) Voltage Grade.
d) Type of insulation i.e. XLPE.
e) Nominal section & Material of conductor and number of crores.
f) Month & Year of manufacture.
g) Inscription for length of cables at 1.0 meter interval on outer sheath by printing/ engraving.
h) Name of the purchaser : WBSEDCL
i) Marking "Electric" shall be embossed throughout the length of the Cable at 1.0 metre spacing.

8.11 **SEALING OF CABLE ENDS** :

The cable ends of cable in the wooden/ steel drum for delivery shall be sealed with heat shrinkable caps.

9.0 **DRUMS**:

The Cable shall be packed in non-returnable wooden. Non-returnable Steel Drum may also be accepted in place of non-returnable Wooden Dum without implication of additional cost.

9.1 The following information shall be marked on each drum.

a) Drum identification No.
b) Manufacturer's Name, Trade Name/Trade Mark, if any.
c) IS reference i.e 7098 (part-II)/2011
d) Nominal sectional area of the conductor of the cable.
e) No. of Cores.
f) Type of Cable and Voltage Grade with Cable Code.
g) Colour of outer sheath
h) Length of the Cable in Cable Drum.
i) Direction of rotation of Drum (by means of an arrow)
j) Approximate Weight : Tare : Gross
k) Month & Year of Manufacture.
l) Purchase Order No. & date
m) Month of Delivery
n) Name of the Purchaser : WBSEDCL

Drums shall be proofed against attack by white ants or termite conforming to IS : 10418. The Drums may also be marked with ISI Certificate Mark, if applicable.

9.2 **Safe Pulling Force:** 30 N/mm2 (for Conductor)

10.0 **Tests to be performed as per IS: 7098 (Part-II)/2011 & IS:8130/1984 and its amendments.**

10.1A Type Test: All the tests mentioned below are to be made as per details given in IS:10810. The party shall submit Type Test report from CPRI or ERDA or Any NABL accredited LAB as per IS:7098/II/2011 and it latest amendment and other relevant IS/ IEC for each offered item of identical type, voltage grade, size, material and design, carried out within 5 years from the due date of opening of tender. Type Test Certificate should bear NABL Logo. Accreditation of NABL LAB should be displayed in the official website of NABL

a) Tests on conductor
   i) Tensile Test (for aluminium) (not applicable for compacted conductor as per IS:8130-1984)

   1. Wrapping Test (for aluminium) (not applicable for compacted conductor as IS:8130-1984)
   2. Resistance Test.

b) Tests for armouring Wires strips.

c) Test for thickness of insulation and sheath

d) Physical test for insulation.
   i) Tensile strength and elongation at break.

   ii) Ageing in air oven.
   iii) Hot test.
   iv) Shrinkage test
   v) Water absorption (Gravimetric)

e) Physical tests for outer sheath
   i) Tensile strength and elongation at break.

   ii) Ageing in air oven.
   iii) Shrinkage test.
   iv) Hot deformation.
   v) Heat shock.
   vi) Loss of mass in air oven.
   vii) Thermal stability.

f) Partial discharge test.
g) Bending test.
h) Dielectric power factor test.

i) As a function voltage.

1) As a function of temperature.

i) Insulation resistance (Volume resistivity) Test.
j) Heating cycle test.
k) Impulse with stand test.
l) High voltage test.
m) Flammability test.

10.1B The following tests on screened cable shall be performed successively on the same test sample of completed cable, not less than 10m. in length between the test accessories.

a) P.D. Test.
b) Bending Test followed by P.D. Test.
c) Dielectric power factor as a function of voltage.
d) Dielectric power factor as a function of temperature.
e) Heating cycle test followed by dielectric power factor as a function of voltage and P.D.tests.
f) Impulse withstand test and
g) High voltage test as per para 7.21.
If a sample fails in test (g) one more sample shall be taken for this test, preceded by tests (b) & (e).

10.2 **Acceptance Test**: The following shall constitute Acceptance Tests:

1. Tensile test (for aluminium)
2. Wrapping test (for aluminium)
3. Conductor resistance test.
4. Test for thickness of insulation and sheath.
5. Hot set test for insulation.
6. Tensile strength and elongation at break test for insulation and outer sheath.
7. P.D. test (for screened cables) only on full drum length.
8. High Voltage test :21 KV for 5 minutes in all samp and
9. Insulation resistance (VOLUME RESISTIVITY) TEST
10. **48 KV (rms)** for 33 KV for 5 minutes and **21 KV (rms)** for 11 KV for 5 minutes as per IS7098 (Part-II): 2011 for all sample . **And 4Uo for 4 hours for 1 sample.**
11. **Length Measurement of 1 drum.**

10.3 **ROUTINE TESTS**:

The routine test shall be carried out on all cables manufactured in accordance with this specification.

The following routine tests shall be made on cable length as specified in the ISS.

a) Conductor resistance test.
b) Partial discharge test on full drum length.
c) High voltage test as per para 7.21

10.4 **TEST WITNESS**:

1. All Tests shall be performed in presence of Purchaser's representative if so desired by the Purchaser.
2. The contractor, shall give at least fifteen (15) days advance notice for witnessing such tests.

11. **TEST CERTIFICATE**:

11.1 Certified copies of all routine tests carried out at Works shall be furnished in Six (6) copies for approval of the purchaser.

11.2 The cables shall be dispatched from Works only after receipt of Purchaser's written approval of shop test reports.

11.3 Type Test Certificates of the Cable offered shall be furnished. Otherwise the cable shall have to be type tested on similar rating as per Clause – 10 free of any charges to prove the design.

12. **DESCRIPTIVE LITERATURES, TEST RESULTS ETC.**:

The following details for the cable shall be submitted with bid.

a) Manufacturer's Catalogue giving cable construction details and characteristics.
b) Manufacturing process in detail for cables highlighting the steps to control.
   i) Contamination.
   ii) Formation of water trees.
   iii) Effects of byproducts of cross-linking.
   iv) Stress control etc.
c) Cross section drawing of the cable.
d) Cable current ratings for different types of installation inclusive of all de rating factors due to ambient temperature, grouping etc.
e) Over-Load characteristics of the cable without endangering the normal life and electrical quality of the insulation.
f) Complete technical data of the cables.
g) List of Customers to whom the Cable of similar rating have been supplied.
h) Copy of Type Test Report carried out within last 5 years from the due date of opening of Tender on similar type of Cable in a NABL accredited/Govt. approved

Test House or Laboratory is to be submitted along with the tender otherwise tender may be rejected.

Type Test (after placement of order) : Besides submission of Type Test Report carried out within last 5 years as per tender specification, type test at the discretion of the ordering authority shall have to be arranged by the successful contractor from any lot offered for inspection sample chosen at random after successful routine test by our inspection team as per relevant ISS from CPRI/NABL accredited/Govt. recognized Test House or Laboratory in presence of WBSEDCL's representative.

However the necessary cost of the type test charges will be reimbursed to the party on production of necessary supporting documents.

i) Valid Calibration Certificate of instruments/equipment used for Testing purpose conducted by NABL accredited Laboratory provided the certificate bears an accreditation body logo. For testing equipment where NABL accreditation is not available, calibration certificate from educational institutions like IIT's, NIT's, J.U., C.U., B.H.U. only can be accepted provided they demonstrate traceability.

j) Documents to be submitted at the time of physical delivery at consignee stores :

The following documents are to be submitted by the venders to the consignee stores at the time of dispatch to stores by the vendors :

a) Copy of Purchase Order

b) Copy of dispatch instruction

c) Inspection Test certificate

d) Guarantee certificate

e) Proforma Invoice

f) Calculation Sheet for price variation on the basis of IEEMA or CACMAI as applicable with base date of order

g) Seal list and packing list

h) Challan in triplicate

k) Way Bill, if applicable

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR

11 KV or 33 KV ARMOURED ALUMINIUM XLPE CABLES
(To be filled in by the Supplier)

1	**NAME OF MANUFACTURER & ADDRESS**	:			
2	Voltage Grade.	:	6.35/11 KV	6.35/11 KV	6.35/11 KV
3	Core & Cross Section No x sq. mm.	:	3 x 400	3 x 300	3 x 95
4	Type & Designation (as per ISS)	:	A2XFY	A2XFY	A2XFY
5	List of Standards applicable with latest amendment	:	**IS: 7098(PT-2) 2011,** IS: 8130 - 1984, IS:5831 – 1984, IS:3975 – 1999, IS: 10810 – 1984 & IS: 10418 - 1982	**IS: 7098(PT-2) 2011,** IS: 8130 -1984, IS:5831 – 1984, IS:3975 – 1999, IS: 10810 – 1984 & IS: 10418 - 1982	**IS: 7098(PT-2) 2011,** IS: 8130 -1984, IS:5831 – 1984, IS:3975 – 1999, IS: 10810 – 1984 & IS: 10418 - 1982
6	System suitable for				
a	Service Voltage	:	11KV	11KV	11KV
b	Neutral Earthing	:	6.35KV	6.35KV	6.35KV
7	Maximum. Conductor temperature	:			
a	Continuous (in Deg. C)	:			
b	Short time (in Deg.C)	:			
8	Conductor	:			
a	Material to IS-8130(Class/Grade)	:	H4 Grade Aluminium of Class-2	H4 Grade Aluminium of Class-2	H4 Grade Aluminium of Class-2
B	Size (Sq.mm.)	:	400	300	95
c	No./Nominal diameter of wires in each.	:			
	Conductor (no./mm.)	:			
D	Shape of conductor(Circuler/ other shaped)	:	Stranded Circular Compacted	Stranded Circular Compacted	Stranded Circular Compacted
9	Shielding/screening on	:			

	Conductor				
a	Material	:	Semi-conducting compound	Semi-conducting compound	Semi-conducting compound
b	Type	:	Extruded	Extruded	Extruded
C	Whether thermosetting?	:			
d	Thickness				
10	Insulation	:			
a	Material	:			
b	Type	:	Extruded	Extruded	Extruded
c	Thickness (mm)	:			
11	Shielding / screening on insulation	:			
a	Material	:	Semi-conducting compound	Semi-conducting compound	Semi-conducting compound
b	Type	:	Extruded	Extruded	Extruded
c	Thickness (mm)	:			
	i) Non-metallic	:			
	ii) Metallic	:			
12	Inner – sheath	:			
A	Material	:			
B	Type	:			
C	Minimum Thickness of sheath (mm)	:			
D	Extruded/Wrapped	:			
E	Approx. outside diameter	:			
13	Armouring	:			
A	Material	:	Galvanised Steel Strip	Galvanised Steel Strip	Galvanised Steel Strip

B	Size	:			
C	D.C. resistance at 20 deg.C (Ohm/Km.)	:			
D	Armour Coverage Percentage	:	90%(Min)	90%(Min)	90%(Min)
14	Overall Sheath	:			
A	Material	:	PVC (Blue Colour)	PVC (Blue Colour)	PVC (Blue Colour)
B	Type	:	ST-2	ST-2	ST-2
C	Thickness (mm.)				
D	Colour of Sheath	:			
15	Approx. overall diameter of the Cable (mm.)	:			
16	Continuous current rating for standard condition, laid direct	:			
A	In ground at temp 30 deg.C	:			
B	In duct at temp 30 deg.C	:			
C	In air at temp40 deg.C	:			
17	Charging current attracted system voltage A/KM	:			
18	Short Circuit Current in KA (Maxm.)	:			
a	for 1 sec	:			
b	for 0.5 sec	:			
19	Combine Earth Fault Current for Screen and Armour in KA for 1 sec				
20	Electrical Parameters	:			
a	Maxm. D.C. resistance/km	:			
	of conductor at 20 deg.C (Ohm/Km)	:			

b	AC resistance/kilometer of	:			
	conductor at 90 deg.C(approx.) (Ohm/Km)	:			
c	Reactance/kilometer(approx.) (Ohm/Km)	:			
d	Capacitance/Kilometer(appr ox.) (um/Km)	:			
e	Di-electric losses at rated	:			
	(Uo/U) system KV, 50 cycles/sec	:			
	in Watts/KV/Phase)	:			
f	i) tan-delta at 0.5 Uo	:			
	ii) tan-Delta at Uo	:			
	iii) tan-Delta at 1.5 Uo	:			
	iv) tan-Delta at 2 Uo	:			
21	Vol. Resistivity at 27 deg.C(ohm/Cm)	:			
22	Recommended minimum bending radius	:			
23	Derating factor for following ambient	:			
	temperature in Air/Ground	:			
a	at30 deg. C	:			
b	at35 deg. C	:			
c	at45 deg. C	:			
d	at 50 deg.C	:			
24	Cable Drums	:			
a	Standard Length of Cable/Drum (Mtrs)		250±5%	250±5%	250±5%
b	Net weight of cable/Drum				

	(kg)				
c	Dimension of Drum		Generally as per IS: 10418-1982	Generally as per IS: 10418-1982	Generally as per IS: 10418-1982
d	Shipping weight (Kg)				
25	Safe pulling force (Kg.)	:			
26	Partial discharge value	:			
27	Details of the protective measures against attack by white ante varmints etc. to be XLPE's outer sheath during manufacture	:			
28	Type of curing of XLPE insulations	:	Inert Gas (Nitrogen) curing through CCV Line	Inert Gas (Nitrogen) curing through CCV Line	Inert Gas (Nitrogen) curing through CCV Line
29	Cut ends of the Cable shall be sealed	:	Heat shrinkable and caps	Heat shrinkable and caps	Heat shrinkable and caps
30	Cable identification shall be made as per class 8.10 (Yes/No)	:			
31	Cable Drums shall be marked with the with the informations of Clauses 9.1 conspicuously (Yes/No)	:			
32	Embossing	:	**a)** Manufacturer's Name or Trade Mark. **b)** Type of Cable / Cable Code **c)** Voltage Grade. **d)** Type of insulation i.e. XLPE. **e)** Nominal section & Material of conductor and number of crores. **f)** Month & Year of manufacture. **g)** Inscription for length of cables at 1.0 meter interval on outer sheath by printing/ engraving. **h)** Name of the purchaser : WBSEDCL **i)** Marking "Electric" shall be embossed throughout the length of the Cable at 1.0 metre spacing.		

33	Drum Marking (Information shall be stencilled on each drum)		As per TS	As per TS	As per TS

Signature with Designation & Seal

With Name of the Firm

TECHNICAL SPECIFICATION FOR G.I. EARTHING ROD

1.	**SCOPE:** This specification covers the technical details of the G.I. earthing rod, complete with the necessary fittings.
2	The earthing rod should be 1853 mm long (i.e., 25 + 1752 + 76 mm), fabricated from a 20 mm diameter M.S. rod. The bottom of the rod shall be shaped into a cone, 76 mm long, made from the same rod. The forged head shall also be made from the same rod, with a diameter of 30 mm and a height of 25 mm. The earthing arrangement shall consist of G.I. bolts, nuts, and washers. The earthing rod shall conform to this office's drawing No. S&P/MC/Misc/8. The raw materials required for manufacturing shall comply with the latest relevant Indian Standards, along with all amendments, additions, and alterations, to ensure the required strength.
3	The rod, including the head portion, should be smoothly and continuously hot-dip galvanized as per the relevant I.S.S. The other components, i.e., bolts, nuts, and washers, should be either hot-dip galvanized or zinc electro-plated. In the case of zinc electroplating, the manufacturer must provide an undertaking for satisfactory performance in the Test Certificate while offering the item for inspection.
4	No cracks should develop, and deformation in the top head and/or bending of the rod should not be appreciable while the rods are being driven into the ground by the application of a heavy intermittent block hammer, not less than 7.5 kg, and in the manner usually adopted for driving rods into the ground.
5	**GUARANTEE ,TESTING & INSPECTION:** Eight copies of the test certificates should be furnished along with the offer for inspection. The following tests will be carried out by our inspecting engineers before acceptance of any materials:
i)	Galvanizing tests as per the relevant I.S.S. on 1% of the offered lot, up to a maximum of 5 numbers.
ii)	Dimensional check on 1% of the offered lot, up to a maximum of 10 numbers.
iii)	Storage tests by hammering (7/8 times) the rods into normal soil using a hammer (not less than 7.5 kg) on 1% of the offered lot, up to a maximum of 2 numbers.
6	**ACCEPTANCE CRITERIES** **FOR 1ST SAMPLE**
A. (a)	Failure in galvanizing test and dimensional check up to 1/5th will confirm the lot for acceptance. However, in the case of dimensional check failure up to 1/5th, the lot will be restricted as follows:
i)	1% on total length
ii)	7½ % on other dimension except 15mm ,25mm & 40mm of small forged portion.
iii)	No failure will be accepted in the 15 mm, 25 mm, and 40 mm small forged portions. If the failure is beyond the above tolerance, re-sampling may be made as per Clause 6.

B.	If the failure in each of the above tests is more than 1/5th but less than or equal to 2/5th, re-sampling in the same manner will be made for the test(s) in which the failure occurred.
C.	However, if the failure in any of the above tests is greater than 2/5th, the whole lot will be rejected.
D.	For 2nd Sample: In case of failure as (a) above, the lot will conform for acceptance. However, if the failure in any of the above tests is greater than 1/5th, the whole lot will be rejected. No re-sampling will be made in case of failure in stress tests by hammering. Any defect found during inspection/testing of the earthing rod or after delivery at the site, in respect of galvanizing, welding, and the quality of the associated materials, shall make the whole lot liable for rejection. The rejected materials shall be taken back by the supplier at his own cost from the place of delivery within ten days from the date of intimation in this respect. Earthing rods with all fittings mounted on them shall be supplied in bundles of ten. TELERANCE: - ½% on total length.,-5% on other dimensions. - 10% on 15mm,25mm,&40mm of small forged portion. Any tolerance on the positive side will be accepted.
9	MARKING: The manufacturer's identification marking is to be punched on the head of the earth rod.

HDPE Pipe

Indian Standard

POLYETHYLENE PIPES FOR WATER SUPPLY — SPECIFICATION

(Fifth Revision)

1 SCOPE

1.1 This standard lays down the requirements for polyethylene (PE) pipes (mains and service pipes) intended for the conveyance of water for human consumption including raw water prior to treatment and also water for general purpose.

1.2 This standard is applicable for the water supplies with a maximum operating pressure of 2.0 MPa.

1.3 An operating temperature of 27°C has been taken as the reference temperature.

1.4 The reference temperature of 20°C for 50 years of continuous stress is considered for the minimum required strength (MRS) of polyethylene base resin. To enable an operating water temperature of 27°C, the design stress has been accordingly corrected (*see* Table 1 and corresponding Notes). The standard also provides pressure reduction coefficients for water temperatures higher than 20°C and other than 27°C so as to calculate the maximum allowable operating pressure at those temperatures.

1.5 This standard does not purport to give guidelines for designing and dimensioning of pipe lines.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication the editions indicated are valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below :

IS No.	*Title*
2362 : 1993	Determination of water by Karl Fischer method — Test method (*second revision*)
2530 : 1963	Methods of test for polyethylene moulding materials and polyethylene compounds
4905 : 1968	Methods of random sampling
7328 : 1992	High Density polyethylene materials for moulding and extrusion — Specification (*first revision*)
9845 : 1998	Method of analysis for the determination of specific and/or overall migration of constituents of plastics materials and articles intended to come in contact with foodstuffs (*first revision*)
10141 : 1982	Positive list of constituents of polyethylene in contact with foodstuffs, pharmaceuticals and drinking water
10146 : 1982	Polyethylene for its safe use in contact with foodstuff, pharmaceuticals and drinking water

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply:

3.1 Nominal Size (DN) — Numerical designation of the size of a component, other than a component designated by a thread size, which is a convenient round number approximately equal to the manufacturing dimension in millimetres (mm).

3.2 Nominal Size (DN/OD) — Nominal size, related to the outside diameter.

3.3 Nominal Outside Diameter (d_n) — Specified outside diameter, in millimetres, assigned to a nominal size DN/OD.

3.4 Outside Diameter at any Point (*de*) — Value of the measurement of the outside diameter through its cross-section at any point of the pipe rounded to the next greater 0.1 mm.

3.5 Mean Outside Diameter (d_{em}) — Value of the measurement of the outer circumference of the pipe or spigot end of a fitting in any cross-section divided by π (= 3.142), rounded to the next greater 0.1 mm.

3.6 Minimum Mean Outside Diameter ($d_{em,Min}$) — Minimum value of the outside diameter as specified for a given nominal size.

3.7 Maximum Mean Outside Diameter ($d_{em,Max}$) — Maximum value of the outside diameter as specified for a given nominal size.

3.8 Out-of-roundness (Ovality) — Ovality shall be measured on the difference between maximum outside diameter and minimum outside diameter measured at the same cross- section of the pipe, at 300 mm away from the cut end, for the pipe to be coiled.

3.9 Nominal Wall Thickness (e_n) — Numerical designation of the wall thickness of a pipe, which is a convenient round number approximately equal to the manufacturing dimension in millimetres.

3.10 Standard Dimension Ratio (*SDR*) — The *SDR* value is the ratio of the nominal outside diameter, d_n of a pipe to its nominal wall thickness.

$$SDR = \frac{d_n}{e_n}$$

3.11 Wall Thickness at any Point (e) — Wall thickness at any point of the body of the pipe, around its circumference.

3.11.1 *Minimum Wall Thickness at any Point* (e_{min}) — Minimum value of the wall thickness at any point of the body of the pipe, around its circumference as specified.

3.11.2 *Maximum Wall Thickness at any Point* (e_{max}) — Maximum value of the wall thickness at any point of the body of the pipe, around its circumference as specified.

3.12 Mean Wall Thickness (e_m) — The arithmetic mean of a number of measurements regularly spaced around the circumference of the pipe in the same cross-section of the pipe, including the measured minimum and the measured maximum values of the wall thickness.

3.13 Tolerance — Permissible variation of the specified value of a quantity expressed as the difference between the permissible maximum and permissible minimum values.

3.14 Minimum Required Strength (*MRS*) — Minimum value in megapascals (MPa), for long-term hydrostatic strength (LTHS) of the polyethylene resin which represents the 97.5 percent confidence limits of the predicted hydrostatic strength at 20°C for 50 years. This is considered as the property of the material.

3.15 Overall Service (Design) Coefficient (C) — An overall design co-efficient with a value greater than 1, which takes into consideration service conditions as well as properties of the components of a piping system other than those represented in the lower confidence limit. For potable water supply pipes, the minimum value of *C* is 1.25.

3.16 Design Stress (σ) — The maximum allowable stress, expressed in megapascals (MPa), for a given application derived by dividing MRS by the co-efficient *C*. This is the allowable stress at 20°C.

3.17 Nominal Pressure (*PN*) — Numerical designation used for reference purposes related to the mechanical characteristics of the component of piping system.

NOTE — For plastic piping systems conveying water, it corresponds to the maximum continuous operating pressure, expressed in bar which can be sustained with water at 20°C, based on the maximum design coefficient, *C* (1 MPa = 10 bar).

The relationship between *MRS*, *PN* and *SDR* is given in Annex A.

3.18 Maximum Allowable Operating Pressure (*MAOP*) — The maximum allowable continuous pressure, expressed in MPa. It is given by the equation,

$$P(\text{MPa}) = \frac{2\times\sigma}{[(SDR)-1]}\times f_T$$

$$P(\text{MPa}) = \frac{2\times MRS}{C\,[(SDR)-1]}\times f_T$$

where

SDR = standard dimension ratio;

σ = design stress, in MPa;

MRS = minimum required strength, in MPa;

f_T = pressure reduction co-efficient; and

C = overall service design co-efficient.

3.19 Pressure Reduction Co-efficient (f_T) — A co-efficient which takes into account the reduction in maximum allowable operating pressure due to increase in operating temperature.

3.20 Melt Flow Rate (*MFR*) — Value relating to the viscosity of the molten thermoplastic material at a specified temperature and rate of shear.

3.21 Virgin Material — Thermoplastics material in a form such as granules which has not been previously processed other than for compounding and to which no reprocessed or recycled materials have been added.

4 GRADE OF RESIN

Pipes shall be classified according to the grade of the raw material (resin) as given in Table 1. The resin supplier shall give the raw material grade.

5 MATERIAL

5.1 General

The material used for the manufacture of pipes should not constitute toxic hazard, should not support microbial growth and should not give rise to unpleasant taste or odour, cloudiness or discoloration of water. Pipe manufacturers shall obtain a certificate to this effect from the manufacturer of raw material.

Table 1 Classification of Materials

(*Clause* 4)

Sl No.	Material Classification (Grade)	MRS (Minimum Required Strength) of PE Resin at 20°C for 50 Year Life MPa	Design Stress at 20°C MPa
(1)	(2)	(3)	(4)
i)	PE 63	6.3	5
ii)	PE 80	8.0	6.3
iii)	PE 100	10.0	8

NOTES

1 The maximum allowable operating pressure (MAOP) of a pipe is obtained by the equations given in **3.18**.

2 Pressure reduction coefficients for calculating maximum allowable operating pressure at temperatures higher than 20°C are given in Fig. 1.

3 As an operating water temperature of 27°C has been considered, a pressure reduction co-efficient, f_T of 0.89 has been taken from Fig. 1 and used in the equation given at **3.18** for determining the maximum allowable operating pressure at 27°C (nominal pressure). That ensures that no further correction factor is required for over ground or underground water supply systems.

4 The wall thicknesses are calculated based on maximum allowable operating pressure at 27°C rounded up to nearest SDR series (PN values). The pressure class (pressure rating) is also rounded to standard series. Tolerances calculated from ($0.1e_{min}$ + 0.11 mm) rounded up to the next 0.1 mm. Considering operational production problems, maximum wall thickness of pipes are considered around 150 mm.

5 The pipes are recommended for maximum water temperature of +45°C.

6 The pipes may also be used up to the ambient temperature of −40°C without any correction factor as long as the water temperatures inside the pipe do not exceed the operating temperature of 27°C. Intermittent increase in the ambient or water temperatures because of weather changes would not have any deleterious effect on the pipe's long-term performance.

5.2 Polyethylene Resin

PE resin used for the manufacture of pipes shall conform to parameters mentioned in Table 2. In addition, the resin shall conform to requirement of 5.6.2 of IS 7328.

The material classification and conformity to Table 2 shall be provided by the raw material (resin) manufacturer with documentation duly certified by resin manufacturer.

5.3 Carbon Black Master Batch

Carbon black master batch shall be manufactured from a mixture of the following:

a) Polyethylene, which may include co-polymers of ethylene and higher olefin, in which the higher olefin constituent does not exceed 10 percent (mass/mass) and density of 910-950 kg/m³.

b) The constituents used should be from the positive list of constituents of PE, in contact with food stuff, pharmaceutical and drinking water as per IS 10141 and should not constitute a toxic hazard, shall not support microbial growth and shall not give rise to an unpleasant taste or odour, cloudiness or discoloration of the water.

c) Loading of carbon black should not exceed 50 percent (*m/m*).

d) Ash content <0.1 percent.

e) Carbon black used in carbon black master batch shall comply with the following requirements:

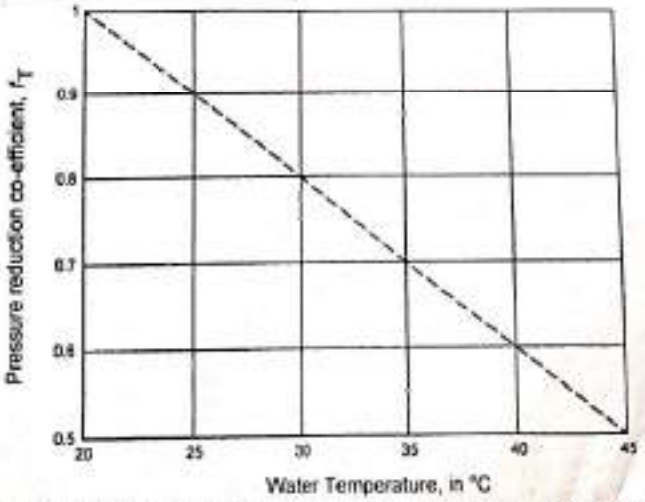


FIG. 1 PRESSURE REDUCTION CO-EFFICIENT FOR WATER TEMPERATURES ABOVE 20°C

Table 2 Characteristics of PE Resin as Granules
(Clauses 5.2 and 6.1.1)

Sl No.	Characteristics	Units	Requirements	Test Parameters		Test Method
(1)	(2)	(3)	(4)	(5)		(6)
i)	Base density	kg/m³	930-960	27°C		IS 7328
ii)	Melt flow rate	g /10 min	0.2 to 1.1 (both inclusive)	190°C using 5 kg mass		IS 2530
iii)	Thermal stability (oxidation induction time)	min	≥ 20	200°C, isothermal		Annex B
iv)	Volatile matter	mg/kg	≤ 350	Number of test pieces	01	Annex C
v)	Water content [1]	mg/kg	≤ 300	Number of test pieces	01	Annex D

[1] This requirement is only applicable if the measured volatile content is not in conformity with the specified requirement. In case of dispute, the requirement for water content shall apply (if the water content exceeds the limit, drying to be done prior to use).

1) Density: 1.5 to 2.0 g/ml.
2) Toluene extract not more than 0.1 percent (m/m) .
3) Maximum volatile matter 0.9 percent (m/m) (see Annex C).
4) Carbon black particle size should be less than 0.025 µ.

NOTE — A test report or conformative certificate may be obtained from the carbon black master batch manufacturer.

5.4 Anti Oxidant

The percentage of anti-oxidant used shall not be more than 0.3 percent by mass of finished resin. The anti-oxidant used shall be physiologically harmless and shall be selected from the list given in IS 10141.

5.5 Rework Material

Clean, reprocessable material generated from a manufacturer's own production and works testing of products according to this standard may be used if it is derived from the same raw material as used for the relevant production. Reprocessable material obtained from external sources and recycled material shall not be used.

6 PIPE DESCRIPTION

6.1 Pipes shall be designated according to the grade of material (see 6.1.1) followed by standard dimension ratio (SDR) (see 6.1.2), nominal outside diameter (see 6.1.3) and pressure rating (PN) (see 6.1.4). For example PE 80, SDR 26, DN 200, PN 0.5 indicates pipe pertaining to material grade PE 80 with wall thickness corresponding to SDR 26, nominal outside diameter 200 mm and pressure rating 0.5.

6.1.1 The grade of material shall be as given in Table 1.

6.1.2 The standard dimension ratio of pipes covered in this standard are:

SDR 41, SDR 33, SDR 26, SDR 21, SDR 17, SDR 13.6, SDR 11, SDR 9, SDR 7.4 and SDR 6.

6.1.3 The nominal outside diameter of pipes covered in this standard are:

16, 20, 25, 32, 40, 50, 63, 75, 90, 110, 125,140, 160, 180, 200, 225, 250, 280, 315, 355, 400, 450, 500, 560, 630, 710, 800, 900, 1 000, 1 200, 1 400, 1 600, 1 800, 2 000 mm.

6.1.4 The pipes shall be classified by pressure rating (PN) corresponding to the maximum allowable operating pressure at 27°C, as follows:

Pressure Rating of Pipe	Maximum Allowable Operating Pressure at 27°C
(1)	(2)
PN 2	0.20 MPa
PN 2.5	0.25 MPa
PN 3	0.30 MPa
PN 3.2	0.32 MPa
PN 4	0.40 MPa
PN 5	0.50 MPa
PN 6	0.60 MPa
PN 8	0.80 MPa
PN 10	1.00 MPa
PN 12.5	1.25 MPa
PN 16	1.60 MPa
PN 20	2.00 MPa

6.2 Colour

The colour of the pipe shall be black with blue identification stripes.

NOTE — Blue pipes have not been included due to non-availability of enough experience regarding manufacture/ use of these pipes and raw materials for the same in India. However blue pipes may also be supplied if so required by the purchaser. Purchaser shall specify requirement regarding raw material, weathering test, etc, in such cases.

6.2.1 *Identification Stripes*

Each black pipe with identification stripes shall contain minimum of three longitudinal stripes of minimum

width of 3 mm in blue colour, circumferentially distributed. These stripes shall be co-extruded during pipe manufacturing and shall not preferably be more than 0.2 mm in depth for wall thickness up to 10 mm and 0.5 mm beyond 10 mm. The material of the stripes shall be of the same type as used in the base compound for the pipe.

7 GEOMETRIC CHARACTERISTICS OF PIPE

7.1 Visual Appearance

The internal and external surface of the pipe shall be smooth, clean and free from grooving and other defects. The ends of the pipes shall be cleanly cut square with the axis of the pipe to within the tolerances given below and free from deformity. Slight shallow longitudinal grooves or irregularities in the wall thickness shall be permissible, provided that the wall thickness remains within the permissible limits.

Nominal diameter DN mm (1)	*Maximum Out of Square of Pipe End* mm (2)
16 to 75	2
90 to 125	3
140 to 180	4
200 to 280	5
Above 280	7

7.2 Length

The length of straight pipe shall be 5 m to 20 m as agreed to between the manufacturer and purchaser. Short lengths of 3 m (minimum) up to the maximum of 10 percent of the total supply may be permitted.

7.3 Coiling

The pipes shall be coiled such that localized deformation, for example, buckling and kinking is prevented. The minimum internal diameter of the coil shall not be less than 18 d_n. The length of the coiled pipes shall be as agreed between the manufacturer and purchaser.

7.4 Dimensions

The mean outside diameters, d_{em}, and the out-of-roundness (ovality) of the pipes for different nominal diameters covered in the standard shall be in accordance with Table 3. The minimum and maximum wall thickness of pipes shall be as given in Table 4.

7.4.1 *Methods of Measurement*

7.4.1.1 Mean outside diameter of the pipe shall be the

Table 3 Mean Outside Diameters and Out-of-Roundness

(*Clause* 7.4)

All dimensions in millimetres.

SI No.	Nominal Size DN/OD	Nominal Outside Diameter d_n	Mean Outside Diameter $(d_{em,min})$	$(d_{em,max})$	Maximum Out-of-Roundness (Ovality)
(1)	(2)	(3)	(4)	(5)	(6)
i	16	16	16.0	16.3	1.2
ii	20	20	20.0	20.3	1.2
iii	25	25	25.0	25.3	1.2
iv	32	32	32.0	32.3	1.3
v	40	40	40.0	40.4	1.4
vi	50	50	50.0	50.4	1.4
vii	63	63	63.0	63.4	1.5
viii	75	75	75.0	75.5	1.6
ix	90	90	90.0	90.6	1.8
x	110	110	110.0	110.7	2.2
xi	125	125	125.0	125.8	2.5
xii	140	140	140.0	140.9	2.8
xiii	160	160	160.0	161.0	3.2
xiv	180	180	180.0	181.1	3.6
xv	200	200	200.0	201.2	4.0
xvi	225	225	225.0	226.4	4.5
xvii	250	250	250.0	251.5	5.0
xviii	280	280	280.0	281.7	9.8
xix	315	315	315.0	316.9	11.1
xx	355	355	355.0	357.2	12.5
xxi	400	400	400.0	402.4	14.0
xxii	450	450	450.0	452.7	15.6
xxiii	500	500	500.0	503.0	17.5
xxiv	560	560	560.0	563.4	19.6
xxv	630	630	630.0	633.8	22.1
xxvi	710	710	710.0	714.4	—
xxvii	800	800	800.0	805.2	—
xxviii	900	900	900.0	905.1	—
xxix	1 000	1 000	1 000.0	1 006.0	—
xxx	1 200	1 200	1 200.0	1 210.8	—
xxxi	1 400	1 400	1 400.0	1 412.6	—
xxxii	1 600	1 600	1 600.0	1 614.4	—
xxxiii	1 800	1 800	1 800.0	1 816.2	—
xxxiv	2 000	2 000	2 000.0	2 018.0	—

NOTE — For coiled pipes and for straight lengths with diameters ≥ 710 mm, the minimum out-of-roundness shall be as agreed to between the manufacturer and the purchaser.

average of two measurements taken using a vernier at right angles for pipes up to 50 mm diameter. For higher sizes, the diameter shall be measured using a flexible PI tape or a circometer, having an accuracy of not less than 0.1 mm. The wall thickness shall be measured by a dial vernier or ball ended micrometer. The resulting dimension shall be expressed to the nearest 0.1 mm.

NOTES

1 The outside diameter shall be measured at a distance of at least 100 mm from the end of the pipe.

2 In the case of discrepancy, the dimension of pipes shall be measured after conditioning at room temperature (27°C ± 2°C) for 4 h.

7.4.1.2 *Ovality*

Ovality shall be measured at 300 mm away from cut end, using a scale having suitable graduations. For

Table 4 Standard Dimension Ratio (SDR) and Corresponding Wall Thicknesses (e) of Pipes

(Clauses 7.4 and E-4.3)

SDR	SDR 41	SDR 33	SDR 26	SDR 21	SDR 17	SDR 13.6	SDR 11	SDR 9	SDR 7.4	SDR 6
PE 63	PN 2	PN 2.5	PN 3.2	PN 4	PN 5	PN 6	PN 8	PN 10	PN 12.5	PN 16
PE 80	PN 2.5	PN 3.2	PN 4	PN 5	PN 6	PN 8	PN 10	PN 12.5	PN 16	PN 20
PE 100	PN 3	PN 4	PN 5	PN 6	PN 8	PN 10	PN 12.5	PN 16	PN 20	PN 25

Nominal Pressure (PN) Bar

Nominal OD d_n, mm	Wall Thickness																					
	e_{min} mm	e_{dev} mm	e_{min} mm	e_{dev} mm	e_{min} mm	e_{dev} mm	e_{min} mm	e_{dev} mm	e_{min} mm	e_{dev} mm	e_{min} mm	e_{dev} mm	e_{min} mm	e_{dev} mm	e_{min} mm	e_{dev} mm	e_{min} mm	e_{dev} mm	e_{min} mm	e_{dev} mm	e_{min} mm	e_{dev} mm
16																					2.3	0.5
20																					2.3	0.5
25																					2.3	0.5
32																					2.4	0.5
40																					2.4	0.5
50																					2.4	0.5
63																					2.5	0.5
75	1.9	0.4																			2.5	0.5
90	2.2	0.4																			2.7	0.5
110	2.7	0.5																			2.7	0.5
125	3.1	0.5																			3.1	0.5
140	3.5	0.6																			3.1	0.5
160	3.9	0.6																			3.2	0.5
180	4.4	0.7																			3.2	0.5
200	4.9	0.7																			3.2	0.5
225	5.5	0.8																			3.2	0.5
250	6.1	0.9																			3.2	0.5
280	6.9	1.0																			3.2	0.5
315	7.7	1.1																			3.2	0.5
355	8.7	1.2																			3.2	0.5
400	9.8	1.4																			3.2	0.5
450	11.0	1.5																			3.2	0.5
500	12.2	1.7																			3.2	0.5
560	13.7	1.9																			3.2	0.5
630	15.4	2.1																			3.2	0.5
710	17.3	2.4																			3.2	0.5
800	19.5	2.7																			3.2	0.5
900	22.0	3.0																			3.2	0.5
1 000	24.4	3.3																			3.2	0.5
1 200	29.3	3.9																			3.2	0.5
1 400	34.1	4.5																			3.2	0.5
1 600	39.0	5.1																			3.2	0.5
1 800	43.9	5.8																			3.2	0.5
2 000	48.8	6.4																			3.2	0.5

NOTES

1 Tolerances calculated from (0.1 e_{dev} + 0.1) mm rounded up to the next 0.1 mm.

1 Tolerances calculated from (0.1 e_{dev} + 0.1) mm rounded up to the next 0.1 mm.

2 All pressure ratings are calculated at 27°C and rounded up to nearest pressure class

coiled pipes and pipes having SDRs > 21, re-rounding shall be permissible before the measurement of ovality. The ovality shall be measured during extrusion and prior to coiling.

8 PERFORMANCE REQUIREMENTS

8.1 Hydraulic Characteristics

8.1.1 *Internal Pressure Creep Rupture Test of Pipe*

When subjected to internal pressure creep rupture test in accordance with procedure given in Annex E and test parameters as specified in Table 5, the pipes under test shall show no signs of localized swelling, leakage or weeping and shall not burst during the prescribed test period.

Table 5 Hydraulic Characteristic Requirements of Pipes

(Clauses 8.1.1 and E-4.3)

Sl No.	Test Temp °C	Test Duration h	Induced Hoop Stress MPa		
			PE 63	PE 80	PE 100
(1)	(2)	(3)	(4)	(5)	(6)
i)	27±	100	6.9	8.6	10.7
ii)	80	48	3.8	4.9	5.2
iii)	80	165	3.5	4.5	5.4
iv)	80	1000	3.2	4.0	5.0

8.1.2 *Internal Pressure Creep Rupture Test of Pipe Joints*

The pipe joints shall also be tested for the hydraulic characteristic requirement by subjecting the butt fusion joint or electro fusion joint of a pipe to internal pressure creep rupture test at 80°C for 48 h as per Table 5 and in accordance with the method given in Annex E. The pipe joints under test shall show no signs of localized swelling, leakage or weeping and shall not burst during the prescribed test period.

8.2 Longitudinal Reversion Test

When tested in accordance with the method given in Annex F, the value of the longitudinal reversion shall not be greater than 3 percent.

8.3 Carbon Black Content and Dispersion

When tested from a composite sample of minimum three pipes, in accordance with IS 2530, the carbon black content shall be within 2.5 ± 0.5 percent, and the dispersion of carbon black shall be satisfactory.

8.4 Melt Flow Rate

When tested from a composite sample of minimum three pipes as per IS 2530 at 190° C with nominal load of 5 kgf, MFR shall not deviate from the MFR of the resin by more than 30 percent.

8.5 Oxidation Induction Time

The minimum oxidation induction time of the pipe when tested in accordance with the method given in Annex B shall be not less than 20 min.

8.6 Overall Migration

When tested from a composite sample of minimum 3 pipes as per IS 9845, the overall migration of constituents shall be within the limits stipulated in IS 10146.

8.7 Density

When tested from a composite sample of minimum of 3 pipes as per IS 7328, the base density of the pipe shall be between 930 to 960 kg/m³.

8.8 Tensile Strength for Butt-fusion

When tested according to Annex G, the test specimens prepared by punching/machining from pipe butt fusion sample preferably 110 mm Dia/SDR 11 shall show ductile failure. If the sample shows brittle fail the test may be considered as a failure.

NOTE — If 110 mm/SDR 11 pipes are not being manufactured, test shall be carried out on the nearest, preferably higher size/SDR ratio being manufactured.

8.9 Elongation at Break

When tested according to Annex H, the test specimens punched/machined from pipe samples, shall meet requirement as per Table 6.

8.10 Slow Crack Growth Rate

When subjected to test parameters as given below and tested in accordance with the procedure given in Annex E, the notched test specimens prepared from pipe size of preferably 110 mm and SDR 11 in accordance with Annex J shall show no signs of localized swelling, leakage or weeping and shall not burst during the prescribed test period.

Test Temperature °C	*Test Duration* h	*Internal Test Pressure,* MPa		
		PE 63	PE 80	PE 100
80 ± 1	500 h	0.64	0.8	0.92

NOTE — If 110 mm/SDR 11 pipes are not being manufactured, test shall be carried out on the nearest, preferably higher size/SDR ratio being manufactured.

Table 6 Elongation at Break Requirements of Pipes
(*Clause* 8.9)

Sl No.	Characteristics	Requirements	Test Parameters		Test Method, Ref to
			Parameter	Value	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Elongation at break for $e \leq 5$ mm	$\geq$ 350 percent	Test piece shape Test speed	Type 2 100 mm/min	Annex H
ii)	Elongation at break for 5 mm $< e \leq$ 12 mm	$\geq$ 350 percent	Test piece shape Test speed	Type 1 [1] 50 mm/min	Annex H
iii)	Elongation at break for $e >$ 12 mm	$\geq$ 350 percent	Test piece shape Test speed	Type 1 [1] 25 mm/min	Annex H
			Test piece shape Test speed	Type 3 [1] 10 mm/min	

[1] Where practical, machined type 2 test pieces may be used for pipe wall thickness $\leq$ 25 mm. The test may be terminated when the requirement is met, without continuing until the rupture of the test piece.

9 SAMPLING, FREQUENCY OF TESTS AND CRITERIA FOR CONFORMITY

9.1 Type Tests

9.1.1 Type tests are intended to prove the suitability and performance of a new composition, a new technique or a new size of a pipe. Such tests, therefore, need be applied only when a change is made in polymer composition or method of manufacture, or when a new size of pipe is to be introduced. Even if no change is envisaged, type test shall be done at least once in two years on each pressure rating and grade of pipe of the highest size manufactured during the period.

9.1.2 Three samples of the same grade, same size and same SDR selected at random shall be tested for compliance with the requirements of the type tests as given in Table 7.

9.1.3 If all the samples pass the requirements of the type test, the type of the pipe under consideration shall be considered eligible for type approval.

9.1.4 In case of any of the samples fails in the type test, the testing authority, at its discretion, may call for fresh samples not exceeding the original number and subject them to the type test again. If in repeat test, no single failure occurs, the type of pipe under consideration shall be considered eligible for type approval. If any of the samples fails in the repeat tests, the type of pipe shall not be approved. The manufacturer or the supplier may be asked to improve the design and resubmit the product for type approval.

9.1.5 At the end of the validity period (normally one year for internal pressure creep rupture test at 27°C for 100 h and two years for all other type tests) or earlier as may be necessary, the testing authority may call for fresh samples for type-test for the purpose of type approval.

Table 7 Type Tests
(*Clause* 9.1.2)

Sl No.	Description of Test	Sample Size	Requirement Clause
(1)	(2)	(3)	(4)
i)	Tensile strength for butt-fusion	3	8.8
ii)	Overall migration	3	8.6
iii)	Internal pressure creep rupture test (hydrostatic resistance test) at 27°C for 100 h	3	8.3.1
iv)	Internal pressure creep rupture test (hydrostatic resistance test) at 80°C for 165 h	3	8.3.1
v)	Internal pressure creep rupture test (hydrostatic resistance test) at 80°C for 1 000 h test	3	8.3.1
vi)	Slow crack growth rate test	3	8.10

9.2 Acceptance Test

9.2.1 Acceptance tests are carried out on sample selected from a lot for the purpose of acceptance of the lot.

9.2.2 *Lot*

All pipes of the same grade, same size, same SDR and also manufactured essentially under similar conditions of manufacture shall constitute a lot. For ascertaining conformity of the lot to the requirements of this standard, samples for acceptance tests (see Table 8) shall be selected and prepared after conditioning at 27±2°C and tested for compliance as per Table 8.

Table 8 Acceptance Tests

(Clause 9.2.2)

Sl No.	Description of Test	Sample Size	Requirement Clause
(1)	(2)	(3)	(4)
(i)	Visual appearance and dimensions	Table 9	7.3 to 7.4
(ii)	Melt flow rate	Table 10	8.4
(iii)	Density	Table 10	8.7
(iv)	Hydrostatic test	Table 10	8.2
(v)	Elongation at break	Table 10	8.9
(vi)	Carbon black content	Table 10	8.3
(vii)	Carbon black dispersion	Table 10	8.3
(viii)	Oxidation induction	Table 10	8.5
(ix)	Internal pressure creep rupture test (hydrostatic resistance test) at 80°C for 48 h	Table 10	8.1.1
(x)	Internal pressure creep rupture test (hydrostatic resistance test) for joints at 80°C for 48 h	Table 10	8.1.2

9.2.3 *Conformity to Dimensional and Visual Characteristics*

9.2.3.1 The number of test samples shall be in accordance with Table 9.

9.2.3.2 These pipes shall be selected at random from the lot and in order to ensure the randomness of selection, a random number table shall be used. For guidance and use of random number tables, IS 4905 may be referred. For the above purpose, each length of the coil of a given size, grade and SDR shall be considered as one pipe. In the absence of a random number table, the following procedure may be adopted.

Starting from any pipe in the lot, count them as 1, 2, 3, 4, etc, up to *r* and so on where *r* is the integral part of *N*/*n*, *N* being the number of pipes in the lot and *n* is the number of pipes in the samples. Every *r*th pipe so counted shall be drawn so as to constitute the required sample size.

9.2.3.3 The number of pipes given for the first sample in col 3 of Table 9 shall be examined for visual and dimensional requirements as given in 7.3 and 7.4 respectively. A pipe failing to satisfy any of these requirements shall be considered as defective. The lot shall be deemed to have satisfied these requirements, if the number of defectives found in the first sample are less than or equal to the corresponding acceptance number given in col 5 of Table 9. The lot shall be deemed not to have met these requirements if the number of defectives found in the first sample is greater than or equal to the corresponding rejection numbers given in col 6 of Table 9. If, however, the number of defectives found in the first sample lies between the corresponding acceptance and rejection numbers given in col 5 and 6 of Table 9, the second sample of the size given in col 3 of Table 9 shall be taken and examined for these requirements. The lot shall be considered to have satisfied these requirements, if the number of defectives found in the cumulative sample is less than or equal to the corresponding acceptance number given in col 5 of Table 9 otherwise not. In case, the sample size equals, or exceeds, lot size, 100 percent inspection shall be done for these tests and all the samples from the lot which pass these tests shall be tested for other acceptance tests.

9.2.4 *Conformity to Acceptance Tests Other Than Dimensional and Visual Characteristics*

The lot having satisfied dimensional and visual requirements shall be tested for other acceptance tests as given in Table 7. The number of test samples selected from the lot for subjecting to these tests shall be in accordance with Table 10. For the above purpose, each length of the coil of a given size, grade and SDR shall be considered as one pipe. The lot shall be considered to have met the requirements of these tests, if none of samples tested fails.

Table 9 Scale of Sampling for Dimensional Requirements

(Clauses 9.2.3.1 and 9.2.3.3)

Sl No.	No. of Pipes in the Lot	Sample No.	Sample Size	Cumulative Sample Size	Acceptance No.	Rejection No.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(i)	Up to 150	First	13	13	0	2
		Second	13	26	1	2
(ii)	151 to 280	First	20	20	0	3
		Second	20	40	3	4
(iii)	281 to 500	First	32	32	1	4
		Second	32	64	4	5
(iv)	501 to 1 200	First	50	50	2	5
		Second	50	100	6	7
(v)	1 201 to 3 200	First	80	80	3	7
		Second	80	160	8	9
(vi)	3 201 to 10 000	First	125	125	5	9
		Second	125	250	12	13
(vii)	10 001 to 35 000	First	200	200	7	11
		Second	200	400	18	19

Table 10 A Scale of Sampling for Acceptance Tests Other Than Dimensional Requirements

(Clauses 9.2.2 and 9.2.4)

Sl No.	No. of Pipes in the Lot	Sample Size
(1)	(2)	(3)
a) For Pipe Sizes Upto 500 mm		
i)	Up to 150	3
ii)	151 to 1 200	5
iii)	1 201 to 35 000	8
b) For Pipe Sizes Above 500 mm		
i)	Up to 500	3
ii)	501 to 1 200	5
iii)	1 201 to 35 000	5

10 MARKING

10.1 Each straight length/coil of pipe shall be clearly and indelibly marked in white/yellow colour using ink/ paint or inkjet print or hot embossed on white base, at every 1 m throughout the length of pipe/coil with the information given in **10.1.1.**

10.1.1 The marking on the pipe shall carry the following minimum information:

a) Manufacturer's name/trade-mark;
b) Material designation (*see* **6.1**);
c) Pressure rating;
d) Standard dimension ratio (SDR);
e) Outside diameter; and
f) Lot No./Batch No., containing information of date of manufacture.

10.2 BIS Certification Marking

Each pipe/coil may also be marked with the Standard Mark.

10.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which a license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

AMENDMENT NO. 2 APRIL 2022

TO

IS 4984 : 2016 POLYETHYLENE PIPES FOR WATER SUPPLY — SPECIFICATION

(Fifth Revision)

[*Foreword, para* 3, *Sl No.* (a), *fourth sentence*] — Substitute the following for the existing sentence:

'Therefoee, the Committee has decided to retain the present practice of manufacturing PE pipes with master batch technology for black pipes, in addition to manufacture by use of pre-compounded material.'

[*Foreword, para* 3, *Sl No.* (g)] — Substitute the following for the existing:

'g) Carbon black content and its dispersion have not been specified for the raw material as PE resin in its virgin form has been permitted. In case of pre-compounded material, where used, a requirement for obtaining test certificate from the material supplier has been included.'

(*Page* 1, *clause* 2) — Substitute the following for the existing entries for IS 4905 : 1968 and IS 7328 : 1992:

IS No.	*Title*
4905 : 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
7328 : 2020	Specification for polyethylene material for moulding and extrusion (*second revision*)

(*Page* 1, *clause* 2) — Delete the entry for IS 10141 : 1982.

(*Page* 1, *clause* 2) —Insert the following new entry at the end:

IS No.	*Title*
16738 : 2018	Positive list of constituents for polypropylene, polyethylene and their copolymers for its safe use in contact with foodstuffs and pharmaceuticals

(*Page* 2, *clause* **3.21**) — Insert the following new clause after the clause:

'**3.22 Rework Material** — Material prepared from rejected unused pipes, including trimmings from the production of pipes, that will be reprocessed in a manufacturer's plant by a process such as extrusion and for which the complete formulation is known.

(*Page* 2, *clause* **5.1**) — Insert the following at the end:

'The various constituents used to make the material for extrusion shall meet the requirements specified in **5.2** to **5.5**.'

(*Page* 3, *clause* **5.2**) — Substitute the following for the existing clause:

'**5.2 Polyethylene Resin**

5.2.1 PE resin used for the manufacture of pipes shall conform to parameters mentioned in Table 2. In addition, the resin shall conform to the requirements of IS 10146 and **5.5** of IS 7328.

The material classification and conformity to Table 2, **5.5** of IS 7328 and IS 10146 shall be provided by raw material (resin) manufacturer with documentation duly certified by the resin manufacturer.

5.2.1.1 In case of pre-compounded black material, the PE resin shall meet the requirements in **5.2.1**. The other constituents used should be from the positive list of constituents of PE in contact with foodstuff and pharmaceuticals as per IS 16738 and should not constitute a toxic hazard, shall not support microbial growth and shall not give rise to an unpleasant taste or odour, cloudiness or discolouration of the water. The certificate for conformity in such a case shall additionally include the results of compound density, carbon black content, toluene extract, maximum volatile matter, carbon black particle size, ash content and carbon black dispersion to establish conformity to the requirements specified in Sl No. (i) of Table 2, **8.3**, Sl No. (2), (3) and (4) of **5.3**(e), **5.3**(d) and **8.3**, respectively.'

[*Page* 3, *clause* **5.3**(b), *line* 4] — Substitute 'IS 16738' *for* 'IS 10141'.

[*Page* 4, *Table* 2, *Sl No.* (i), *col* 4] — Substitute '940-960 (The tested value of density shall not differ from density declared/nominated by the resin manufacturer by more than 3 kg/m^3.)' *for* '930-960'.

[*Page* 4, *Table* 2, *Sl No.* (ii), *col* 4] — Substitute '0.15 to 1.1 (both inclusive)[2] (The tested value of melt flow rate (MFR) shall be within ± 20 percent of the MFR declared/nominated by the resin manufacturer if the latter is 1 or above, and within ± 30 percent if the latter is less than 1)' *for* '0.2 to 1.1 (both inclusive)'.

(*Page* 4, *Table* 2, *footnote* [2]) — Insert the following new footnote at the end of table:

[2] In case of materials with 0.15 < MFR < 0.20, attention is drawn to the fusion compatibility which has to be established by the raw material supplier. The lowest MFR value resulting from the maximum lower deviation of the nominated value should be not less than 0.15. For 0.15 ≤ MFR < 0.20 compounds, fusion compatibility of larger diameter thicker-walled pipes should be investigated to confirm compatibility. If electrofusion jointing is to be adopted, appropriate testing should be carried out to verify the fusion capability of such pipes.

(*Page* 4, *clause* **5.4**, *line* 4) — Substitute 'IS 16738' *for* 'IS 10141'.

(*Page* 4, *clause* **5.5**) — Substitute the following for the existing clause:

'**5.5 Rework Material**

The addition of not more than 5 percent of the manufacturer's own rework material conforming to this standard is permissible. No other rework material shall be used.'

(*Page* 4, *clause* **6.1.3**, *line* 6) — Substitute '2 000, 2 250, 2 500 mm' *for* '2 000 mm'.

(*Page* 4, *clause* **6.1.4**, *Informal Table*) — Delete the entry for PN 5 from the table.

(*Page* 4, *clause* **6.2.1**, *line* 5) — Delete the term 'preferably'.

[*Page* 5, *Table* 3, *Sl No.* (xxxiv)] — Insert the following new entries at the end:

Sl No.	Nominal Size DN/OD	Nominal Outside Diameter, d_n	Mean Outside Diameter		Maximum Out-of-Roundness (Ovality)
			$(d_{em,min})$	$(d_{em,max})$	
(1)	(2)	(3)	(4)	(5)	(6)
xxxv)	2 250	2 250	2 250.0	2 278.3	-
xxxvi)	2 500	2 500	2 500.0	2 522.5	-

(*Page* 5, *clause* **7.4.1.1**, *Note* 2) — Substitute 'dispute' *for* 'discrepancy'.

(*Page* 5, *clause* **7.4.1.2**) — Substitute the following for the existing clause:

'Ovality shall be measured at 300 mm away from cut end, using a scale having suitable graduations/sliding vernier calliper permitting reading to the nearest 0.05 mm. For coiled pipes and straight pipes having SDRs ≥ 21, re-rounding shall be permissible before the measurement of ovality.

Ovality shall also be measured by the manufacturer during extrusion and prior to coiling and a record of the results obtained shall be maintained for inspection by the purchaser, wherever required.'

(*Page 6, Table 4*) — Substitute the following for the existing table:

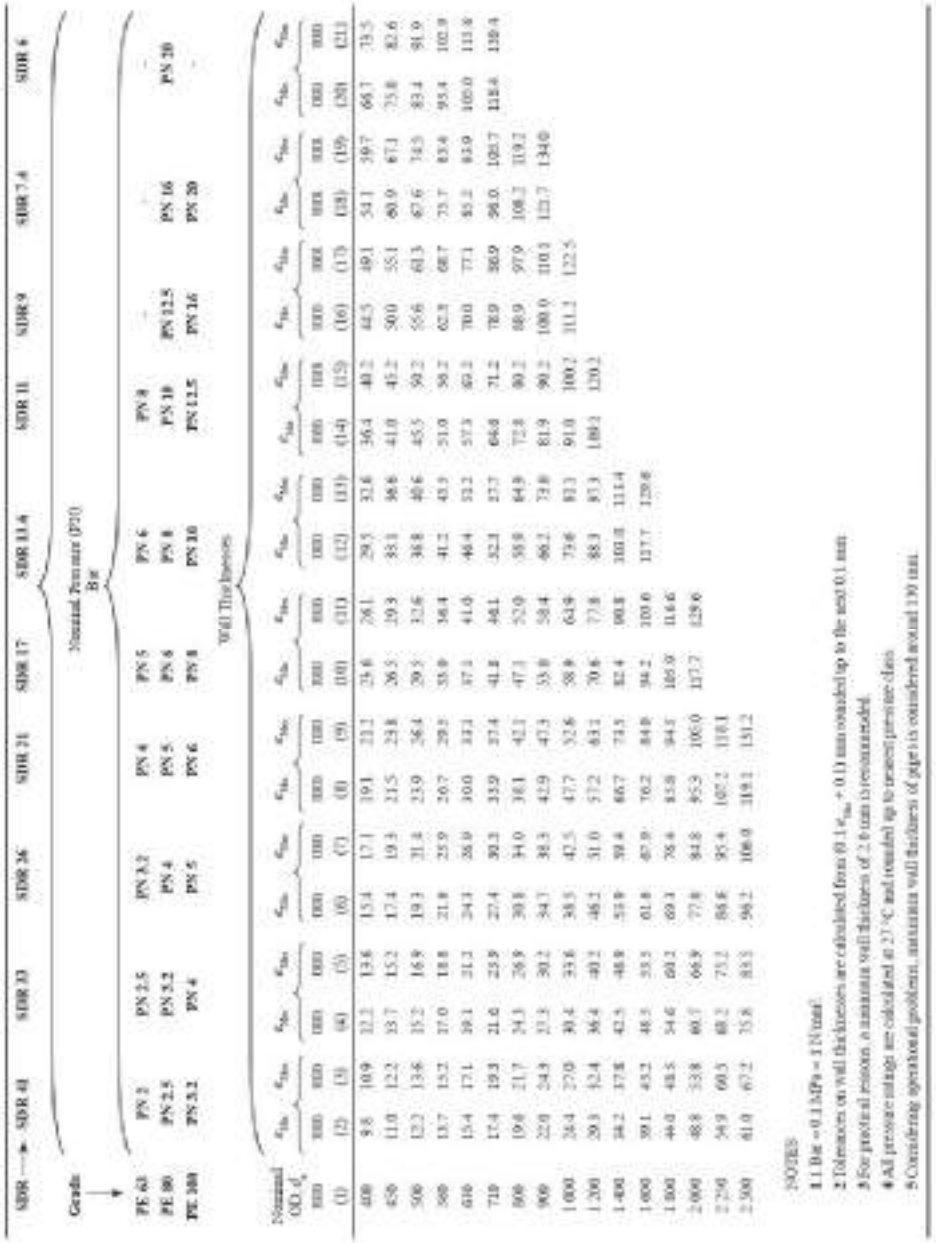
Table 4 Standard Dimension Ratio (SDR) and Corresponding Wall Thicknesses (*e*) of Pipes

(*Clauses* 7.2 *and* E-4.3)

SDR →	SDR 41	SDR 33	SDR 26	SDR 21	SDR 17	SDR 13.6	SDR 11	SDR 9	SDR 7.4	SDR 6
Grade ↓	Nominal Pressure (PN) Bar									
PE 63	PN 2	PN 2.5	PN 3.2	PN 4	PN 5	PN 6	PN 8	-	-	-
PE 80	PN 2.5	PN 3.2	PN 4	PN 5	PN 6	PN 8	PN 10	PN 12.5	PN 16	PN 20
PE 100	PN 3.2	PN 4	PN 5	PN 6	PN 8	PN 10	PN 12.5	PN 16	PN 20	-

Nominal OD d_n	Wall Thickness																			
	e_{min}	e_{max}	e_{min}	e_{max}	e_{min}	e_{max}	e_{min}	e_{max}	e_{min}	e_{max}	e_{min}	e_{max}	e_{min}	e_{max}	e_{min}	e_{max}	e_{min}	e_{max}	e_{min}	e_{max}
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	2.3	2.7	3.0	3.7	4.1
20	-	-	-	-	-	-	-	-	-	-	-	-	2.0	2.3	2.3	2.7	2.8	3.2	3.4	3.9
25	-	-	-	-	-	-	-	-	2.0	2.3	2.3	2.7	2.8	3.2	3.4	3.8	4.2	4.6	4.2	4.8
32	-	-	-	-	-	-	-	-	2.4	2.8	3.0	3.4	3.7	4.2	4.4	4.9	5.4	5.9	5.4	6.1
40	-	-	-	-	-	-	2.0	2.3	2.4	2.8	3.0	3.4	3.7	4.2	4.4	5.5	6.2	6.7	6.7	7.5
50	-	-	-	-	2.0	2.3	2.4	2.8	3.0	3.4	3.7	4.2	4.6	5.2	5.5	6.8	7.6	8.4	8.4	9.4
63	-	-	-	-	2.5	2.9	3.0	3.4	3.8	4.3	4.7	5.3	5.8	6.5	7.0	8.6	9.6	10.5	10.5	11.7
75	2.0	2.3	2.3	2.7	2.9	3.3	3.6	4.1	4.5	5.1	5.6	6.3	6.9	7.7	8.4	10.2	11.4	12.5	12.5	13.9
90	2.2	2.6	2.8	3.2	3.5	4.0	4.3	4.9	5.3	6.0	6.7	7.5	8.2	9.2	10.0	12.2	13.6	15.0	15.0	16.6
110	2.7	3.1	3.4	3.9	4.3	4.9	5.3	6.0	6.5	7.3	8.1	9.1	10.0	11.1	12.3	14.9	16.5	18.4	18.4	20.4
125	3.1	3.6	3.8	4.3	4.8	5.3	6.0	6.7	7.4	8.3	9.2	10.3	11.4	12.7	13.9	16.9	18.7	20.9	20.9	23.1
140	3.5	4.0	4.3	4.9	5.4	6.1	6.7	7.5	8.3	9.3	10.3	11.5	12.8	14.2	15.6	19.0	21.0	23.4	23.4	25.9
160	4.0	4.3	4.9	5.5	6.2	7.0	7.7	8.6	9.5	10.6	11.8	13.1	14.6	16.2	17.8	21.7	24.0	26.7	26.7	29.5
180	4.4	5.0	5.5	6.2	7.0	7.8	8.6	9.6	10.6	11.8	13.3	14.8	16.4	18.2	20.0	24.4	27.0	30.0	30.0	33.1
200	4.9	5.5	6.1	6.9	7.7	8.6	9.6	10.7	11.8	13.1	14.8	16.4	18.2	20.2	22.3	27.1	30.0	33.4	33.4	36.9
225	5.5	6.2	6.9	7.7	8.7	9.7	10.8	12.0	13.3	14.8	16.6	18.4	20.5	22.7	25.0	30.5	33.7	37.5	37.5	41.4
250	6.1	6.9	7.6	8.5	9.7	10.8	12.0	13.3	14.8	16.4	18.4	20.4	22.8	25.2	27.8	33.8	37.3	41.7	41.7	46.0
280	6.9	7.7	8.5	9.5	10.8	12.0	13.4	14.9	16.5	18.3	20.6	22.8	25.5	28.2	31.2	37.9	41.8	46.7	46.7	51.5
315	7.7	8.6	9.6	10.7	12.2	13.6	15.0	16.6	18.6	20.6	23.2	25.7	28.7	31.7	35.0	42.6	47.0	52.5	52.5	57.9
355	8.7	9.7	10.8	12.0	13.7	15.2	17.0	18.8	20.9	23.1	26.2	29.0	32.3	35.7	39.5	48.0	52.9	59.2	59.2	65.3

Table 4 (Concluded)



SDR →	SDR 41	SDR 33	SDR 26	SDR 21	SDR 17	SDR 13.6	SDR 11	SDR 9	SDR 7.4	SDR 6
Grade →	Nominal Pressure (PN) Bar									
PE 63	PN 2	PN 2.5	PN 3.2	PN 4	PN 5	PN 6	PN 8	PN 10	PN 12.5	PN 16
PE 80	PN 2.5	PN 3.2	PN 4	PN 5	PN 6	PN 8	PN 10	PN 12.5	PN 16	PN 20
PE 100	PN 3.2	PN 4	PN 5	PN 6	PN 8	PN 10	PN 12.5	PN 16	PN 20	PN 25
	Wall Thickness									

Nominal OD d_n	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}	e_{min}
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
400	9.8	10.9	12.2	13.6	15.4	17.1	19.1	21.1	23.6	26.1	29.5	32.6	36.4	40.2	44.5	49.1	54.1	59.7	66.7	73.5
450	11.0	12.2	13.7	15.2	17.4	19.3	21.5	23.8	26.5	29.3	33.1	36.6	41.0	45.2	50.0	55.1	60.9	67.1	75.0	82.6
500	12.3	13.6	15.2	16.9	19.3	21.4	23.9	26.4	29.5	32.6	36.8	40.6	45.5	50.2	55.6	61.3	67.6	74.5	83.4	91.9
560	13.7	15.2	17.0	18.8	21.8	23.9	26.7	29.5	33.0	36.4	41.2	45.3	51.0	56.2	62.3	68.7	75.7	83.4	93.4	102.9
630	15.4	17.1	19.1	21.2	24.3	26.9	30.0	33.1	37.1	41.0	46.4	51.2	57.3	63.2	70.0	77.1	85.2	93.9	105.0	115.8
710	17.4	19.3	21.6	23.9	27.4	30.3	33.9	37.4	41.8	46.1	52.3	57.7	64.6	71.2	78.9	86.9	96.0	105.7	118.4	130.4
800	19.6	21.7	24.3	26.9	30.8	34.0	38.1	42.1	47.1	52.0	58.8	64.9	72.8	80.2	88.9	97.9	108.2	119.2		
900	22.0	24.3	27.3	30.2	34.7	38.3	42.9	47.3	53.0	58.4	66.2	73.0	81.9	90.2	100.0	110.1	121.7	134.0		
1 000	24.4	27.0	30.4	33.6	38.5	42.5	47.7	52.6	58.9	64.9	73.6	81.1	91.0	100.2	111.2	122.5				
1 200	29.3	32.4	36.4	40.2	46.2	51.0	57.2	63.1	70.6	77.8	88.3	97.3	109.2	120.2						
1 400	34.2	37.8	42.5	46.9	53.9	59.4	66.7	73.5	82.4	90.8	103.0	113.4								
1 600	39.1	43.2	48.5	53.5	61.6	67.9	76.2	84.0	94.2	103.6	117.7	129.6								
1 800	44.0	48.5	54.6	60.2	69.3	76.4	85.8	94.5	105.9	116.6										
2 000	48.8	53.8	60.7	66.9	77.0	84.8	95.2	105.0	117.7	129.6										
2 250	54.9	60.5	68.2	75.2	86.6	95.4	107.2	118.1												
2 500	61.0	67.2	75.8	83.5	96.2	106.0	119.1	131.2												

NOTES

1 1 Bar = 0.1 MPa = 1 N/mm²

2 Tolerances on wall thicknesses are calculated from $0.1\,e_{min} + 0.1$ mm rounded up to the next 0.1 mm

3 For practical reasons, a maximum wall thickness of 2.6 mm is recommended.

4 All pressure ratings are calculated at 27 °C and rounded up to nearest pressure class

5 Considering operational problems, minimum wall thickness of pipe is considered around 130 mm

(*Page* 7, *clause* **8.3**) — Substitute the following for the existing clause:

'**8.3 Carbon Black Content and Dispersion**

When tested from a composite sample of minimum three pipes, in accordance with IS 2530, the carbon black content shall be within 2.5 ± 0.5 percent. When tested from a composite sample of minimum three pipes, the carbon black dispersion shall meet the requirement of **5.4.6** of IS 7328.'

(*Page* 7, *clause* **8.7**) — Substitute the following for the existing clause:

'**8.7 Density**

When tested from a composite sample of minimum three pipes as per IS 7328, the base (corrected) density of pipes shall be between 940 kg/m^3 and 960 kg/m^3 and the same shall not differ from the density of the resin as specified by the resin manufacturer by more than 3 kg/m^3.'

(*Page* 7, *clause* **8.8**, *line* 3) — Substitute '110 mm diameter and SDR 11' for '110 mm Dia/SDR 11'.

(*Page* 7, *clause* **8.8**, Note) — Substitute the following for the existing note:

'NOTE — If 110 mm and SDR 11 pipes are not being manufactured, test shall be carried out on the nearest, preferably higher size of SDR 11 pipe being manufactured. If pipe sizes only below 90 mm are manufactured, the test is not required, however, in such cases, a test certificate from the raw material (resin) supplier for establishing conformity to the above requirement for 110 mm and SDR 11 pipe shall be provided.'

(*Page* 7, *clause* **8.9**) — Substitute the following for the existing clause:

'**8.9 Tensile Properties**

When tested in accordance with Annex H with test parameters as per Table 6, the yield strength and elongation at break shall be as follows:

a) Yield strength : 15 MPa, *Min*

b) Elongation at break : 350 percent, *Min*

(*Page* 7, *clause* **8.10**, *line* 4) — Delete the word 'preferably'.

(*Page* 7, *clause* **8.10**) — Substitute the following for the existing clause:

'**8.10** When subjected to test parameters as given below and tested in accordance with the procedure given in Annex E, the notched test specimens prepared from 110 mm SDR 11 pipe in accordance with Annex J shall show no signs of localized swelling, leakage or weeping and shall not burst during the prescribed test period.

Test Temperature °C	*Test Duration* h	*Internal Test Pressure, Min (or Induced Hoop Stress, Min)* MPa		
		PE 63	PE 80	PE 100
(1)	(2)	(3)	(4)	(5)
80 ± 1	500	0.64 (3.2)	0.8 (4.0)	0.92 (4.6)

8.10.1 If 110 mm SDR 11 pipes are not being manufactured, the test shall be carried out on the nearest higher size SDR 11 pipe being manufactured with test parameters as given in **8.10**.

NOTES

1 The test is applicable to pipes of wall thickness greater than 5 mm.

2 If pipe sizes only below 63 mm are manufactured, the test is not required, however, in such cases, the test certificate from the raw material (resin) supplier for establishing conformity to the above requirement for 110 mm and SDR 11 pipe will suffice.

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3 In case SDR 11 pipes are not manufactured, the internal test pressure values shall be calculated using the formula given in 8.18 (considering pressure reduction coefficient, f_r as 1) for an induced hoop stress of 3.2 MPa, 4.0 MPa and 4.6 MPa for PE 63, PE 80 and PE 100 pipes, respectively.

(*Page* 8, *clause* **9.1.1**, *third sentence*) — Substitute the following for the existing sentence:

'Even if no change is envisaged, type test shall be done at least once during the validity period as mentioned in **9.1.5**.'

[(*Page* 8, *clause* **9.1.5** (*see also* Amendment No. 1)] — Substitute the following for the existing:

'**9.1.5** At the end of the validity period [normally one year for internal pressure creep rupture test at 27 °C for 100 h and internal pressure creep rupture test (hydrostatic resistance test) for joints at 80 °C for 48 h, five years for internal pressure creep rupture test (hydrostatic resistance test) at 80 °C for 1 000 h, and two years for all other type tests] or earlier, as may be necessary, the testing authority may call for fresh samples for type test for the purpose of type approval.'

[*Page* 8, *Table* 7, *Sl No.* (v), *col* 2] — Substitute '1 000 h' for '1 000 h test'.

[*Page* 10, *clauses* **10.1.1** and **10.1.1.1** (*see also Amendment No.* 1)] — Substitute the following for the existing clauses:

'**10.1.1** The marking on the pipe shall carry the following minimum information:

a) Manufacturer's name/trade mark;
b) Pipe designation as per **6.1**; and
c) Lot number/Batch number containing information of date of manufacture.

10.1.1.1 The lot number/batch number shall include the details of production in the following manner:

Year	Month	Day	Machine No.	Shift
XXXX	XX	XX	XXX	X

'

(*Page* 10, *clauses* **10.2**) — Substitute the following for the existing clause:

'**10.2 BIS Certification Marking**

PE pipe for water supply conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and each PE pipe for water supply may be marked with the Standard Mark.'

(*Page* 11, *clause* **B-2**) — Substitute the following for the existing clause:

'A sample from the pipe shall be taken by use of a core drill directed radically through the pipe wall. In case of PE granules, the sample shall be taken in a manner to avoid voids. The diameter of the sample in both the above cases shall be just less than the inner diameter of the sample pan of the thermal analyzer, and care should be taken not to overheat the sample during the coring/cutting operation. Using a scalpel, cut the test pieces that weigh 15 ± 0.5 mg in the form of discs from the inner and outer surfaces of the cored sample. These samples are to be tested with the original surface facing upward.

NOTE — If the purchaser wants to check the characteristics of the base material, the sample should be obtained by cutting a middle-section disc by removing the outer and inner surfaces.'

(*Page* 11, *clause* **B-3**, *para* 1, *line* 4) — Insert ',' between 'made' and 'the'.

(*Page* 12, *clause* **B-3**, *para* 2, *line* 2) — Insert 'and' between 'pan' and 'an'.

(*Page* 12, *clause* **B-3**, *para* 2 and *para* 3) — Substitute 'thermogram' *for* 'thermograph'.

(*Page* 16, *clause* **G-1**, *para* 2, *first sentence*) — Insert the following sentence at the end:

'A ductile failure will be the one which is a gradual failure with significant plastic deformation before rupture. A brittle failure will be the one with abrupt/sudden failure.'

[*Page* 20, *Table* 14, *Sl No.* (iv), *col* 4] — Substitute '6 ± 0.4' *for* '6+0-0.4'.

(*Page* 19, *Annex* H, *Title*) — Substitute the following for the existing title:

'DETERMINATION OF YIELD STRESS AND ELONGATION AT BREAK'.

[*Page* 22, *clause* **H-5**(a), *second sentence*] — Substitute the following for the existing sentence:

'Calculate the minimum initial cross-sectional area, A.'

[*Page* 22, *clause* **H-5**(d)] — Insert the following at the end:

'Also, record the load at yield point (steady load), F, which is the point from where the elongation of the test piece continues without any increase in the load.'

[*Page* 22, *clause* **H-6** (*see also Amendment No.* 1)] — Substitute the following for the existing clause:

'H-6 EXPRESSION OF RESULTS

H-6.1 Elongation at Break

Calculate, for each test piece, the elongation at break, using the following formula:

$$E = \frac{L_1 - L_0}{L_0} \times 100$$

Where,

E = elongation at break, expressed as a percentage;

L_0 = initial gauge length of the test piece, expressed in mm; and

L_1 = gauge length at rupture/break, expressed in mm.

The average value (arithmetic mean) of the elongation at break of the three test pieces shall be obtained and reported.

H-6.2 Yield Stress

Calculate for each test piece, the yield stress on the basis of the minimum initial cross-sectional area of the test piece, using the following formula:

$$\sigma_y = \frac{F}{A}$$

where,

σ_y = tensile stress at yield, in MPa;

F = force at yield, in N; and

A = minimum initial cross-sectional area of the test piece, in mm^2.'

NOTE — The yield stress should, in fact, be calculated using the cross-sectional area of the test piece at yield, but for reasons of convenience, the initial cross-sectional area is used.

The average value (arithmetic mean) of the tensile strength of the three test pieces shall be obtained and reported. The result should be expressed to three significant figures.'

(CED 50)

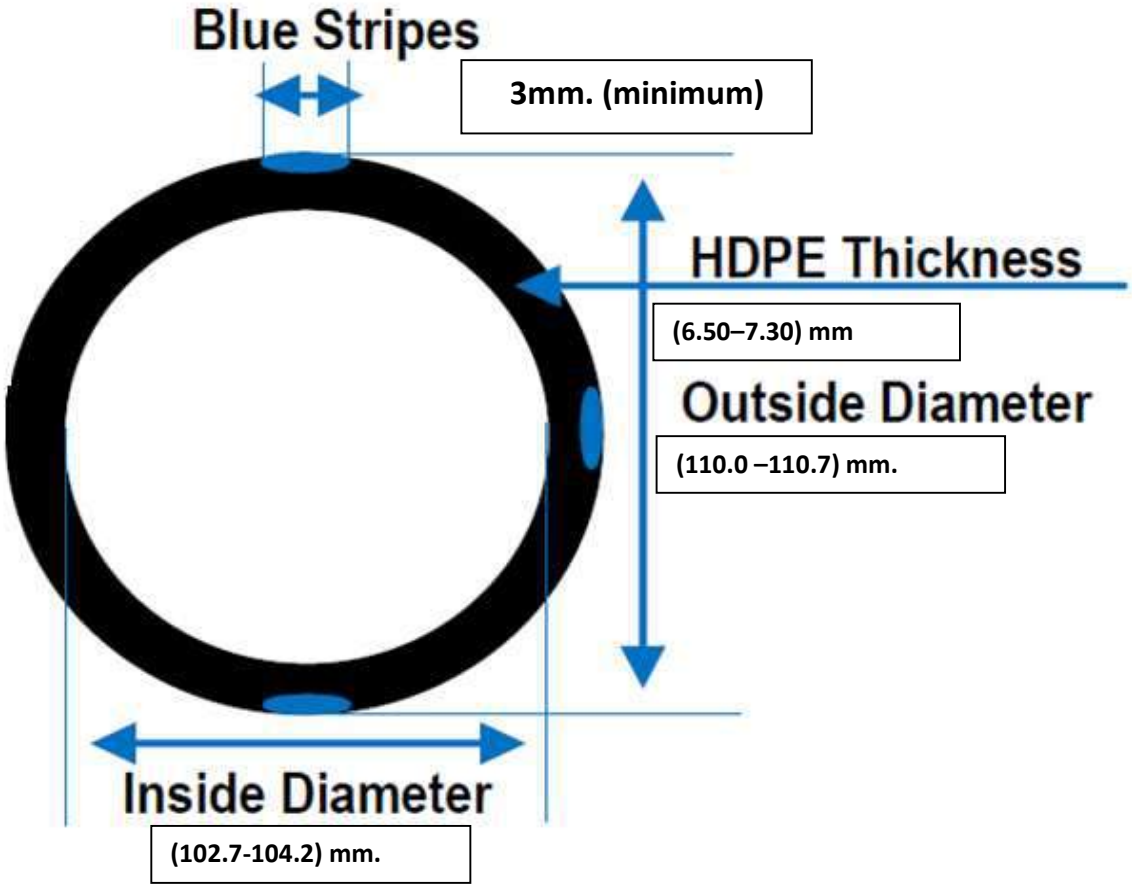
Publication Unit, BIS, New Delhi, India

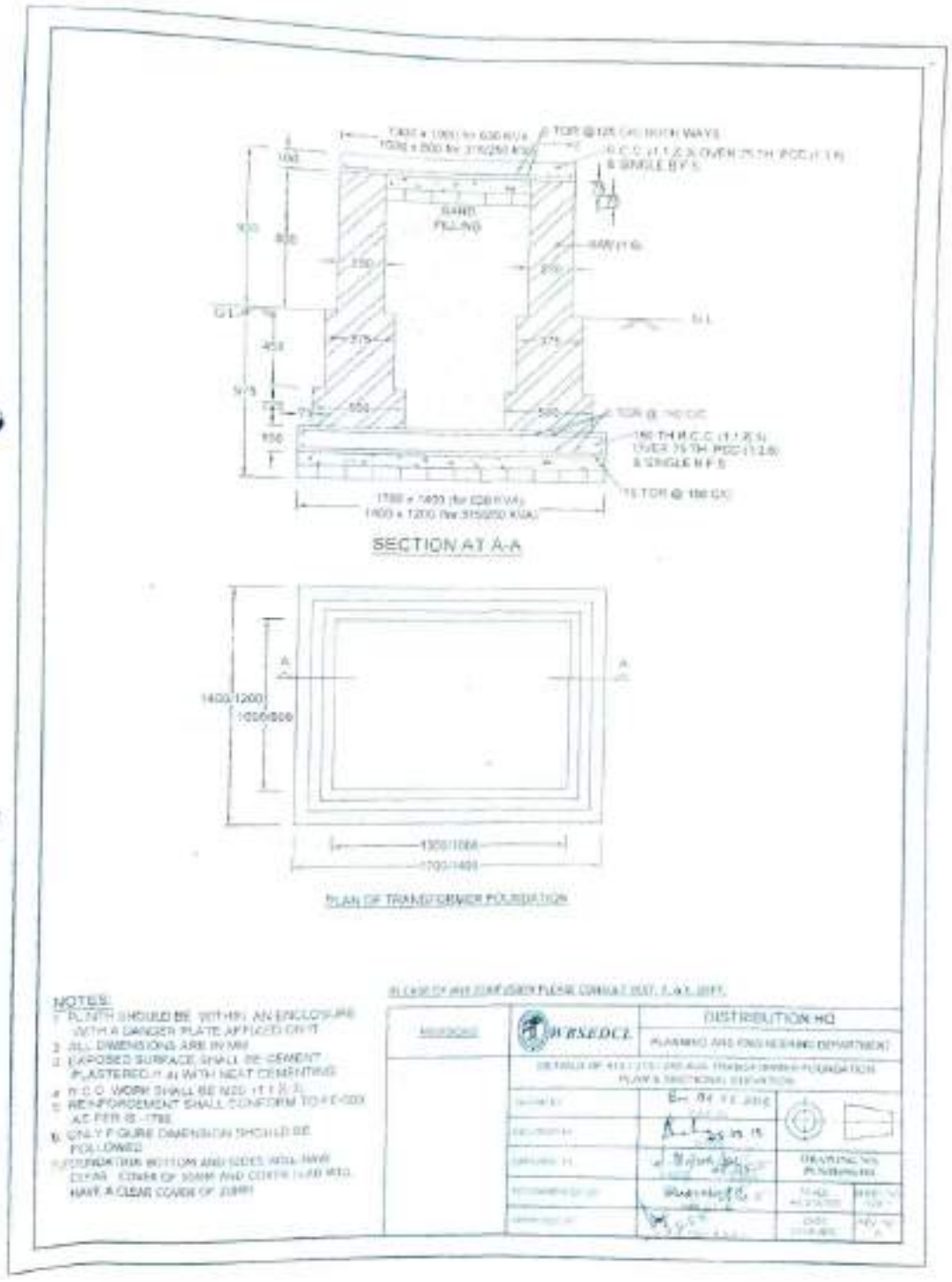
GTP OF PE80 PN6 DN 200 SDR 17, DN 160 SDR 17 & DN 110 SDR 17				
SL. NO.	**PARAMETER**	**SPECIFIED VALUE**	**REF. STANDARD**	**VENDER DATA**
A	**RAW MATERIAL**			
I	PE GRADE	PE 80	IS 4984:2016	PE 80
II	DENSITY	930.0-960.0 KG/M³	IS 7328:1992	930.0-960.0 KG/M³
III	MELT FLOW RATE AT 190°C @5 kg	0.20-1.10 GM/10MINS	IS 2530:1963	0.20-1.10 GM/10MINS
IV	THERMAL STABILITY (OXIDATION INDUCTION TIME)	≥20 MINS AT 200°C ISOTHARMAL	IS 4984:2016	≥20 MINS AT 200°C ISOTHARMAL
V	VOLATITE MATTER	≤350%	IS 4984:2016	≤350%
VI	WATER CONTAIN	≤300%	IS 4984:2016	≤350%
	IN PROCESS			
B	VISUAL APPEARANCE	SATISFACTORY AS PER CLAUSE 9.2.3 OF IS 4984:1995	IS 4984:2016	Internal & External surface of pipe shall be smooth clean and free from grooving. The ends shall be cleanly cut and square with axis of pipe
C	**DIMENSION OF PE80 PN6 DN 200 SDR 17**			
I	OUTSIDE DIAMETER	200 (+)1.0MM, (-)0.0MM	IS 4984:2016	200.0-201.2 MM
II	OVALITY	3.2 MM(MAX)		3.2 MM (MAX)
III	WALL THICKNESS	11.80 – 13.1 MM		11.80 – 13.1 MM
IV	LENGTH OF PIPES	6 METER + 10MM		6 METER + 10MM
	DIMENSION OF PE80 PN6 DN 160 SDR 17			

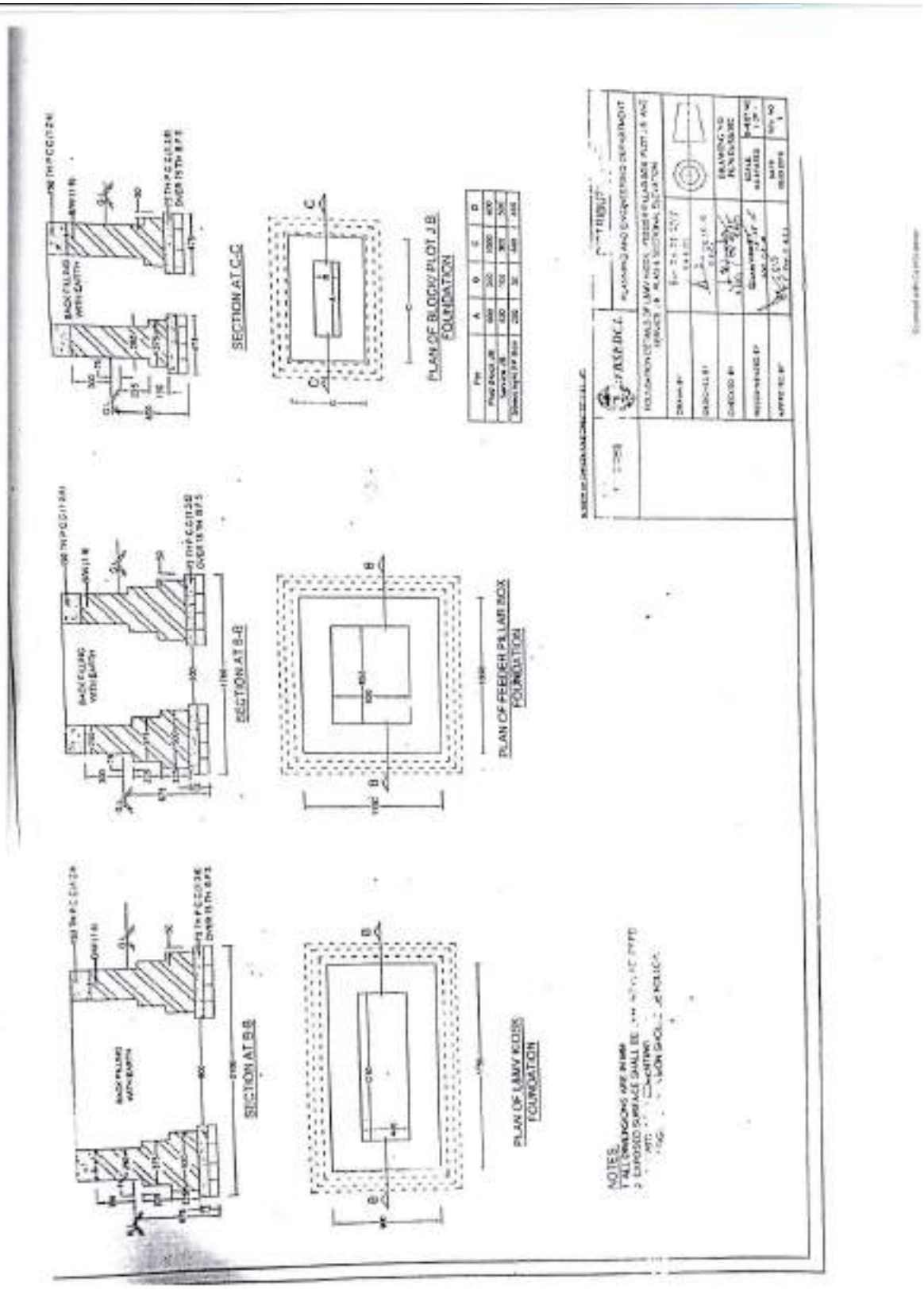
I	OUTSIDE DIAMETER	160 (+)1.0MM, (-)0.0MM	IS 4984:2016	160.0-161.0 MM
II	OVALITY	3.2 MM(MAX)		3.2 MM (MAX)
III	WALL THICKNESS	9.50 – 10.60 MM		9.50 – 10.60 MM
IV	LENGTH OF PIPES	6 METER + 10MM		6 METER + 10MM
	DIMENSION OF PE80 PN6 DN 110 SDR 17			
I	OUTSIDE DIAMETER	110 (+)1.0MM, (-)0.0MM	IS 4984:2016	110.0-110.7 MM
II	OVALITY	2.2 MM(MAX)		2.2 MM (MAX)
III	WALL THICKNESS	6.50 – 7.30 MM		6.50 – 7.30 MM
IV	LENGTH OF PIPES	6 METER + 10MM		6 METER + 10MM
D	MARKING	MARKING BRAND NAME,SIZE WITH GRADE & PRESSURE RATING,ISILOGO,BATCH NO	IS 4984:2016	MARKING BRAND NAME,SIZE WITH GRADE & PRESSURE RATING,ISILOGO,BATCH NO
	PERFORMANCE TESTS			
E	HYDRAULIC CHARACTERISTICS INTERNAL PRESSURE CREEP RAPTURETEST OF PIPE	NO FAILURE OR LEAKAGE AS PER	IS 4984:2016	NO FAILURE OR LEAKAGE ON 6.0Kg/Cm² for 48 Hrs. on 80^0C AS PER IS 4984:2016
F	REVERSION TEST	±3 %(MAX)	IS 4984:2016	Longitudinal Reversion shall not be greater than 3% at 110°C
G	DENSITY TEST AT 27°C	930.0-960.0 KG/M³	IS 7328:1992	930.0-960.0 KG/M³
H	OVERALL MIGRATION TEST	10MG/DM² (MAX)	IS 2530:1963	10MG/DM² (MAX)
I	MFI TEST AT 190°C @5 kg	0.20-1.10 GM/10MINS	IS 2530:1963	0.20-1.10 GM/10 MINS
J	CBC TEST	2.5±0.5 %	IS 2530:1963	2.5±0.5 %

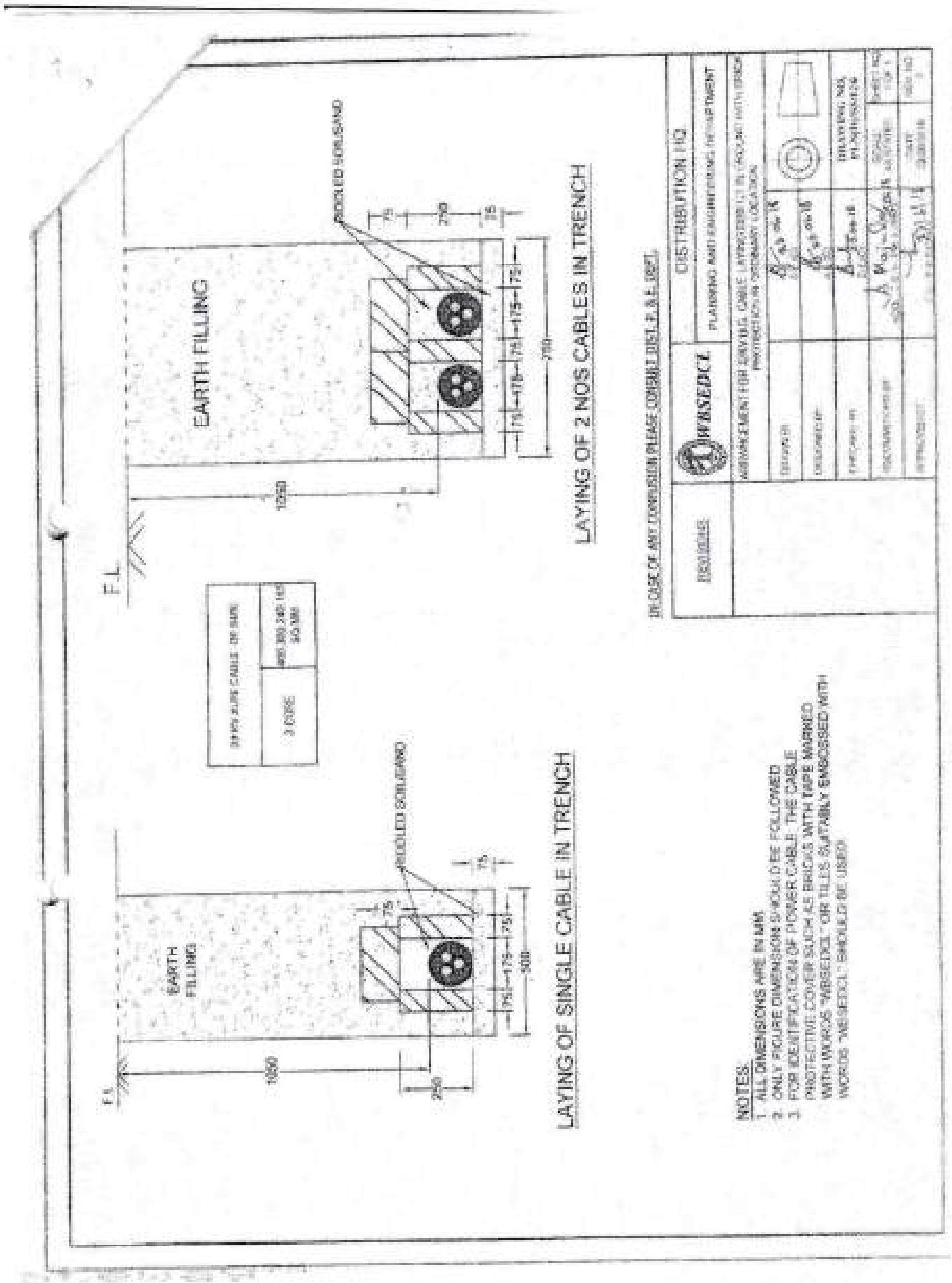
K	CBD TEST	SATISFACTORY	IS 2530:1963	SATISFACTORY
L	ELONGATION AT BREAK	≥350%	IS 4984:2016	≥350%
M	OXIDATION INDUCTION TIME	≥20 MINS AT 200°C ISOTHARMAL	IS 4984:2016	≥20 MINS AT 200°C ISOTHARMAL
N	COLOUR OF THE PIPE	BLACK		
O	IDENTIFICATION OF PIPE & DIMENSION OF STRIP	Pipe shall contain three longitudinal strips of minimum width of 3mm in blue colour& 0.2 mm maximum in depth		

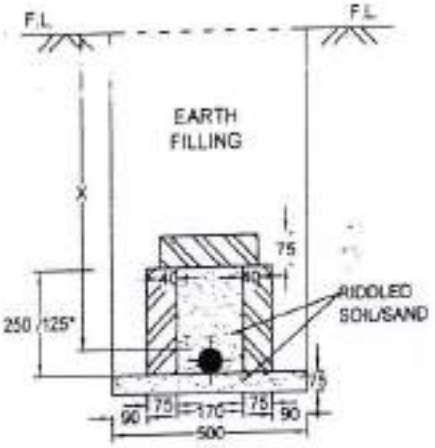
DRAWING OF PE80 PN6 DN110 SDR 17




SAND FILLING
SECTION AT A-A
PLAN OF TRANSFORMER FOUNDATION
NOTES:
DISTRIBUTION HQ
WBSEDCL


SECTION AT C-C
PLAN OF BLOCK/ PLOT J.B FOUNDATION
SECTION AT B-B
PLAN OF FEEDER PILLAR BOX FOUNDATION
SECTION AT B-B
PLAN OF LAMP POSTS FOUNDATION
NOTES


LAYING OF 2 NOS CABLES IN TRENCH
LAYING OF SINGLE CABLE IN TRENCH
EARTH FILLING
EARTH FILLING
F.L
F.L
NOTES:
1. ALL DIMENSIONS ARE IN MM.
2. ONLY FIGURE DIMENSION SHOULD BE FOLLOWED
3. FOR IDENTIFICATION OF POWER CABLE, THE CABLE PROTECTIVE COVER SUCH AS BRICKS WITH TAPE MARKED WITH WORDS "WBSEDCL" OR TILES SUITABLY EMBOSSED WITH WORDS "WBSEDCL" SHOULD BE USED.
IN CASE OF ANY CONFUSION PLEASE CONSULT DIST. P & E DEPT.
WBSEDCL
DISTRIBUTION HQ
PLANNING AND ENGINEERING DEPARTMENT
3 CORE



* FOR CABLE UPTO 1.1 KV OF SIZE	
4 CORE	120,95,50,25 ,16SQ.MM
*250 FOR CABLE UPTO 1.1 KV OF SIZE	
4 CORE	400,300,240,185 SQ.MM
*250 FOR CABLE UPTO 11 KV OF SIZE	
3 CORE	400,300,240,185 SQ.MM

SCHEDULE OF DEPTH 'X'	
CABLE UPTO 1.1 KV	'X'= 750
H.T. CABLE UPTO 11KV	'X'= 900

NOTES:
1. ALL DIMENSIONS ARE IN MM.
2. ONLY FIGURE DIMENSION SHOULD BE FOLLOWED.
3. FOR IDENTIFICATION OF POWER CABLE, THE CABLE PROTECTIVE COVER SUCH AS BRICKS WITH TAPE MARKED WITH WORDS "WBSEDCL" OR TILES SUITABLY EMBOSSED WITH WORDS "WBSEDCL" SHOULD BE USED.

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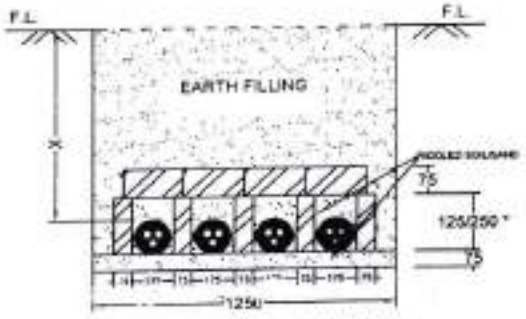
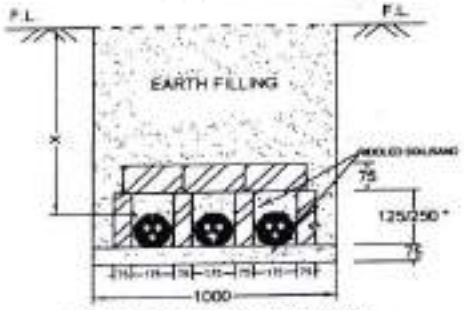
REVISIONS	WBSEDCL	DISTRIBUTION HQ
		PLANNING AND ENGINEERING DEPARTMENT
	ARRANGEMENT FOR U.G. CABLE LAYING DIRECT IN GROUND WITH BRICK PROTECTION IN ORDINARY LOCATION.	
	DRAWN BY: 04.05.2015	
	DESIGNED BY: 05.05.15.	
	CHECKED BY: 05.5.15	DRAWING NO. PLN/DSS/194
	RECOMMENDED BY:	SCALE: AS STATED / SHEET NO: 1 OF 1
	APPROVED BY: 5.5.15	DATE: 05.05.2015 / REV. NO: 0



LAYING OF 4 NOS CABLES IN TRENCH

*125 FOR CABLE UPTO 1.1 KV OF SIZE	
4 CORE	150,120,95,50, 25,16 SQ MM
*250 FOR CABLE UPTO 1.1 KV OF SIZE	
4 CORE	400,300,240,185 SQ MM
*140 FOR CABLE UPTO 11 KV OF SIZE	
3 CORE	400,300,240,185 SQ MM



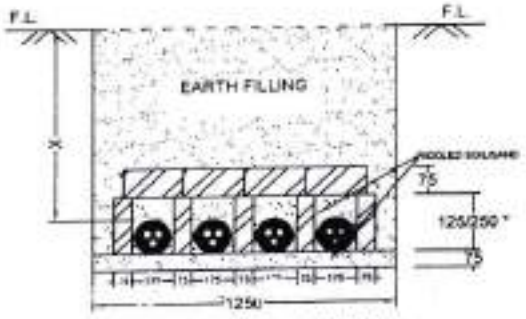
LAYING OF 3 NOS CABLES IN TRENCH

SCHEDULE OF DEPTH 'X'	
CABLE UPTO 1.1 KV	'X'= 750
H.T. CABLE UPTO 11KV	'X'= 900

NOTES:
1. ALL DIMENSIONS ARE IN MM.
2. ONLY FIGURE DIMENSION SHOULD BE FOLLOWED.
3. FOR IDENTIFICATION OF POWER CABLE, THE CABLE PROTECTIVE COVER SUCH AS BRICKS WITH TAPE MARKED WITH WORDS "WBSEDCL" OR TILES SUITABLY EMBOSSED WITH WORDS "WBSEDCL" SHOULD BE USED.

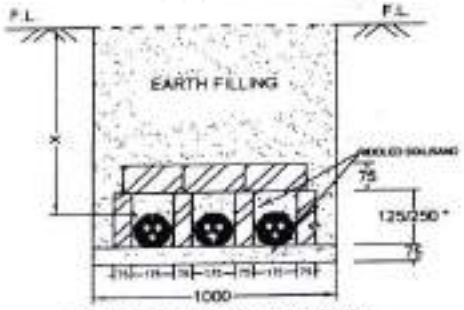
IN CASE OF ANY CONFUSION PLEASE CONSULT DIST. P. & E. DEPT.

REVISIONS	WBSEDCL	DISTRIBUTION HQ.
		PLANNING AND ENGINEERING DEPARTMENT
	ARRANGEMENT FOR LAYING OF 4 NOS & 3 NOS U.G. CABLE DIRECTLY IN GROUND WITH BRICKS PROTECTION IN ORDINARY LOCATION	
	DRAWN BY: 04.05.2015	
	DESIGNED BY: 04.05.15	
	CHECKED BY:	DRAWING NO. PLN(D)/SS/185
	RECOMMENDED BY:	SCALE: AS STATED / SHEET NO. 1 OF 1
	APPROVED BY: CE (Dist. P & E)	DATE: 06.05.2015 / REV. NO. 0



LAYING OF 4 NOS CABLES IN TRENCH

*125 FOR CABLE UPTO 1.1 KV OF SIZE	
4 CORE	150,120,95,50, 25,16 SQ MM
*250 FOR CABLE UPTO 1.1 KV OF SIZE	
4 CORE	400,300,240,185 SQ MM
*140 FOR CABLE UPTO 11 KV OF SIZE	
3 CORE	400,300,240,185 SQ MM



LAYING OF 3 NOS CABLES IN TRENCH

SCHEDULE OF DEPTH 'X'	
CABLE UPTO 1.1 KV	'X'= 750
H.T. CABLE UPTO 11KV	'X'= 900

NOTES:
1. ALL DIMENSIONS ARE IN MM.
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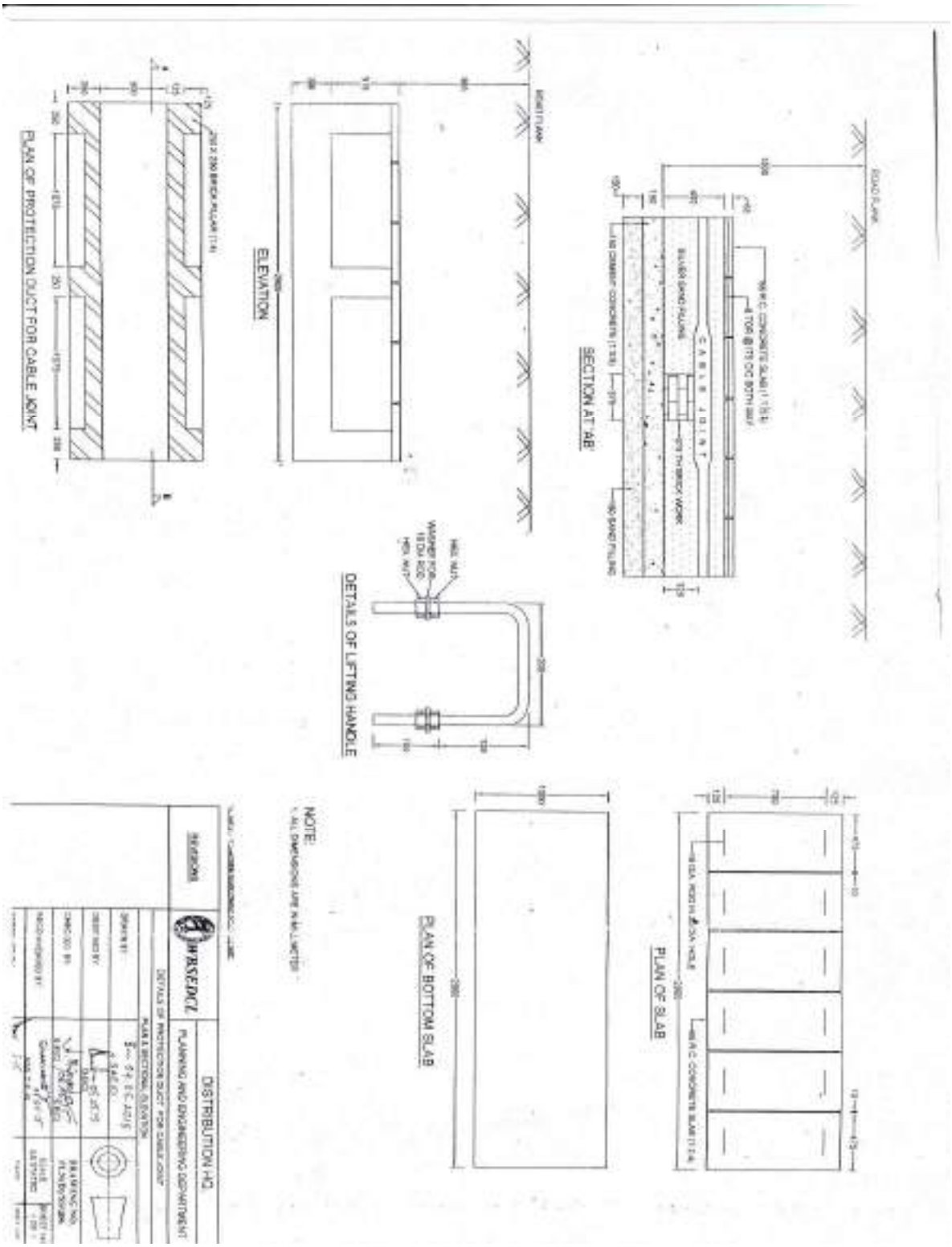
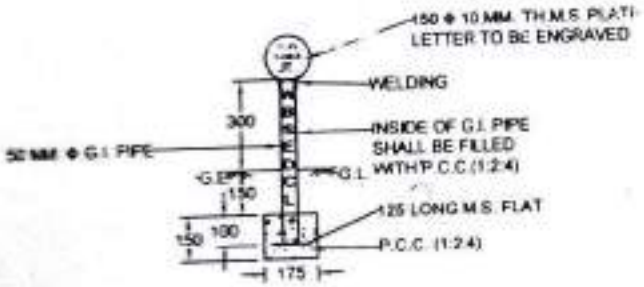
3. FOR IDENTIFICATION OF POWER CABLE, THE CABLE PROTECTIVE COVER SUCH AS BRICKS WITH TAPE MARKED WITH WORDS "WBSEDCL" OR TILES SUITABLY EMBOSSED WITH WORDS "WBSEDCL" SHOULD BE USED.

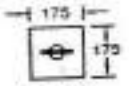
IN CASE OF ANY CONFUSION PLEASE CONSULT DIST. P. & E. DEPT.

REVISIONS	WBSEDCL	DISTRIBUTION HQ.
		PLANNING AND ENGINEERING DEPARTMENT
	ARRANGEMENT FOR LAYING OF 4 NOS & 3 NOS U.G. CABLE DIRECTLY IN GROUND WITH BRICKS PROTECTION IN ORDINARY LOCATION	
	DRAWN BY: 04.05.2015	
	DESIGNED BY: 04.05.15	
	CHECKED BY:	DRAWING NO. PLN/D/SS/085
	RECOMMENDED BY:	SCALE: AS STATED / SHEET NO: 1 OF 1
	APPROVED BY: CE (Dist. P & E)	DATE: 04.05.2015 / REV. NO: 0


PLAN OF PROTECTION DUCT FOR CABLE JOINT
ELEVATION
SECTION AT AB
CABLE JOINT
DETAILS OF LIFTING HANDLE
PLAN OF BOTTOM SLAB
PLAN OF SLAB
NOTE:
WBSEDCL
DISTRIBUTION HQ
PLANNING AND ENGINEERING DEPARTMENT



ELEVATION

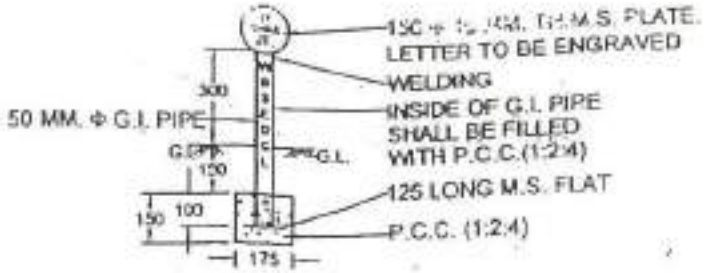


PLAN

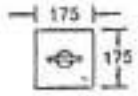
NOTES:
1. ALL DIMENSIONS ARE IN MM.
2. ONLY FIGURE DIMENSION SHOULD BE FOLLOWED
3. THIS DRAWING SUPERSEDS DRAWING NO. -
PLN(D)/CABLE/ 04 AND PLN(D)/CABLE/ 05

IN CASE OF ANY CONFUSION PLEASE CONSULT DIST. P. & E. DEPT.

REVISIONS	WBSEDCL	DISTRIBUTION HQ.
		PLANNING AND ENGINEERING DEPARTMENT
	DETAILS OF MARKER FOR 11KV CABLE JOINT	
	DRAWN BY: Bm 04.05.2015 S.A.E.(C)	
	DESIGNED BY: 05.05.15 D.E.(C)	
	CHECKED BY: S.E.(C) S.E.(C)	DRAWING NO. PLN(D)/SS/107
	RECOMMENDED BY: 05.05.15 Addl. C.E. (I)	SCALE AS STATED / SHEET NO 1 OF 1
	APPROVED BY: 5.5.15 C.E. (Dist. P. & E.)	DATE 05.05.2015 / REV. NO 0



ELEVATION

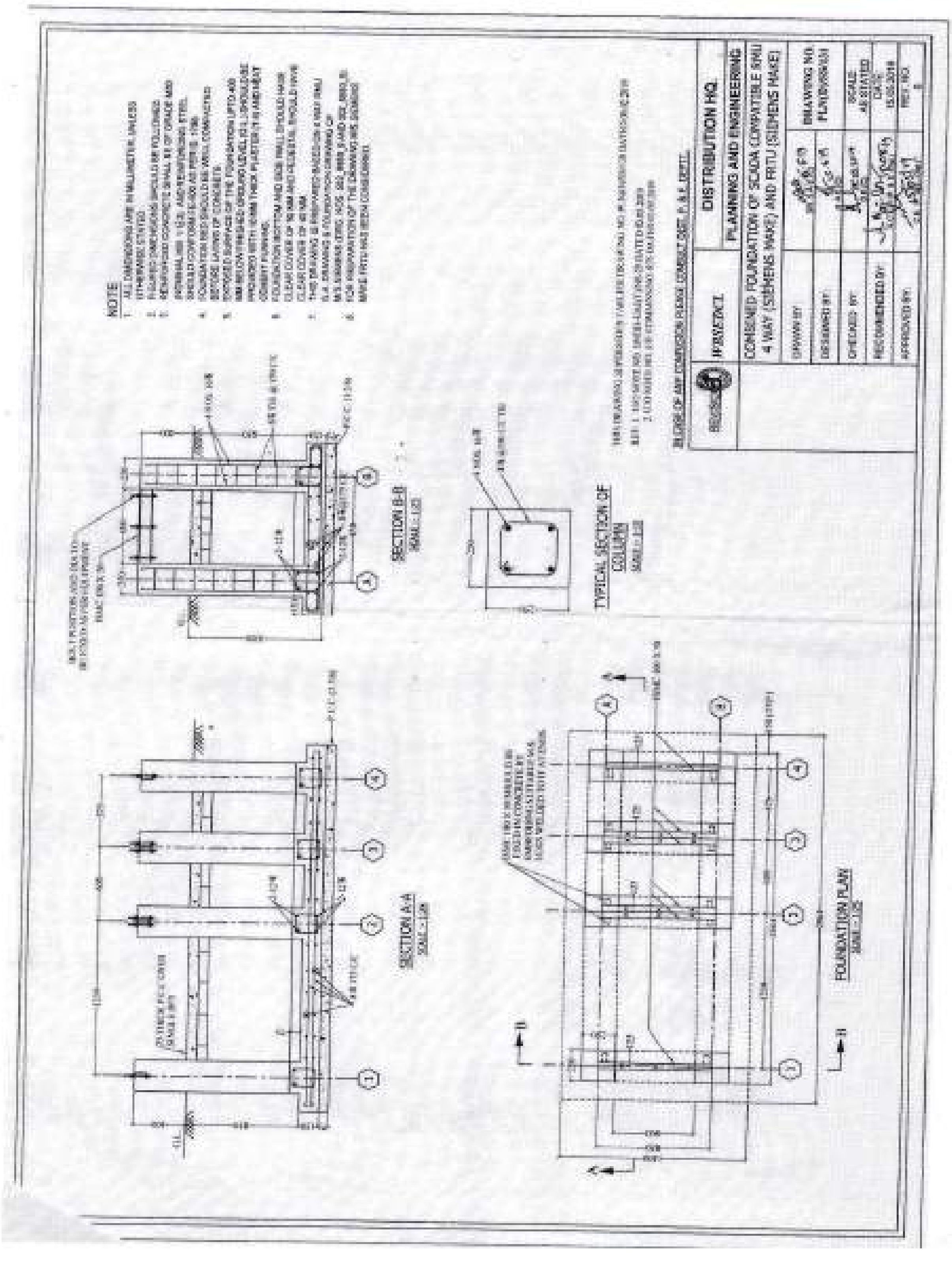


PLAN

NOTES:
1. ALL DIMENSIONS ARE IN MM.
2. ONLY FIGURE DIMENSION SHOULD BE FOLLOWED
3. THIS DRAWING SUPERSEDS DRAWING NO. PLN(D)/CABLE/ 04 AND PLN(D)/CABLE/ 05

IN CASE OF ANY CONFUSION PLEASE CONSULT DIST. P. & E. DEPT.

REVISIONS	WBSEDCL	DISTRIBUTION HQ.	
		PLANNING AND ENGINEERING DEPARTMENT	
	DETAILS OF MARKER FOR LT CABLE JOINT		
	DRAWN BY:	04.05.2015 S.A.E.(C)	
	DESIGNED BY:	05.05.15 D.E.(C)	
	CHECKED BY:	S.E.(C) 05.05.15 S.E.(C)	DRAWING NO. PLN(D)/SS/108
	RECOMMENDED BY:	05.05.15 Addl. C.E.-III	SCALE: AS STATED / SHEET NO 1 OF 1
	APPROVED BY:	5.5.15 C.E. (Dist. P. & E.)	DATE: 05.05.2015 / REV. NO 0


SECTION A-A
SECTION B-B
TYPICAL SECTION OF COLUMN
FOUNDATION PLAN
NOTE
DISTRIBUTION HQ
PLANNING AND ENGINEERING
WBSEDCL
CONSENED FOUNDATION OF SCADA COMPATIBLE RMU 4 WAY (SIEMENS MAKE) AND FRTU (SIEMENS MAKE)
DRAWN BY
DESIGNED BY
CHECKED BY
RECOMMENDED BY
APPROVED BY

Detail Scope of work for Micro- Tunneling with HDPE pipe for Underground cable laying	
1	The Micro-Tunneling work with HDPE Pipe of requisite sizes (160 mm. or 200mm dia as per 15: 4984-1995) by Horizontal Direct drilling(H.D.D) method may be done for laying of different sizes of underground cables along the route for main crossing point of NH/ SH/ Metal road, Railway, River/ Canal, Other pipelines/ installations of different utilities as per direction of Engineer in Charge. (Cost of all materials, labour, hiring charges of tools, plants, machineries etc, transportations, incidentals are to be borne by the contractor)
2	Ground penetrating Radar survey along the proposed Micro-Tunneling route for identification of underground services is to be adopted during Micro-tunneling work
3	Requisite safe drilling inspection pits and test pits, where ever necessary, are to be executed during Micro-tunneling work
4	Guided boring/ drilling Technology is to be used.
5	In horizontal and vertical boring system should be capable up to 10 m below ground level
6	Depth of boring should be as to clear any underground utilities/ obstructions Minimum depth of boring for 6 road crossing should be 1.65m from the crust level of road. The micro-Tunneling should be at least 2 m below the design bed level of the Channel/ Canal
7	Radio or any other detection system should be used for avoiding damage to existing underground utilities like electric cables, water pipe lines, sewerage line. Telcom copper cables, Optical fibers, Gas pipe lines etc.
8	The record of depth of laying HDPE pipe through Micro-Tunneling below the canal/road/ Railway/other utilities should be maintained at an interval of 5m
9	Necessary data from the appropriate different authorities for crossing point are to be obtained for Micro-Tunneling work with the assistance of WBSEDCL
10	Proposed Micro-Tunneling diagram with land mark along with depth profile are to be submitted for 10 obtaining approval from the respective utilities before execution. After execution of Micro-Tunneling work route profile are to be submitted for record

West Bengal State Electricity Distribution Company Limited

(A Govt. Of West Bengal Enterprise)

April'2024

Technical Specification for

SCADA compatible 11 kV Non extensible 4-Way Ring Main Unit

1.0 SCOPE

This specification covers Design, Engineering, Manufacture, Assembly, testing, Inspection, packing, delivery and unloading at site **of new "SCADA-Ready" Ring Main Units capable of being monitored and controlled by the Central SCADA.** The RMU to be supplied against this specification are required for vital installations where continuity of service is very important. The design, materials and manufacture of the equipment shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years.

The RMU offered shall be compact, maintenance free, easy to install, reliable, safe and easy to operate and complete with all parts necessary for their effective and trouble-free operation. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not.

It is not the intent to specify herein complete details of design and construction. The offered equipment shall conform to the relevant standards and be of high quality, sturdy, robust and of good design and workmanship complete in all respects and capable to perform continuous and satisfactory operations in the actual service conditions at site and shall have sufficiently long life in service as per statutory requirements. In actual practice, not withstanding any anomalies, discrepancies, omissions, in-completeness, etc. in these specifications, the design and constructional aspects, including materials and dimensions, will be subject to good engineering practice in conformity with the required quality of the product, and to such tolerances, allowances and requirements for clearances etc. as are necessary by virtue of various stipulations in that respect in the relevant Indian Standards, IEC standards, I.E. Rules, I.E. Act and other statutory provisions.

The Tenderer/supplier shall bind himself to abide by these considerations to the entire satisfaction of the purchaser and will be required to adjust such details at no extra cost to the purchaser over and above the tendered rates and prices.

It shall also encompass all necessary project management, data engineering, acceptance testing, documentation, warranty services.

Each RMU shall include its own power supply unit (including auxiliary power transformer, batteries, and battery charger), which shall provide a stable power source for the RMU.

Scope of Work

- Supply of SCADA Ready 4 way (2 LBS+2 VCB) RMU.
- Supply of battery charger and battery.
- Supply of right angle boots for covering the bare cable lug.

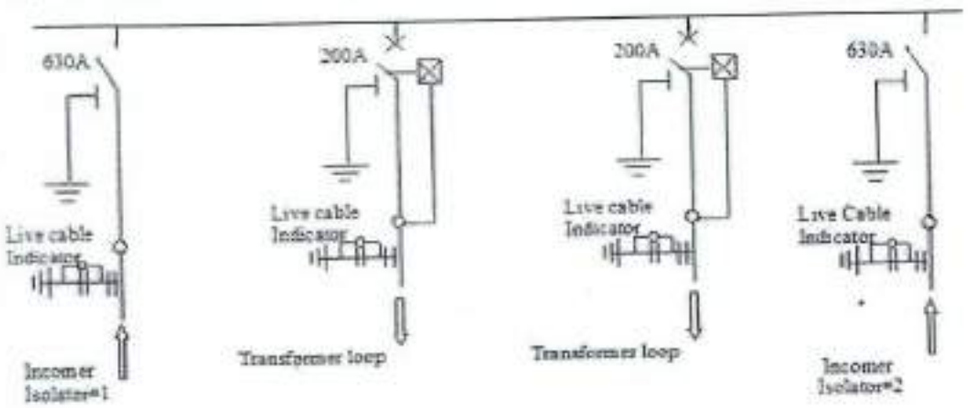
Tolerances: Tolerances on all the dimensions shall be in accordance with provisions made in the relevant Indian/IEC standards amended up to date and in this specification. Otherwise, the same will be governed by good engineering practice in conformity with required quality of the product.

2.0 Key RMU Components:

Key RMU components are listed as follows:

- Two (2) Isolators with earthing switches, connecting the RMU to incoming and outgoing main loop, 11 kV, **630 Amp XLPE cables of size 400/300 mm²** cross section aluminium conductor.
- Two (2) circuit breakers (CB) with earthing switches, connecting the RMU to distribution transformers loop, 11 kV, 200 Amp XLPE cables of size 185 mm² cross section aluminium conductors.
- One numerical relays having non-directional O/C and E/F protection for each outgoing feeder. In case of 630 KVA and above oil type transformer, auxiliary relays for transformer supervision shall be provided. Both the Incomers shall have FPI with electrical reset facility.
- All necessary current sensors/ CTs for protection.
- All necessary potential-free contacts for indications relevant to RMU monitoring and control.
- A power supply unit, including auxiliary power transformer and battery backup, to provide stable 24 V DC sources of power for the RMU's spring-charge motors, relays etc. The power supply shall also provide in metering enclosure lighting fixtures and power-plug receptacles for maintenance/test equipment.
- Capacitor voltage dividers serving live-line cable indicators. A typical four-way RMU configuration is illustrated in Figure-1. In this case, the RMU has five compartment of equal height, one for each of the two Isolators and two circuit breakers and one for the RMU's auxiliary power supply unit and the necessary SCADA monitoring and control equipment. The SCADA monitoring and control equipment includes the RTU and modem to be supplied by others.
- All Battery, Battery Charger, FPI and Relay manufacturing date shall be contemporary to RMU manufacturing date.

Figure-1: Typical RMU Configuration



3.0 Applicable Standards

The RMUs shall be manufactured to the highest quality consistent with best practice and workmanship and in full accord with the Contractor's **quality assurance plan**.

The RMUs and the work associated with their installation shall also conform to the Indian and equivalent international standards that are applicable.

The Contractor shall provide an English language copy of the applicable Indian and equivalent international standards met by the proposed RMU.

Rating, characteristics, tests and test procedures etc. for the RMU , protection Relays, monitoring and control devices and accessories including current transformer shall comply with the provisions and requirements of the standards of the IEC and IS where specified.

The latest revision or edition in effect at the time of bid invitation shall apply. Where references are given to numbers in the old numbering scheme from IEC it shall be taken to be the equivalent number in the new five-digit number scheme. The bidder shall specifically state the precise standard, complete with identification number, to which the various equipments and materials are manufactured and tested. The bid document may not contain a full list of standards to be used, as they only are referred to where useful for clarification of the text.

Table 1-1: Applicable Standards

Standard	Description
IEC 60529	Classification of degrees of protection provided by enclosures of electrical equipment
IEC 60298	A.C metal-enclosed switchgear and control gear for rated voltages above 1KV and up to and including 72KV
IEC 1330	High voltage/Low voltage prefabricated substations
IEC 60694	Common specification for HV switchgear standards
IEC 60265	High-voltage switches-Part 1: Switches for rated voltages above 1kV and less than 52 kV
IEC 60801	Monitoring and control
IEC 61869	Current Transformers
IEC 61869	Voltage transformers
BS 159	Busbar
IEC 60137	Bushings
CP 1013(British Code of Practice)	Earthing
IEC 60255	Specification for Static Protective Relays
BS 6231	Wires and wiring
IEC 61000	Electromagnetic compatibility

Standard	Description
IEC 60129	Alternating current Disconnector (isolators) and earthing switches
IEC 62271-200	Metal enclosed BS 5311 switchgear
IEC 62271-100	MV AC circuit breaker
IEC 60060-1 BS 923	High Voltage test technique
IEC 60034-1	Motors
IEC 60947-4-1	Control Gears
IEC 60623	Open Ni-Cd prismatic rechargeable cell
IEC 376	Filling of SF6 gas in RMU

4.0 Environmental Conditions

All materials supplied and installed shall be capable of operating without fault in a tropical climate, which exhibits a high level of ultra-violet radiation and severe thunderstorms. Relevant environmental conditions are listed as follows:

- Maximum ambient air temperature: 40°C
- Minimum ambient air temperature: 10°C
- Maximum relative humidity: 95%
- Average thunder storm days per annum: 50
- Average rainfall per annum: 1450 mm
- Maximum wind pressure: 150 km/sq.m
- Altitude above mean sea level: Max. 1000m

5.0 Distribution Network Electrical Parameters:

The main parameters of the WBSEDCL distribution network are as follows:

1	Nominal system voltage:	11 kV(rms)
2	Highest system voltage:	12 kV(rms)
3	Number of phases:	3 ph/3wire
4	Frequency:	50 Hz
5	Type of earthing:	Solid
6	Rated normal current:	630 Amp (Ring Switch) 200 Amps (Transformer Feeder)
7	Power frequency withstand voltage	28 kV for 1min
8	Number of electrical operations at full load current.	100
9	Rated cable charging Current	25A
10	Rated magnetizing interrupting current for Line Switch	16A
11	Minimum number of operations at rated	10 breaking operations

	short circuit current on circuit breaker	
12	Number of operations at rated short circuit current on lines switches, earthing switches and CB	5 closing operations
13	Basic impulse withstand voltage Ph to ph &ph to earth :	75 kVpeak
14	Fault level(minimum) :	18.4 kA for 3 sec for 12kV
15	Rated short circuit making capacity at rated voltage of line switches and earthing switches and CB	46kA peak
16	Climatic Condition	Moderately hot and humid tropical climate conducive to rust and fungus growth.
17	Visible or audible corona with switch gear energized at 12kV phase to earth at 50Hz	None

5.1 Circuit Breaker : In addition to the ratings mentioned in this specification, the circuit breaker shall have following:

Cable charging breaking current	25A
Small inductive breaking current	16A

5.2 General data, enclosure and dimension:-

Sl. No	Description	WBSEDCL Requirement
1.	Standard to which Switchgear complies	IEC
2.	Type of Ring Main Unit	Metal enclosed panel type, Compact module
3.	Number of phases	3
4.	Whether RMU is Type tested	Yes
5.	Whether facility is provided with pressure relief	Yes
6.	Insulating gas	1.3 bar at 20° C
7.	Gas leakage rate	0.1% per year
8.	Expected operating lifetime	30 Yrs.
9.	Whether facility is provided for gas monitoring	Yes, temperature compensated Manometer can be delivered.
10.	Material used in tank construction	Stainless steel

5.3 Operations, degree of protection and colors

Sl. No	Description	WBSEDCL Requirement
1.	Means of switch operation	Separate handle
2.	Means circuit breaker operation	Separate handle and push buttons
3.	Rated operating sequence of Circuit Breaker	O-3min-CO-3min-CO
4.	Opening time of circuit breaker	Approx. 40-60 ms.
5.	Closing time of Circuit Breaker	Approx. 60-80 ms.
6.	Mechanical operations of Disconnector switch	1000
7.	Mechanical operation of earthing switch	1000
8.	Mechanical operations of circuit breaker	2000
9.	Disconnector switch/earth switch	3 position combined switch/earth switch

Degree of Protection		
1.	High voltage live parts, SF_6, VCB	IP67
2.	Front cover mechanism	IP2X
3.	Cable cover	IP 2X
4.	Outdoor Enclosure	IP54

6.0 Testing

The specified RMUs shall be subject to type tests, routine tests, and acceptance tests. Where applicable, these tests shall be carried out as per the standards stated above. Prior to testing, the Contractor shall prepare and submit a detailed test plan for review and approval by the Employer.

7.0 RMU Design Features

All design features of the proposed RMU, as described in the Contractor's bid and in the bid's reference materials, shall be fully supported by the equipment actually delivered. The key design features include those that relate to:

- Availability, maintainability and lifespan
- Ability to operate in severe outdoor environmental conditions
- Immunity to electrical stress and disturbance
- Acceptable insulation properties
- Termination to SCADA Terminal Box for convenient RTU inters connection features.

  All terminals from LBS and CB relevant to SCADA, likewise indication, status, command and MODBUS communication wire to be terminated in the SCADA terminal of low voltage enclosure for remote SCADA communication.

In these and all other specified respects, the RMU shall meet or exceed the cited standards or where appropriate, other equivalent industry standards.

7.1.0 Availability, Maintainability and Life Span

Availability

The RMU shall be designed to have a fully enclosed metal housing combined with the single-phase insulation of all primary live parts to reduce the risk of internal faults to an absolute minimum and to provide a high degree of safety as well as availability. Nevertheless, manufacturer standard designs shall be used to the fullest extent possible.

Each RMU shall exhibit an availability of greater than 99.5%. To ensure this high degree of availability, the RMUs shall be fabricated, assembled, and finished with workmanship of the highest production quality and shall conform to all applicable quality control standards. All materials comprising the RMU shall be new, unused, and of the best industrial grade, and the RMU shall incorporate all recent improvements in both design and materials. All components shall be of current production from reliable component manufacturers.

Maintainability

The Employer prefers RMU designs that do not require periodic preventive maintenance and inspections. If periodic maintenance is required, it shall be possible to perform all such work in the field without requiring the associated distribution network circuits to be de-energized.

7.2.0 Outdoor Features

7.2.1 General

The RMUs shall be designed specifically for outdoor installation and, in this respect, shall be suitable for continuous operation in a tropical climate that includes exposure to severe frequently occurring thunderstorms. They shall also be suitable for conditions in which they will be exposed to heavy industrial pollution, salt-spray, and high levels of airborne dust.

The equipment in the proposed outdoor RMU shall be conformably coated to meet these climatic conditions. In this respect, standards such as IEC 60870-2-2 covering equipment, systems, operating conditions, and environmental conditions shall apply along with IEC 60721, which covers the classification of such conditions. In particular, the RMU equipment shall have been type tested for continuous operation under the environmental conditions identified in Clause1.5.

addition to the above, materials promoting the growth of fungus or susceptibility to rosion and heat degradation shall not be used, and steps shall be taken to provide

rodent proof installations.

All live parts, high voltage components, excluding the HV cable termination of the switchgear shall be insulated/ protected in SF6 to provide complete proofing against dangers of flashover between phase and earth and between phases. In particular, the equipment shall be climate free in that no high voltage connection will be exposed to the environment.

7.2.2 Corrosion Protection

The fabricated parts are pretreated using 7 tank process and then coated by layer of zinc phosphate. A finish coat with high scratch resistance or epoxy powder finish paint shall be applied over the primer. The coat thickness shall be of the order of – 60 micrometers. The Employer shall approve the finish-coat color. The RAL-7032/RAL-7035/IEC 632 code will be agreed upon with the Bidder during the early design phases of project implementation.

7.2.3 Material

Except for main tank and external hardware which made of stainless steel, all structural steel and outer enclosure as well as nuts and bolts etc. shall be of CRCA steel/GI steel with epoxy powder finish paint..

7.2.4 Immunity to Electrical Stress and Disturbance

The electrical and electronic components of the RMU shall conform to relevant standards concerning insulation, isolation, and immunity from electromagnetic interference, radiated disturbance, and electrostatic discharge. The ability to meet these requirements shall be verified by type tests carried out by accredited test laboratories that are independent of the bidder and/or the manufacturer of the RMU components. Certified copies of all available type test certificates and test results shall be

included as part of the bidder's proposal. Failure to conform to this requirement shall constitute grounds for rejection of the proposal.

7.2.5 Minimum Insulation of Equipment

The RMUs shall have SF6 gas-insulated type stainless steel tank with joints inside tank. All live parts shall be fully insulated throughout their joints.

7.2.6 Nameplate Information

RMU nameplate information shall be determined in agreement with the Employer. This information may include for example:

- Name of manufacturer and country
- Type, design, and serial number

- Rated voltage and current
- Rated frequency
- Rated symmetrical breaking capacity
- Rated making capacity
- Rated short time current and its duration
- Rated lightning impulse withstand voltage
- Vacuum Interrupter Make and Type
- Purchase Order number and date
- Month and year of supply
- Property label: Property of WBSEDCL
- Guarantee period : 5years

7.2.7 Danger Board:

The Danger Board plate as per relevant IS shall be riveted on the front plate of the RMU.

7.2.8 Interconnecting Cables, Wiring, Connectors, and Terminal Blocks

The Manufacturer shall provide all interconnecting wires, cables, connectors, terminations and other wiring accessories such as terminal blocks required by the RMU.

7.2.9 Cables

ll metallic cables and wiring shall be of required cross-section multiple strands of round opper conductors and have flame retardant insulation. All wiring shall be neatly laced and amped.

ll wire and cable connectors and terminators shall be permanently labeled for entification. All connection points for external cables and wires shall be easily accessible r connection and disconnection and shall be permanently labeled. Conductors in multi-nductor cables shall be individually color-coded.

e DC cables from the battery unit to RMU and to pilot marshalling box shall be at least m^2. CT & OT Control cable will be 2.5 Sq. mm and all other control cable shall be 1.5 n^2 Cu multi- conductor and shall be screened with half-lapped copper tape. Conductor d for AC and DC circuits shall not be mixed in the same multi-conductor cable.

wires shall be neatly run in groups and shall be securely fixed by cleats which are made nsulating material. Suitable crimped connectors shall be used for the termination of the to the terminal blocks.

ires, including the spare cores of a multi-core cable, shall be properly numbered by an oved type of interlocking ferrule. All spare relay contacts shall also be wired out to

spare terminal block inside the panels. The marking on the ferrules shall not be erased easily. The colour of DC supply circuits shall be grey to differentiate from AC supply (Black) for easy identification.

All wiring colour classification, wire terminal sleeve colour and wire numbering system shall be subjected to WBSEDCL's approval.

All AC and DC wiring terminals that are easily accessible by operating personnel shall be adequately shielded by suitable means.

7.2.10 Connectors

Terminal connectors shall be used for inter panel connection. The connectors shall be polarized to prevent improper assembly.

7.2.11 Terminal Blocks

Suitable Disconnector type terminal blocks shall be provided for CT circuits with necessary spares with 5 mm minimum machine screws shall be provided for other necessary metallic cable terminations. In using a terminal block, no more than two cables or wires shall be connected to any of its individual terminals.

Self-extinguishing fireproof vinyl marking strips shall be used to identify all external connection blocks. Marking tags shall be read horizontally. All terminals to which battery or other high voltages are connected shall be provided with fireproof covers.

All individual status input, AC voltage input, and control output points shall be isolatable without the need to remove wiring by means of individual terminal blocks of the removable link type. In order to avoid open circuits on the secondary side of CTs, termination blocks with by-pass bridges shall be provided for all AC current inputs.

Terminal blocks shall comply with IEC 60947-7-1 (2009): Low-voltage Switchgear and Control Gear, Part 7-1: Ancillary Equipment, Terminal Blocks for Copper Conductors.

TBs shall be mounted onto suitable insulation materials via channels. TBs shall be able to withstand 2 kV AC rms voltage continuously for 1 minute between terminal and terminal to earth.

One TB shall be used for one feeder panel. Translucent cover shall be provided for all cable termination blocks. TBs shall be suitably spaced and labeled to enable easy and neat termination. Each terminal shall be labeled according to the panel number. **The use of embossing tape for such purpose is not acceptable.**

7.3.0 General Requirements

Each RMU shall include its own power supply, including battery and battery charger. In addition, space must be provided for the RMU's auxiliary power transformer.

Within this context, the general requirements of the RMU shall include, but shall not be limited to provision of the following local and remote monitoring and control features through SCADA:

- Positions of local/remote switches as used to control local and remote access to circuit breakers.
- Power supply indications including battery failure and voltage alarms.
- Open/closed position of circuit breakers, and earthing switches.
- Enclosure door-open indications.
- SF6 gas-pressure low alarm and Lockout.
- Circuit breaker relay protection indications.
- Circuit breaker open/close control.
- Protection device failures through built-in Watch dog contact i.e 'self monitoring' feature of relay. This indication can be wired to RTU for integration in SCADA.
- FPI indication

SCADA wire termination at Marshaling Box shall have to be standardized. Hence, sequence of termination shall be subject to WBSEDCL's Drawing approval.

7.4.0 Design Details

- The RMU shall be designed to operate at the rated voltage of 12 kV. It shall consist of two(2) numbers of 630 Amp SF_6 insulated Isolators (incomers) and up to two (2) number of 200 Amp SF_6 insulated Circuit Breakers for load.
- It shall include, within the same metal enclosure, earthing switches for each Isolators and Circuit Breaker.
- Suitable fool-proof interlocks shall be provided to the earthing switches to prevent inadvertent or accidental closing when the circuit is live and the concerned Circuit Breaker/Isolator is in its closed position.
- Enclosures filled with gas at suitable pressure to ensure adequate insulation and safe operation shall be used. The assembly shall not require further gas processing during its expected operational life.
- The degree of protection required against prevailing environmental conditions, including splashing water and dust, shall be not less than IP 54.

- The active parts of the switchgear shall be maintenance free. Rest parts shall be of low- maintenance type.
- The tank shall be made of an adequate thickness of stainless steel and internally arc tested.
- The RMU shall be suitable for mounting on its connecting cable trench.
- For each RMU enclosure, a suitably sized nameplate clearly identifying the enclosure and the electrical characteristics of the enclosed devices shall be provided.
- The positions of the different devices shall be clearly visible to an operator when standing in front of each enclosure with its door open. Device operations shall be clearly visible.
- The RMU design shall be such that access to live parts shall not be possible without the use of OEM-supplied tools.
- The design shall incorporate features that prevent any accidental opening of the earth switch when it is in the closed position. Similarly, accidental closing of a Circuit Breaker shall be prevented when the same is in an open position. This includes protection against accidental closing resulting from the release of any latch or spring in tension due to vibrations caused externally or internally.
- Circuit breakers shall be enclosed in the main tank using SF6 gas as insulating and vacuum as arc quenching medium. The main tank shall be non-magnetic, non-ferrite stainless steel sheet of adequate thickness to ensure leak rate below 0.1% per year and preferably robotically/TIG welded with a pressure relief arrangement. The minimum thickness of main tank of RMU shall not be less than 2.00mm.
- The main tank (Inner enclosure of Circuit Breaker) and all Switchboard assembly shall be housed in a single compact metal clad suitable for both indoor/outdoor applications. The design of enclosure for Switchgear, RMU & Switchboard housing shall be in accordance with IEC 298.
- An absorption material such as activated alumina / molecular sieve in the tank shall be provided to absorb the moisture from the SF6 gas. A temperature compensating gas pressure indicator offering a simple indication shall constantly monitor the SF6 insulating medium.
- The unit shall be internal arc proof and tested and totally safe for human beings. The release of gas to be from the top or bottom of the unit, so that, even if the person is operating the unit, opening the cover, the release will be at the top or

bottom. The release in no case should be from any side of the unit, as the same is unsafe for the operating personnel/pedestrian or general public.

- **The clearances of all live parts to earth and between phases shall be to approve and shall be in no way less than clearances specified in the relevant standards of this technical specification.** All equipment shall be designed so as to minimize corona or any other electrical discharges under all atmospheric conditions.

- RMU shall have sufficient height of cable compartment for easy bending of cables for termination with the unit, safe for temporary water logging and ease in installation at any urban location without wasting much time to make the cable trench etc.

- The maximum allowable Dimension of 4 way SCADA compatible Non – Extendable RMU will be – Length –2400 mm, Breadth –1050mm & Height – 2300mm.

7.5.0 Sulphur Hexa Fluoride Gas (SF6GAS):

The SF6 gas shall comply with IEC 376,376A and 376B and shall be suitable in all respects for use in RMUs under the stipulated service conditions. The SF6 shall be tested for purity, dew point air hydrolysable fluorides and water content as per IEC 376,376A and 376B and test certificate shall be furnished to the owner indicating all the tests as per IEC 376 for each lot of SF6 Gas.

7.6.0 ENCLOSURE:

All Contractor-supplied enclosures shall be sized to provide convenient access to all enclosed components. It shall not be necessary to remove any component to gain access to another component for maintenance purposes or any other reason.

The enclosures shall also be designed to ensure that the enclosure remains rigid and retain its structural integrity under all operating and service conditions with and without the enclosure door closed.

7.7.0 Outer Enclosure:

The RMU enclosure (Outer) shall be made up of CRCA steel/GI steelof minimum 1.6 mm thickness. The rating of enclosure shall be suitable for operation on three phase, three wire, 12 kV, 50 cycles, A.C. System with short-time current rating of 18.4 KA for 3 seconds for 12 kV supply with Panels. The complete RMU enclosure shall be of degree of protection **IP 54**. The enclosure shall provide full insulation, making the

Switchgear insensitive to the environment like temporary flooding, high humidity etc. The active parts of the Switchgear shall be maintenance-free and the unit shall be of minimum maintenance.

The complete RMU unit shall be powder coating of RAL 7032/RAL 7035 Grey to DIN Standard 43656/IEC 632.

Each switchboard shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics.

The Switchgear and Switchboards shall be designed such that the position of the different devices is visible to the operator on the front of the Switchboard and operations are visible.

In accordance with the standards in effect, the switchboards shall be designed so as to prevent access to all live parts during operation without the use of tools.

The compact RMU Unit shall be provided with a base frame /Channel support of minimum thickness 3 mm for whole unit to mount the unit on plain surface or any concrete pillar/metal structure.

All LV compartment for metering, relay, switches and indications shall be one side hinged type openable door.

7.8.0 Inner enclosure (Main tank)

The tank shall be preferably made of time tested welded stainless steel sheet of adequate thickness to ensure leak rate less tank 0.1% per year. The tank shall be sealed and no handling of gas is required throughout the service life. However, the SF6 gas pressure inside the tank shall be at 1.3 bar relative minimum to ensure the insulation and breaking functions and constantly monitored by a temperature compensating gas pressure indicator offering a simple go, no-go indication. The gas pressure indicator shall be provided with green pressure and red pressure zones. There shall be one Non – return valve to fill up the gas. The manufacturer shall give guarantee for maximum leakage rate of SF6 gas will be lower than 0.1 % / year. There shall be no requirement to 'top up' the SF6 gas. An absorption material such as activated alumina in the tank shall be provided to absorb the moisture from the SF6 gas to regenerate the SF6 gas following arc interruption. The degree of protection of the inner enclosure shall be IP 67.

Oil or Air filled Switchgear will not be considered. The temperature rise test shall be carried out on complete RMU unit and test reports shall be submitted with the offer.

The height of the bottom of cable box shall be 310 mm to provide the turning radius for the HT cable termination. Means of enabling the SCADA to monitor the

open/closed status of the enclosure door shall be provided.

7.9.0 Earthing

- There shall be continuity between metallic parts of the RMUs and cables so that there is no dangerous electric field in the surrounding air and the safety of personnelis ensured.
- The RMU frames shall be connected to the main earth bars, and the cables shall be earthed by an Earthing Switch having the specified short circuit making capacity.
- The Earthing Switch shall be operable only when the main switch is open. In this respect, a suitable mechanical fail-proof interlock shall be provided.
- The Earthing Switch shall be provided with a reliable earthing terminal for connection to an earthing conductor having a clamping screw suitable for the specified earth fault conditions. The connection point shall be marked with the earth symbol.
- The Earthing Switch shall be fitted with its own operating mechanism. In this respect, manual closing shall be driven by a fast acting mechanism independent of the operator's action.
- All parts of the switchgear metal enclosure, metal relay and instrument cases, cable glands, earthing terminals and other metal work on switchgear shall be connected to earth by means of main and subsidiary earth bus bars.
- The switchgear earth bar and earth conductors shall be of high conductivity tin plated copper and their sizes shall be selected in accordance with BS CP 1013 taking into consideration the rated short circuit currents of the switchgear.
- All metal parts of the switchgear which do not belong to main circuit and which can collect electric charges causing dangerous effect shall be connected to the earthing

  conductor made of copper having cross section area of minimum 90 sq.mm. Each end of conductor shall be terminated by M12/equivalent quality and type of terminal for connection to earth system installation. Earth conductor location shall not obstruct access to cable terminations.
- The following items are to be connected to the main earth conductor by rigid or copper conductors having a minimum cross section of 75 sq. mm (a) earthing switches (b) Cable sheath or screen (c) capacitors used in voltage control devices, if any.

- The metallic cases of the relays, instruments and other panel mounted equipment's shall be connected to the earth bus. The colour code of earthing wire shall be green. Earthing wires shall be connected on the terminals with suitable clamp connectors and soldering shall not be permitted.

8.0 Circuit Breakers

The Circuit Breakers shall be maintenance free and, when standing in front of the RMU with enclosure doors open, their positions shall be clearly visible. The position indicator shall provide positive contact indication in accordance with IS 9920. In addition, the manufacturer shall prove the reliability of indication in accordance with IS 9921.

The breakers shall have two positions (or states), i.e., ON and OFF in association with three position disconnector ON-OFF-EARTHED and shall be constructed in such a way that natural interlocking prevents unauthorized operations. They shall be fully assembled, tested, and inspected in the factory.

An operating mechanism shall be used to manually close the Circuit Breaker and charge the mechanism in a single movement. It shall be fitted with a local system for manual tripping. There shall be no automatic reclosing. The Circuit Breaker shall be capable of closing fully and latching against the rated making current. Mechanical indication of the OPEN, CLOSED, and EARTHED positions of the Circuit Breaker shall be provided.

The circuit breaker shall be fitted with a mechanical flag, which shall operate in the event of fault occurrences. The breaker indications **ON** and **OFF** positions shall be indicated by suitable flag. For **ON** position indication by Red flag and **OFF** position indication by Green flag shall be provided.

The circuit breaker shall be operated by the same unidirectional handle or switch. The rated operating sequence shall be **O-3min-CO-3 min-CO**.

Each Circuit Breaker shall operate in conjunction with a suitable protection relay under lateral circuit phase and earth fault conditions. In addition, the Circuit Breaker shall be provided with a motorized operating mechanism that can be remotely monitored and controlled from the SCADA.

9.0 RING SWITCHES (Isolator):

They shall consist of 630 amp fault making/load breaking spring assisted ring switches, each with integral fault making/load breaking earth switches. The switch shall be naturally interlocked to prevent the main and earth switch being switched 'ON' at the same time. The

selection of the main and earth switch is made by a lever on the fascia which is allowed to move only if the main or earth switch is in 'OFF' position. **The Ring switches shall be capable for remote SCADA operation.**

10.0 BUSBARS:

The Three nos. of continuous Busbars made up of copper of rating 630A shall be provided. The Short time rating current shall be 18.4 kA for 3 seconds for 12 kV. All joints and connectors shall be SF6 insulated in accordance to this specification. Any component directly connected to the power cables shall also be capable of withstanding the DC test voltage applied to the cables. Earth busbar shall be tin/silver plated copper made having minimum cross sectional area 90 Sqmm. Cross section of the main Busbar shall not be less than that stated in GTP.

11.0 BUSHINGS

All the bushings shall be of same height, parallel, on the equal distances from the ground and protected by a cable cover. It is preferable to have bushings accessible from the front side of the RMU.

12.0 CABLEBOXES

All cable boxes shall be air insulated suitable for dry type cable terminations. The cable boxes of the circuit breaker shall be suitable up to **12 kV 3Core 400/300 sq.mm XLPE** types vertically ascending cable preferably for front type connection. Necessary Right angle Boot should be supplied for cable terminations. Compound filled cable boxes are not acceptable. The cable box shall be arc resistant as per IEC 62271-200 amended up to date. The internal arc fault test on cable box shall be carried out for12 kV systems for 18.4 kA for 1 second. The clearance between phase to phase and phase to earth shall be as per IEC 61243-5 amended up to date. The cable box provided shall be of adequate dimension to house an air-insulated cable termination. It shall be able to accommodate crossing of phase cores, if necessary. The cable box shall be rated in accordance with the rated insulation level of the switchgear.

Phases of all primary terminals shall be positively marked on the main structure and not on the removable covers.

13.0 VOLTAGE INDICATOR LAMPS AND PHASE COMPARATORS

The RMU shall be equipped with a voltage indication. Three outlets can be used to

check the synchronization of phases with the use of an external device. It shall be possible for each of the bay of the RMU to be equipped with a permanent voltage indication as per IEC 601958 to indicate whether or not there is voltage on the cables. The capacitive dividers will supply low voltage power to sockets at the front of the unit, voltage presence lamp must be used to indicate live cables. The lamp shall be of adequate dimensions to provide clear indication under all conditions.

14.0 Operating lever

An anti-reflex mechanism on the operating lever shall prevent any attempts to re-open immediately after closing of the switch or earthing switch. All manual operations shall be carried out on the front of the switchboard. The effort exerted on the lever by the operator should not be more than 250 N for the switch and circuit breaker. The overall dimensions of the RMU shall not be increased due to the use of the operating handle. The operating handle should have two workable positions 180° apart.

15.0 Safety of Equipment

With respect to the RMU's SF6-filled equipment, any accidental overpressure inside the sealed chamber shall be limited by the opening of a pressure-limiting device in the enclosure so that the gas will be released away from the operator without endangering the operator or anyone else in the vicinity of the RMU.

All manual operations shall be carried out from the front of the RMU. The effort required to be exerted on the lever as used by the operator shall not exceed 250 N.

16.0 Front Plate

The front plate shall include a clear mimic diagram indicating RMU functionality. The position indicators shall correctly depict the position of the main contacts and shall be clearly visible to the operator. The lever operating direction shall be clearly indicated.

17.0 Current Transformers/Sensors

A panel fixture shall be provided in each circuit breaker enclosure to mount single-core ring type CT at power cable compartment for protection purposes. CT access for maintenance or any other purpose shall be from the front, or back of these panels.

The CTs shall conform to IS 2705. The design and construction shall be sufficiently robust to withstand thermal and dynamic stresses during short circuits. Secondary terminals of CTs shall be brought out suitably to a terminal block, which will be easily accessible for testing and terminal connections.

Further characteristics and features for CTs used for protection are listed as follows:

17.1 CBCT/Current Sensors for FPI Protection (for Ring) :

- Material: Epoxy resin cast
- Ratio and burden suitable as per FPI manufacturer's recommendation.

17.2 CTs for Protection (for Outgoing) :

- Material: Epoxy resin cast
- Type: ring type
- BIL: 0.73kV/3kV
- Class of insulation: E or better
- Frequency: 50Hz
- Burden:2.5 VA
- Ratio: 100-50/1A
- Accuracy Class: 5P10

18.0 Protection Relay

The RMU shall be equipped with self powered numerical relays as used to trip the RMU circuit breakers.

18.1 General

The Circuit Breaker enclosures in the RMU shall be outfitted with a communicable-type numerical (feeder protection) relay, i.e., one for each circuit breaker. The protection relay's auxiliary contacts shall be hard wired to the SCADA Terminal Block. The relay shall also interface with the RTU via an RS 485 port in order to send, as a minimum, real-time phase current , readings using the MODBUS protocol.

The numerical relay shall be self powered and be provided with Inverse Definite Minimum Time (IDMT) and Instantaneous protection characteristics. On this basis, the relay as a minimum shall provide:

- Phase Over current Protection: Non-directional(50/51)
- Earth Fault Protection : Non-Directional(50N/51N)
- Potential pulse output contact for direct triggering to trip coil.
- **Transformer supervision relay shall be stand alone self rest type**- Buchholtz alarm/trip, temperature alarm etc. for connection to 630 KVA and above transformer.
- Full provision to be made in respect of wiring and termination for future retrofitting of transformer supervision relay for others RMU.

Tripping and closing of RMU shall be done through suitable tripping and closing

Relay which will be interfaced with the tripping and closing coil of the RMU. A flag /LED indicator shall be provided for signaling the occurrence of trip conditions in the numerical relay.

Tripping shall be done directly through potential pulse output of self-power relay and any other electrical and mechanical trip.

18.2 Features and Characteristics

The numerical relay shall have the following minimal features and characteristics noting that variations may be acceptable as long as they provide similar or better functionality and/or flexibility.

The make of the Numerical relay shall be as per Annexure-A.

The bidders will have to send the numerical relay of same make, model, Firmware & type as offered in the bid documents along with Engineers to Distribution Testing Department on the pre scheduled date & time for testing of the relay in respect of relevant features as per specification and Communications via a MODBUS RS232/RS485 port to provide the RTU (and hence the SCADA) with phase current measurements and tripping indications. The bidder will have to provide the necessary software for testing of the communication part. This is a part of Techno-commercial evaluation and it is the responsibility of the bidder to show all the features of the relay, failing which they will not be considered as Techno-commercially acceptable. The date & time of such tests at Distribution Testing Department, WBSEDCL, will

be intimated to the bidder at least 10 (Ten) days prior to the date of testing. The particular relay thus tested will have to be supplied during execution of the Order if placed upon them.

- It shall be housed in a flush mounting case and if required, will be powered by the RMU power supply unit.
- It shall have three phase over current elements and one earth fault element.
- IDMT trip current settings shall be 20-200% in steps of 1% for phase over current and 10- 80% in steps of 1% for earth fault.
- Instantaneous trip current settings shall be 100-3000% in steps of 100% for phase over current and 100-1200% in steps of 100% for earth fault.
- Selectable IDMT curves shall be provided to include, for example, Normal Inverse, Very Inverse, Extreme Inverse, Long Time Inverse, and Definite Time. Separate curve settings for phase over current and earth fault shall be supported.

- For IDMT delay multiplication, the Time Multiplier Setting (TMS) shall be adjustable from.01 to 1-in .01 steps.

- The relay shall have local independent LED indications for Healthy, Trip, I>, I>>, IN>, and IN>> conditions.
- The relay shall also be provided with:
  - Alphanumeric Liquid Crystal Display (LCD) for measurement and relay setting.
  - Communications via a MODBUS RS232/RS485 port to provide the RTU (and hence the SCADA) with phase current measurements. It is also desirable that this same means of communication can be used by the RTU to send setting.
  - Front USB port for local communications with a laptop PC.
  - Parameter change capability that is password protected.
  - Capability to record up to 5 of the latest fault records duly time stamped and stored in non-volatile memory for subsequent reading via the above referenced USB port.

19.0 Power Supply

Each RMU shall be outfitted with a power supply, including batteries and battery charger, suitable for operation of a 5-way RMU even if the RMU is only 4-way. The following operational specifications shall apply:

- The power supply unit shall conform to the following requirements:
  - Input: 230 V AC nominal from the RMU's auxiliary power transformer allowing for possible variations from 190 to 300 VAC
  - Output: Stable 24 VDC
  - Batteries: 24 VDC
  - **Receptacles: 2 x 230 V AC (for test equipment)**
  - Lighting Fixtures: One for each enclosure
- The auxiliary power transformer's inputs shall be equipped with surge protection devices in accordance with IEC62305.
- The 24 V DC batteries shall have sufficient capacity to supply power to the following devices with a nominal backup of 8 hours:
  - To restore a depleted battery to 80% of full capacity in less than 8 hours.
  - To deliver the load of RMU's trip coils, close coils, multifunction meters, and relays, spring charge motor.
- The batteries shall be of SMF/ VRLA/dry type/Ni-Cad type, comply with IEC 60623 and shall have a minimum life of five (5) years at 25°C. The nominal capacity in ampere-hours shall be the capacity for twenty hour discharge (C20). The cell shall be of a suitable type for high rate/medium rate discharge A cell of low rate of discharge is not acceptable. The battery shall have the capability to close and open the switches for at least 10 close-open cycles (this must be verified

by calculation). When sizing the AH capacity of the battery, the effect of aging shall be taken into consideration. The AH rating of the battery shall be greater than calculated AH but not less than 26 AH.

- To prevent deep discharge of the batteries on loss of AC power source, the battery charger shall automatically disconnect all circuitry fed by the batteries following a user-adjustable time period or when the battery voltage falls below a preset value.
- The battery charger shall be provided with an alarm displayed at the local control panel and remotely at the SCADA to account for any of the following conditions:
  - Low battery voltage
  - High battery voltage
  - Battery failed
  - Battery charger overvoltage
  - Grounded battery/battery-charger
  - Input MCB off
  - Station AC supply fail
  - Battery Charger fail
  - Others according to manufacturer's design
- The capacity of battery and charger and the basis of calculation shall be declared in the GTP.
- Battery shall be covered with perforated metal sheet so that it can't easily visible from outside and cover shall not be opened easily to prevent theft.

19.1 Battery Charger

The charger shall be designed to provide a well regulated DC supply to the load while float charging or quick charging the battery. The charger shall be the constant potential, current limiting fully automatic type. The charger shall automatically switch to float charge after the battery is restored to 80% of its nominal capacity under BOOST charge. The BOOST charge shall be automatically ON after an emergency discharge and the duration of BOOST charge shall be less than 8 hours.

The battery charger shall be fully temperature compensated and minimum continuous current rating shall be 10Amp at rated voltage 24 Volts.

The float charge voltage shall not vary by more than +/- 2% of the set value irrespective of AC input voltage variation of +/- 10 % and of load variation from 0% to 100%. The r.m.s ripple voltage across the battery shall not exceed 1% of the nominal output voltage.

The charger shall be protected against low battery voltage and short circuit at the output by employing current limiting feature. It shall also be protected against reversed battery voltage. Suitable protection shall be incorporated for DC output, transformer secondary, rectifier etc. The charger shall be designed to operate continuously at a temperature of 55º C. To ensure long service life for the charger, all semiconductor devices shall be of industrial grade.

The following instrument and control shall be provided on the charger:-

- Mains ON/OFF input circuit breaker with Mains ON neon or LED indicator, DC output MCBs with spare. All MCBs shall be of double pole design with auxiliary voltage free contact.
- Voltmeter and Ammeter to measure charger/battery voltage and current.
- All visual alarm indication shall be of LED type with its function clearly mentioned.

20.0 Distribution Automation System Interface

The RMU shall be equipped so that it can be monitored and controlled via the SCADA. In this respect, it shall interoperate with the RTU that will be housed in the RMU Control Cabinet. The RTU in turn will interoperate with the SCADA through public network of GPRS/CDMA.

The RMU shall have provisions for opening and closing its switches, breakers using output from the RTU. The RMU shall also supply analog and status signals to the RTU for monitoring the condition of the RMU's distribution network circuits as well as the components of the RMU. A list of input/output points required for 4-way is presented in Table 1-2 below. Digital Input points and control Output points shall be connected via auxiliary relay to be provided by SCADA Vendor and analog value and protection alarms shall be provided via IED/Relay through MODBUS through RS-485 ports.

Table 1-2: Data Points per RMU Configuration

4-Way RMU

FRTU: Site Name			RTU ADD:XXX		IP ADD: xx.xx.xxx.xxx
SINGLE POINT	Hardware Signal	State	Double Point	Hardware Signal	State
Site Name LBS1 FPI fault	SS	S/C			
Site Name LBS2 FPI fault	SS	S/C	Site Name RMU L/R switch Status	DS	Remote/ Local
Site Name LBS1 FPI	SS	E/F	Site Name VCB1 EARTH SW Status	DS	ON/OFF
Site Name LBS2 FPI	SS	E/F	Site Name VCB2 EARTH SW Status	DS	ON/OFF
VCB1 Tripped on fault	SS	Tripped	Site Name LBS1 EARTH SW Status	DS	ON/OFF
VCB2 Tripped on fault	SS	Tripped	Site Name LBS2 EARTH SW Status	DS	ON/OFF
VCB 1 WTI Status	SS	Tripped	Site Name VCB1 Isolator Status	DS	ON/OFF
VCB1 OTI Status	SS	Tripped	Site Name VCB2 Isolator Status	DS	ON/OFF
VCB1 Buchholtz Status	SS	Tripped	Site Name VCB1 BRK STATUS	DS	ON/OFF
VCB 2 WTI Status	SS	Tripped	Site Name VCB2 BRK STATUS	DS	ON/OFF
VCB2 OTI Status	SS	Tripped	Site Name LBS1 STATUS	DS	ON/OFF
VCB2 Buchholtz Status	SS	Tripped	Site Name LBS2 STATUS	DS	ON/OFF

MODBUS Signal	From Relay
Site Name VCB1 CURR L1	Analog value
Site Name VCB1 CURR L2	
Site Name VCB1 CURR L3	
Site Name VCB1 CURR E	
Site Name VCB2 CURR L1	
Site Name VCB2 CURR L2	
Site Name VCB2 CURR L3	
Site Name VCB2 CURR E	
MODBUS Signal	**From Relay**
Site Name VCB1 Fault	O/C
Site Name VCB1 Fault	E/F
Site Name VCB2 Fault	O/C
Site Name VCB2 Fault	E/F

Common Signal		State
RMU Battery Charger Input AC supply	SS	fail
Site Name RMU Batt Charger	SS	Fail
Site Name RMU Batt Volt	SS	Low
Site Name SF6 PRESURE	SS	LOW (all four signals in series)
RMU Door	SS	Open
Common Signal		**State**
RMU battery DC Voltage		Analog Signal

CONTROL	Hardware Signal	State
Site Name VCB1 BRK Control Command	Double Command	Open/ Close
Site Name VCB2 BRK Control Command	Double Command	Open/ Close
Site Name LBS1 Control Command	Double Command	Open/ Close
Site Name LBS2 Control Command	Double Command	Open/ Close
Site Name LBS1 FPI Command	Single Command	Reset
Site Name LBS2 FPI Command	Single Command	Reset

20.1 Numerical Relay Interface with RTU

The Bidder is required to furnish the numerical relay information that pertains to interfacing the relay with the RTU through an RS 485 serial communications link. The protocol details along with the MODBUS mapping data as implemented in each relay shall be provided. In this respect, the RMU Manufacturer in cooperation and coordination with the RTU Manufacturer/contractor shall share the responsibility of ensuring effective communications is attained between the relay and RTU, i.e., all parameters read by the relay shall also be immediately available to the RTU.

All relays of specified make must be complied the availability of WBSEDCL specified/

listed status, and measurement parameter over MODBUS for remote SCADA communication. Numerical relays shall have latest up to dated firmware and that need to be mentioned during approval of drawing.

Offered numerical relay to be tested at WBSEDCL laboratory in respect of its functionality. Manufacturer will have to arrange the third party MODBUS simulator software for that purpose to show the requirement of WBSEDCL for SCADA communication during the evaluation of tender.

20.2 Construction

The RMU shall be sufficiently sturdy to withstand handling during shipment, installation, and start-up without damage. The configuration for shipment shall adequately protect the RMU equipment from scraping, banging, or any other damage. The Bidder shall assume responsibility for correction of all such damage prior to final acceptance of the equipment.

20.3 Control Cabinet

The RMU shall be outfitted with a separate enclosure, referred to herein as the Control Cabinet, to house the following equipment as a minimum:

- Auxiliary transformer for RMU AC Aux. Power Supply will be required.
- SCADA terminal blocks shall be mounted on base plate inside Control Cabinet. All Door shall be free from any terminals.
- RMU Power Supply Unit including Charger and Batteries
- Other equipment according to manufacturer's design

The Control Cabinet shall be similar in style and finish as the other RMU enclosures. This shall include having a minimum protection class of IP 54. It shall be tested in accordance with the latest IEC 60529 standard.

The cabinet shall have a hinged front access door with a three-point latch locking system and a latch operating lockable handle. The door shall be fitted with a perimeter flange and gasket (rubber or neoprene) to prevent the entrance of water. **In addition, a means of monitoring and indicating that the door is open shall be provided.**

A metal screen with holes shall be provided on the top and bottom of the control cabinet to provide ventilation aimed at avoiding condensation inside. Venting however shall in no way reduce the effectiveness of the control cabinet's water-tight, dust-tight, and corrosion- resistant characteristics. To augment the cabinet's effectiveness in preventing the ingress of dust, insects, vermin, and small objects, all electronic parts within the control cabinet shall be enclosed in modules. Such parts and modules shall be separated from the power supply modules as also installed in

the cabinet.

The thickness of all enclosure panels shall be at least 1.6 mm. The control cabinet shall also be provided with:

- Weatherproof fittings for control cables.
- Provision for handle and padlock.
- Grounding terminal, with solder less clamp type connector suitable for steel stranded conductor of suitable diameter and complete with lock washer of stainless steel or better.
- Provision for separately grounding the RMU's electronic items.
- Means of protection against rain water, corrosive salt formations, and high levels of airborne dust(IP-54).
- Circuit diagram of control unit for maintenance purpose affixed permanently.
- Others according to manufacturer's design.

20.4 Auxiliary Transformer

The RMU shall be outfitted with a single-phase auxiliary power transformer with a turns ratio of 11000/√3 to 230, i.e., it shall be connected line-to-neutral to the RMU 11 kV bus and used to provide the required 230 VAC input to the RMU's power supply. The auxiliary power transformer shall have a capacity of at least 1.0 KVA and maximum allowable voltage regulation shall be 5%. During supply, however, the bidder shall assess this requirement by taking into account the actual load corresponding to the RTU and Modem (supplied by others) as well as the load represented by the RMU motors, etc. In this respect, with a suitable margin approved by the Employer, the auxiliary transformer must be capable of supporting the power supply requirements that correspond to a 5-way RMU. HRC fuses shall be provided on both the HV and LV sides of the transformer.

20.5 Motors

The RMU shall be factory fitted with Closing motors of insulation Class E or better in accordance to IEC 60085 and allowing the circuit breakers to be operated without manual intervention. Motor speed shall ensure closing in 40-60 ms. Independently of SCADA control, the mechanism shall ensure that the motors start up immediately once the spring becomes discharged, so that the breaker becomes ready for the next operation.

In addition to allowing circuit breaker tripping by the RMU's protection relays, the motorized operating mechanism shall be suitable for remote control by the SCADA.

The motors along with a Contractor supplied control panel shall allow Employer personnel to electrically operate the circuit breakers at site without any modification of the operating mechanism and without de-energizing the RMU.

The motors shall be of a reputable make in the form of a 24 VDC, single phase type. They shall be enclosed and completely dust proof and sized with a suitable margin to meet the torque requirement of the spring charge mechanism. The motors shall comply with IEC 60034-1 and continuously rated. An 'ON-OFF' switch shall be installed on the RMU for isolation of the motor from the supply and a thermal device or other approved means shall be provided for protection of the motor.

The DC motor shall be able to withstand 'BOOST' voltage of the battery charger.

21.0 Operating Mechanism:

21.1 Manual Operation:

Each of the Circuit Breaker shall be provided with an independent manual closing and opening mechanisms complete with operating handles. An approved visual indicating device coupled to the operating mechanism shall be provided to show whether the breaker is open or close.

The operating mechanism shall be of robust construction and shall be designed to operate with minimum mechanical shock and to prevent inadvertent operation due to vibration or other causes. The circuit breaker shall be operated from the front of the equipment.

21.2 Motorised Operation:

The circuit breakers/Isolators shall in addition be provided with motor actuator to enable them to be remotely operated. If the actuator mechanism is to be detached before manual operation is possible, simple means of detaching the mechanism shall be provided. Padlockable cover shall be provided over the actuator and its linkages.

21.3 Fault Passage Indicator(FPI)

This shall facilitate quick detection of faulty cable. The fault indication may be on the basis of monitoring fault current through the device. The unit shall be self contained requiring no

auxiliary supply. FPI shall be integral part of each Isolator and shall be capable of displaying fault. It shall have LED indication and electrical reset facility. It shall sense short circuit and earth fault current separately. It shall have multiple ampere

and time setting both for short circuit and earth fault. The FPI should be put through current sensor with site selectable setting/CBCT in all the three phases of the Ring of the RMUs. FPI should have suitable connectivity with the FRTUs for the SCADA purpose.

21.4 Integral Cable Earthing Switch

Each circuit breaker/Isolator shall be provided with an integral cable earthing switch. A visual indication device coupled to the earthing switch mechanism shall be provided to show clearly whether the cable earthing switch is in the 'cable earthed' or 'cable unearthed' position. Each earthing switch shall be Padlockable.

21.5 Cable Testing and Test Plug

Provision shall be made for the high voltage testing of cables connected to the switchgear. All parts of the switchgear directly connected to a cable including any necessary test plugs shall be capable of withstanding at any time the high voltages that may be applied during the testing of the connected cable. The insulation between poles and to earth of the test plug should be at least 10,000 meg-ohm when tested with a 5000 volts insulation resistance tester.

21.6 Indicators

The front of the equipment shall provide clear, unambiguous indication of the position and state of the circuit breaker.

A single line diagram and mimic system of the RMUs, indicating the layout and connection of the Circuit Breakers and bus bars shall be provided at the front of the equipment.

Positively driven mechanical indication of the operating positions of a switching device shall be provided. Separate labels shall indicate ON, OFF and EARTH ON for the Circuit breakers. Separate labels shall indicate MAIN SWITCH and EARTH SWITCH for breakers and earth switch mechanism.

21.7 Interlocks

Each switch panel shall be provided with a comprehensive interlocking system to prevent dangerous or undesirable operations.

The interlocks shall be by mechanical means only.

The following minimum interlocks to prevent:-

i. Inadvertent operation of the Circuit breaker from ON to EARTH position.

ii. Opening of test access cover to access test terminals until the switch is in CABLE EARTHED position. Switch can't be closed until the test access cover has been replaced.

iii. Earthing of cable when Disconnector is in ON position.

iv. Operation of switch from ON to OFF and Earth switch from Earth ON to OFF for a minimum period of three seconds subsequent to the achievement of the ON or EARTH ON positions respectively.

v. Remote ON/OFF from SCADA shall not be done when RMU is in Local position.

21.9 SF6 Gas Pressure Gauge

Pressure gauge with temperature compensated value(in **Bar**) of pressure with safety level marking shall be provided for monitoring SF6 gas pressure. A pair of voltage free contact shall be provided for remote monitoring of low pressure alarm & lockout. The supply and installation of the control cable to connect the contact to the SCADA terminal block shall be included in the Contractor's scope of work.

21.10 Padlocks

Padlocks or other approved locking devices shall be provided for locking each panel in the ON, OFF, Cable Earth or Unearthed positions.

21.11 Provision of Supervisory Control

Control Circuits of RMU

The interposing relays for remote opening and closing of the RMU shall be provided by SCADA vendor. Necessary wiring shall be provided by the RMU manufacturer upto the terminal blocks assigned for SCADA. Circuits from the motors as well as the power supply for the operation must be wired up to the TB in such a way that remote operation on the RMU are possible through the contact of the corresponding interposing relay in the supervisory control equipment. There should not be any connector/joints in between RMU internal TB to SCADA TB. MODBUS wiring from relays to SCADA TB is to be wired.

21.12 Position indication of Circuit breakers

Voltage free auxiliary contacts must be wired up to the terminal blocks assigned for SCADA interface for each circuit breaker for both ON/OFF indications.

A Remote/Local switch shall be provided to control motorized Circuit breakers.

The Remote and local indication shall be connected and wired up to a separate terminal block assigned for SCADA interface.

Voltage free contact must be wired for other alarms as detailed in Table-1-2.

22.0 TYPE and ROUTINE TEST:

22.1 Type tests:

The equipment offered in the tender should have been successfully type tested at NABL accredited third party laboratories in India or equivalent international laboratories in line with the relevant standard and technical specification, Validity of type test shall be as per latest CEA guidelines, i.e., 15 (fifteen) years from the date of offer. The bidder shall be required to submit complete set of the type test reports along with the offer.

The list of type tests is as follows:

I. Short time current withstand test and peak current withstand test.

II. Lightning Impulse voltage with-stand test.

III. Temperature rise test.

IV. Short Circuit current making and breaking tests.

V. Power frequency voltage withstand test(dry).

VI. Capacitive current switching test conforming to IEC.

a) Rated line-charging breaking current;
b) Rated cable-charging breaking current;

VII. Mechanical operation test both for LBS and CB.

VIII. Measurement of the resistance of the main circuit.

IX. Degree of protection of main tank and outer enclosure.

X. Circuit breaker, earthing switch making capacity.

XI. Switch, circuit breaker breaking capacity.

XII. Internal arc withstand.

The details of type test certificate according to the composition of the Switchboard shall be submitted with the offer. In addition, for switches, test reports on rated breaking and making capacity shall be supplied. For earthing switches, test reports on making capacity, short-time withstand current and peak short-circuit current shall be supplied.

22.2 ACCEPTANCE & ROUTINETESTS:

All acceptance as stipulated in the respective applicable standards amended up-to-

date for all the equipment shall be carried out by the supplier in the presence of purchaser's representative without any extra cost to the purchaser before dispatch. The tenderer shall have full facilities to carry out all the acceptance and routine test as per the applicable standards.

After finalization of the program of acceptance testing, the supplier shall give 15 days advance intimation to the purchaser, to enable him to depute his representatives for witnessing the tests.

The routine tests carried out by the manufacturer at his works as per IEC 62271-200 on the RMU.

The routine tests as per relevant IEC/IS are as follows:

1. Conformity with drawings , diagrams, and GTP,
2. Measurement of insulation resistance and high voltage test at high voltage and low voltage circuit.
3. Electrical control and operation checking applying specified control DC voltage.
4. Protection circuit operation checking.
5. Measurement of closing and opening time/ speeds,
6. Checking of filling pressure,
7. Diclectric testing and main circuit resistance measurement.
8. Measurement of contact Resistance.
9. Mechanical and electrical operation tests.
10. All IO points as scheduled above are to be made available in SCADA TB and to be tested.
11. All IO and measurement data point address (for remote SCADA communication) of numerical relay to be supplied by the manufacture prior to the inspection. Manufacturer will have to arrange third party MODBUS simulator software for testing the same.

All major type tests shall have been certified at an independent authority with the tests carried outside country of manufacture shall be translated in English and submitted in hard copy.

The supplier in the presence of WBSEDCL's representative shall carry out all above acceptance. The supplier shall give at least 15 days advance intimation to the WBSEDCL to enable them to depute their representative for witnessing the tests.

The WBSEDCL reserves the right for carrying out any other tests of a reasonable nature at the works of the supplier/laboratory or at any other recognized laboratory/research institute in addition to the above mentioned type, acceptance and routine tests at the cost of the WBSEDCL to satisfy that the material complies with the intent of this specification.

23.0 INSPECTION:

The inspection may be carried out by the purchaser at any stage of manufacture. The successful tenderer shall grant free access to the purchaser's representative/s at a reasonable notice when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

The supplier shall keep the purchaser informed, in advance, about the manufacturing program so that arrangement can be made for stage inspection.

The purchaser reserves the right to insist for witnessing the acceptance/routine testing of the bought out items. The supplier shall keep the purchaser informed, in advance, about such testing program.

24.0 MANUFACTURING FACILITIES:

As RMU are having sealed pressure system in compliance with IEC 298, manufacturer shall have complete facility with state of the art equipments for ensuring the quality of product delivered strictly adhering to IEC 298 GUIDELINES. Following are the work station requirement at manufacturer place to ensure the adherence: -

1. Robotic/TIG welding station for stainless steel main tank ensuring the leak rate lessthan 0.1% per annum
2. Work stations with adjustable work benches and torque wrenches, giving flexibility to workmen for proper tightness of internal components of sealed tank.
3. State of the Gas leak testing system ensuring the quality of sealing and have precision to measure leak rate less than 0.1% per annum.
4. High voltage testing station to have high voltage power frequency test and partial discharge measurement.
5. Computerized system to measure time travel characteristic of breaker before sealing the tank.
6. Computerized SF6 filling and testing facility.
7. Partial Discharge Lab for conducting the partial discharge test.

It is mandatory to have the complete assembled tank tested for partial discharge to ensure a high life and reliability of the product.

25.0 QUALITY ASSURANCE PLAN:

The raw materials/components are to be procured only from reputed manufacturers. After placement of Purchase Order, the bidder is required to produce on demand the source of each material/component along with their test certificate.

26.0 DRAWINGS:

All drawings shall conform to relevant IEC Standards Specification. All drawings shall be in ink. The Tenderer shall submit along with his tender dimensional general arrangement drawings of the equipments, illustrative and descriptive literature in triplicate for various items in the RMUs, which are all essentially required for future automation.

1. Schematic diagram of the RMU panel
2. Instruction manuals
3. Catalogues of spares recommended with drawing to indicate each items of spares
4. List of spares and special tools recommended by the supplier.
5. Drawings of equipments, relays, control wiring circuit, etc.
6. Foundation drawings of RMU.
7. Dimensional drawings of each material used for item Vii.
8. Actual single line diagram of RMU/RMUs with or without extra combinations shall be made displayed on the front portion of the RMU so as to carry out the operations easily.

5 sets of the manuals as above shall be supplied to the Chief Engineer/Distribution. Six nos. soft copy of the all Technical documents and Drawings furnished in a CD. All drawings shall be prepared in Auto Cad and documents, literature etc. in MS OFFICE format for submission.

27.0 PACKING & FORWARDING:

The equipment shall be packed in crates suitable for vertical/horizontal transport as the case may be and the packing shall be suitable to withstand handling during the transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable materials shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost.

Each consignment shall be accompanied by a detailed packing list containing the following information:

a. Name of the consignee.
b. Details of consignment.
c. Destination.
d. Total weight of consignment.

e. Sign showing upper/lower side of the crate.
f. Handling and unpacking instructions.
g. Bill of material indicating contents of each package.

All the equipment covered in this specification shall be delivered to the various stores of the WBSEDCL as will be intimated to the successful tenderers. The equipment shall be delivered to these stores only by road transport and shall be suitably packed to avoid damages during transit in the case of indigenous supplies.

28.0 PERFORMANCE GUARANTEE:

In the event of any defect in the equipment arising out of faulty design, materials, workmanship within a period of 5 (five) years from the date of last dispatch of any integral part of the equipment, the supplier shall guarantee to replace or repair the same to the satisfaction of the purchaser.

29.0 DOCUMENTATION:

After issue of letter of acceptance, the successful Tenderers shall submit 3 identical sets of complete drawings along with detailed bill of materials for approval, to the Chief Engineer, Planning & Engineering, Distribution. If any modifications are required on these, the same will be conveyed to the supplier who shall modify the drawings accordingly and furnish final drawings for approval. In no case delivery extension will be granted for any delay in drawing approved.

The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation will be permitted without the written approval of the Distribution department. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the supplier's risk.

After approval of the drawings and bills of materials, the suppliers shall submit detailed packing lists for approval. After approval, copies of these packing lists shall be forwarded to the respective consignees. Copies of packing lists shall also be submitted to the respective site stores.

Before dispatch of equipment to various consignees, the suppliers shall furnish sets of final drawings, including bills of materials and wiring schedules and also sets of technical literature and commissioning manuals. These shall be in Five sets and shall be furnished to the Distribution Procurement department, positively before the dispatch of equipment. All drawings shall preferably be of A3 size. No drawing of width more than 35 cm will be acceptable. One set each of the final drawings, bill of

materials, wiring schedules and commissioning manuals shall invariably be forwarded to the consignee along with the each switchgear consignment and shall be listed out in the packing list, when submitted for approval.

In case the supplier fails to furnish contractual drawings and manuals even at the time of supply of equipment, the date of furnishing of drawings/manuals will be considered as the date of supply of equipment for the purpose of computing penalties for late delivery.

30.0 SCHEDULES:

The tenderer shall fill-in the following schedules which is part and parcel of the tender specification and offer. If the schedules are not submitted duly filled-in with the offer, the offer shall be liable for rejection.

Schedule 'A' ... Guaranteed technical particulars. Schedule 'B' ... Schedule of Tenderer's experience.

Any additional information may be furnished separately by the tenderer, if felt necessary by him.

31.0 ACCESSORIES & SPARES:

The following spares and accessories shall be supplied along with the main equipments at free of costs. This shall not be included in the price schedule.

1. Charging lever for operating load break isolators & circuit breaker of each RMU.

Provision shall be made for padlocking the load break switches/ Circuit breaker, and the earthing switches in either open or closed position with lock &Masterkey

Annexure-A

Standard Make of Relay and fitment

1.	Relays	ABB/Siemens/Schneider Electric/ C&S /CGL/ Ashida Electronics or OEM make
2.	Breaker Control Switch	Kaycee / Alstom / Recom/Switron/L&T/ABB/Siemens/GE
3.	Ammeter/Voltmeter Selector switch	Kaycee/ Recom/ Switron/L&T/ABB/Siemens/GE
	Static Ammeter/ Voltmeter	AE/IMP/MECO/RISHOVE/SECURE

5.	Push Buttons	Alstom / Kaycee / Vaishno/ /L&T/Siemens
6.	Indicating Lamps with lenses	Alstom / Kaycee / Vaishno/ /L&T/Siemens
7.	Panel Wiring (FRLS)	ECKO/PHOENIX/ Finolex/Havels/KEI/RR Kables/Poly Cab (with ISI mark)
8.	Vacuum Interrupter	BEL / SCHNEIDER / SIEMENS / ABB/ CGL or OEM make
9.	FPI	Preferably OEM make
10.	Current and Voltage transformer	ECS/Pragati / Narayan Powertech /BMC/ Plastofab/Ericon transformer
11.	Battery Charger	Alan, Gogate Electric
11.	Battery	Exide, Amara Raja
12	MCB	Siemens/L&T/Schneider/ABB/Kaycee/Legrand/GE/C&S

GURANTEED TECHNICAL PARTICULARS
SCADA Compatible 11 KV Non-Extensible 4WAY Outdoor RMU
(To be filled by the bidder)

	Manufacturer's Name & Factory Address	
A.	General :	
1.	Applicable Standard	
2.	Type/Model	
3.	Rated Voltage	
4.	Highest System Voltage	
5.	Phase	
6.	Frequency	
7.	Rated Normal Current	
8.	Rated Short Circuit Current Capacity	
9.	Rated Breaking Current Capacity (min)	
10.	Rated Making Capacity	
11.	Insulation Level	
12	Minimum Gas Pressure	
13.	Dimension of RMU (H X W X D)(Maximum Limit)	
14.	Material and Thickness	
	a) Tank	
	b) Outer Structure	
	c) Outdoor enclosure	
15.	Degree of Protection	
	a) High Voltage live parts, SF6, VCB	
	b) Front Cover Mechanism	
	c) Cable Compartment	
	d) Outdoor Enclosure	
16.	Internal Arc for main Tank & Cable Chamber	
17.	Maximum Temperature withstand capacity	
18.	Whether RMU are designed to withstand all weather conditions including chemical industry and polluted areas	
19.	Whether RMU has provision for sensors for temperature compensated pressure measurement in the relevant gas compartment to monitor the pressure of SF6 gas	
20.	Whether RMU is sealed pressure system	
21.	Whether RMU is manufactured as per IS/IEC standards to hold SF6 gas without leakage	
22.	Whether RMU is provided with necessary take off terminals for automation	
23.	Weight of RMU complete with operating mechanism	
24.	Position of the Power Cable entry of the RMU	
25.	Position of release of Gas during Internal Fault	
26.	Provision of FPI in all LBS	
27.	Provision of Live Line Detectors in all Panels	
28.	Whether RMU metal clad has sufficient space for integration of: • 2 numbers of Vacuum Circuit breaker • Sufficient space for inspection, testing, etc. • Earthing arrangements • Terminal output points for automation	
29.	Whether Enclosure door-open indications	
	Isolator/Circuit breaker spring charge indications	
	Whether RMU is suitable for remote closing and tripping for SCADA operation.	
	Whether the enclosure is anti-corrosive, if so give the detail.	
	ing between live parts to earth	
	n Circuit Breaker	

1.	Material used for making the body of the breaker	
2.	Make	
3.	Type/Model	
4.	Standard	
5.	Normal Voltage	
6.	Highest System Voltage	
7.	Frequency	
8.	No. of Poles	
9.	Rated Current	
10.	Short Time Current with duration	
11.	a.) Rated Dry PF Withstand Voltage for 1 min (b/w line terminal & earth)	
	b.) Between terminals with breaker contacts open	
12.	a.) Rated 1.2/50 full wave Impulse Withstand Voltage (Between line terminal and earth)	
	b.) Between terminals with breaker contacts open	
13.	Breaking Capacity	
14	Making Capacity	
15	Rated Fault level MVA	
16.	Short circuit breaking current	
	(a)Symmetrical	
	(b)Symmetrical at rated voltage	
	(c)Asymmetrical at rated voltage	
	(i). Per Phase	
	(ii). Average	
	(d)DC Component	
17.	Single Phase Capacitor Breaking Current	
18.	Cable Charging Breaking Current	
19.	Rated restriking voltage at 100% and 50% rated capacity	
	(a)Amplitude factor	
	(b)Phase factor	
	(c)Natural frequency	
	(d)R.R.R.V.(Volts/micro sec.)	
20.	Duty Cycle	
21.	Arcing Time (at rated breaking current)	
22.	Closing time	
23.	Breaking time	
24.	Opening time	
25.	Make time in ms.	
26.	Minimum Phase to Phase Clearance	
27.	Minimum Phase to Ground Clearance	
28.	Type of operating mechanism	
29.	Maximum Temperature withstand capacity	
30.	Mechanical Safety Interlock	
31.	No of Break per Phase	
32.	Mechanical Endurance Capacity	
33.	Thickness of the Tank	
34.	Thickness of enclosures	
35.	Type of welding of the main Tank	
C.	**Vacuum Interrupter**	
1.	Make	
2.	Type & Model	
3.	Current Rating	
4.	STC with duration	
5.	Breaking Capacity	
6.	Mechanical Endurance Capacity	
7.	Electrical Endurance Capacity	
8.	Minimum Electrical Life at STC	

9.	Contact separation distance	
10.	Type of main contacts	
11.	Contact pressure	
12.	Contact resistance	
13.	Details of main contacts making contact with the breaker truck with the panel	
14.	Control circuit voltage AC/DC.	
15.	Whether trip free or not	
D.	**Load Break Switch (Three Position)**	
1.	Material used for making the body of the isolators	
2.	Type/model	
3.	Reference Standard	
4.	Rated Voltage	
5.	Highest System Voltage	
6.	Rated PF Withstand Voltage(To Earth & between Poles)	
7.	Rated PF Withstand Voltage(Across the Isolating Distance)	
8.	Rated Impulse Withstand Voltage(To Earth & between Poles)	
9.	Rated Impulse Withstand Voltage(Across the Isolating Distance)	
10.	Frequency	
11.	No. of Poles	
12.	Material	
13.	Insulation Medium	
14.	Rated Current	
15.	STC with duration	
16.	Rated Making Current	
17.	Load Breaking Current	
18.	Arcing time(at rated breaking current)	
19.	Opening Time	
20.	Type of Operating Mechanism	
21.	Interlocking Arrangement	
	Fault Passage Indicator	
	a.) Make	
22.	b.)Type	
[illegible]3.	Spacing between Live part to Earth	
[illegible].	Spacing between Phases	
25.	Spacing between Fixed & Moving Contacts in open position	
26.	Mechanical Endurance Capacity	
27.	Temperature Rise	
28.	Type of Operating Mechanism for closing & opening	
29.	LBS provided with Earth Switch (Y / N)	
30.	Whether FPI has LED indication and Electrical Reset Facility.	
E.	**Earth Switch**	
1.	Material used for making the body	
2.	Make	
3.	Type/Model	
4.	Reference Standard	
5.	Rated Voltage	
6.	Highest System Voltage	
7.	Rated PF Withstand Voltage (To Earth & between Poles)	
8.	Rated PF Withstand Voltage (Across the Isolating Distance)	
9.	Rated Impulse Withstand Voltage (To Earth & between Poles)	
[illegible]0.	Rated Impulse Withstand Voltage (Across the Isolating Distance)	
	Frequency	
	[illegible]o. of Poles	
	[illegible]erial	
	[illegible]ion Medium	

15.	Rated Current		
16.	STC with duration		
17.	Rated Making Current		
18.	Opening Time		
19.	Type of Operating Mechanism		
20.	Interlocking Arrangement		
21.	Spacing between Fixed & Moving Contacts in open position		
22.	Mechanical Endurance Capacity		
23.	Temperature Rise		
24.	Type of Operating Mechanism for closing & opening		
F.	**Current Transformer**		
1.	Make		
2.	Type		
3.	Voltage Grade		
4.	Type of Primary winding		
5.	Reference Standard		
6.	Primary Insulation level (PF rms / impulse peak)		
7.	One minute PF withstand Voltage on Secondary		
8.	Frequency		
9.	Ratio		
10.	Class of Accuracy		
11.	Rated burden		
12.	STC with duration		
13.	Secondary resistance at 70°C		
14.	Continuous Over Load in percentage(%)		
15.	Class of Insulation		
G.	**Bus Bar**		
1.	Material		
3.	Maximum Current Density (Amp/sq.mm.)		
4.	Minimum clearance (Phase to Phase)(AIS portion)		
5.	Minimum clearance (Phase to Ground)(AIS portion)		
6.	Cross sectional area of the Bus with dimension		
7.	Current Rating of Bus		
8.	Type of Insulation		
9.	Minimum Creepage Distance of Bus support Insulator (AIS portion)		
H.	**Earth Bus**		
1.	Material		
2.	Size (Minimum)		
I.	**Numerical Relay**		
01.	Make		
02.	Model No.		
03.	Ref. Type		
04.	Ordering Code of Numerical relay		
05.	Applicable Standards		
06.	Current Setting range for (a) Over current relay	IDMT	
	(b) Earth fault Element	Definite Time	
07.	Whether the relay has the in-built facilities of IDMT, OL, EL		
08.	Details of IDMT Characteristics		
09.	Accuracy for different settings and limits of errors		
10.	Whether Alpha numeric / LED display		
11.	Whether compatible for 1 A CT Secondary		
12.	Whether draw out type		
13.	Type of case		
14.	Reset time		
15.	Burden of relay		
16.	Maximum and Minimum, operating ambient air temp.		

17.	Whether technical literature pamphlets about the relay submitted	
18.	Certificate of Proof for Electro Magnetic Interference.	
19.	Communications port – RS 232 / RS 485	
20.	Communication Protocol – MODBUS	
J.	**Whether Transformer supervision relay- Buchholtz alarm/trip, temperature alarm etc. for 630 KVA and above is of Stand-alone self-Reset Type Auxiliary Relay**	
K.	**Transformer supervision relay for RMU for 630 KVA Transformer**	
	i. Make	
	ii. Model	
	iii. Voltage	
	iv. Ordering Code	
	v. Whether Technical catalogue enclosed or not	
	Painting	
	a) Support Structure	
	b) Mimic	
	c) Outdoor part	
	d) Thickness	
M.	**Control Wire**	
	a) Make	
	b) Voltage Grade	
	c) Size	
	(i) CT Circuit	
	(ii) Other Circuit	
	d. Colour	
N.	**Accessories**	
	i. Spring Charging Handle	
	ii. VCB operating Handle	
O.	**Battery**	
	i. Make	
	ii. Type	
	iii. Voltage rating (V)	
	iv. Ampere Hour Rating (AH)	
	v. Capacity	
	vi. Discharge Class	
	vii. Min. Back up hours	
	viii. Min. Life Span (yrs)	
P.	**Battery Charger**	
	i. Make	
	ii. Type	
	iii. Voltage rating (V)	
	iv. Ampere Rating (A)	
	v. Variation of O/P Voltage in (%)	
	vi. Whether battery Charger of the offered RMU is equipped with an alarm at the local control panel and remotely at the SCADA to account for all the conditions specified in the TS of NIT	
Q.	**Auxiliary Transformer**	
	i. Make	
	ii. Type	
	iii. Voltage rating (V)	
	iv. Capacity (KVA)	
	v. Whether input Auxiliary Transformer equipped with surge protection device.	
	vi. Maximum % of voltage regulation	
	Confirmation of list of Input/output points as per Table 1-2:	

	(Data Points per RMU configuration) of Technical Specification.	
S.	Guarantee of the total equipment including any integral part of the equipment	

Signature with Designation & Seal
With Name of the Firm

SCHEDULE 'B'

SCHEDULE OF TENDERER's EXPERIENCE

The tenderer shall furnish here the list of the similar orders executed/under execution by him to whom a reference may be made by the purchaser in case he considers such reference necessary.

Sr. No.	Name of the client & description of the order	Value of order	Period of supply & commissioning	Name and address to whom ref can be made

NAME OF THE FIRM .....

NAME & SIGNATURE OF THE TENDERER .....

DESIGNATION .....

DATE .....
