BIDDING DOCUMENT FOR

ELECTRICAL SYSTEM IMPROVEMENT WORKS

UNDER

BIJU GRAM JYOTI YOJANA

IN

BHADRAKDISTRICT

UNDER

DISTRICT RURAL DEVELOPMENT AGENCY
BHADRAK,ODISHA

DISTRICTRURALDEVELOPMENT

At*-Charigharia*, P.O.-Madhab Nagar, Dist.-Bhadrak, Pin-756181

***E_Mail* -ori-dbhadrak@nic.in, Ph.-06784-242864**

TENDER NOTICE NO: Date. …….. 2021

Date of Opening: Time:

NAME OF WORK :-

Electrification of Villages/Hamlets as described below:

Sl.No.	Description of work
1	Stringing of 1 KM 33KV OH line with 100mm2 AAAC on Existing Pole (4nos. Of CP)
2	Construction of 11KV 2Ph OH line over 9mtr long 300 kgPSC pole with 55mm2 AAAC and Average span 60mtr (CP-4 with 2nos. Of SP & 2nos. Of DP)
3	construction of 3 Phase 11KV OH line over 9mtr long 300 kgPSC pole with 55mm2 AAAC and Average span 60mtr (CP-4 with 2nos. Of SP & 2nos. Of DP)
4	Erection of 11mtr interposing PSC Pole in 11KV OH line
5	Erection of 9mtr interposing PSC Pole in 11KV OH line
6	Up gradation of 11KV 2Ph line to 3Ph OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC
7	construction of DP Structure (with Existing Plinth Mounted Transformer)
8	construction of 100 KVA(3ph) DP Structure & Plinth Mounted Sub-station (without Transformer)
9	Construction of 100 KVA(3ph) Plinth Mounted Sub-station over 9mtr long PSC Pole
10	construction of 63 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole
11	construction of 25 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole
12	construction of 16 KVA(1ph) Single Pole Mounted Sub-station over 9mtr long PSC Pole
13	construction of 10 KVA(1ph) Single Pole Mounted Sub-station over 9mtr long PSC Pole
14	Up gradation from 63KVA to 100 (3ph)
15	Up gradation from 25KVA to 63KVA ,11/0.4KV S/S
16	Up gradation from 25KVA to 100VA ,11/0.4KV S/S
17	Up gradation from 16KVA (1Ph) to 25KVA 11/0.4KV S/S
18	Up gradation from 16KVA (1Ph) to 63KVA 11/0.4KV S/S
19	Up gradation from 16KVA (1Ph) to 100KVA 11/0.4KV S/S
20	construction of 1ph 2w LT (NEW)Line over 9mtr Long 300Kg PSC Pole with 1*35+1x25mm2 AB cable
21	construction of 3ph 4w (New) LT Line over 9mtr Long 300Kg PSC Pole with 3*50+1*35mm2 AB cable
22	Conversion of 1ph to 3ph 4w LT Line over existing PSC Pole with 3*50+1*35mm2 AB cable
23	replacement of damaged 1ph 2w LT Line with 1*35+1x25mm2 AB cable
24	Conversion of 3 Ph LT Line having Bare conductor with 3*50+1*35mm2 AB cable
25	Construction of 11 KV Guarding (60mtr Span)
26	Installation of 11Kv line AB switch (3 Pole 400A) with DP Structure along with 9mtr long 300kg PSC pole
27	Power supply to BPL Households

CONTENTS

DistrictRuralDevelopmentAgency,Bhadrak–756100

Tel/FaxNo.06784-242864

E-mail–ori-dbhadrak@nic.in

DISTRICT RURAL DEVELOPMENT AGENCY, BHADRAK

NOTICE INVITING TENDERS FOR ELECTRICAL SYSTEM IMPROVEMENT WORKS IN 7NO BLOCKS, WITHIN BHADRAK DISTRICT

No: BGJY……. **Dated: 2021**

1	The Collector, Bhadrak on behalf of Government of Odisha inviting sealed tenders Block-wise in duplicate from the eligible ELBO registered Electrical HT Contractors/Firms/ Manufacturers/ Suppliers/ Proprietors/Agencies for Electrical System Improvement Works in all the 7 blocks of Bhadrak District i.e. Bonth, Bhandaripokhari, Dhamnagar, Basudevpur, Bhadrak, Tihidi and Chandabali Block under BIJU GRAMYA JYOTI Yojana (BGJY)for the year 2021-2022(6th Phase) on Turnkey Basis.The approximate requirement of quantities along with specifications of System Improvement Works to be required along with scope of works are given as perthe list enclosed herewith separately. The other details as well as scope of works, eligibility criteria and documents to be required for submission along with tender documents can be seen from the DTCN of this Tender Call Notice web hosted in BHADRAK District Official Website"www.bhadrak.nic.in".The bidders registered in other State Government are required to produce non-assessment certificate obtained from Commercial Tax Authority of Government of Odisha at the time of submission of tender.		
2	Nature of Works	:-	Supply & Installation of Electrical System Improvement Works Inall the 7blocks in Bhadrak district under BGJY Schemes for the year 2021-2022
3	ClassofContractor	:-	HT Electrical Contractors
4	EarnestMoneyDeposit	:-	The bidders shall deposit the EMD/Bid Security amount@1%of the estimated cost put to tender,as in the annexure, in shape of Demand Draft issued from any Nationalized/ ScheduledBankin favour of Project Director, DRDA, BHADRAK to be drawn at BHADRAK.
5	Cost of Tender Paper (NonRefundable)	:-	The bidders shall deposit the cost of Bid Document as in the annexure toward tender paper cost, inshape of Demand Draft issued from any Nationalized/ Scheduled Bank in favour of Project Director, DRDA, BHADRAK to be drawn at BHADRAK.
6	Mode of submission oftenderdocuments.	:-	Tender should be submitted in **Off Line** mode only through Registered Post/ Speed Post (Indian Post Offices) only and in no other means, in the address of Project Director,DRDA,Bhadrak,At/Po/District- Bhadrak, PIN-.756181,Odisha.
7	Goods & Service Tax(GST)	:-	The estimated cost put to tender is inclusive of GST and no extra amount shall be paid towards the GST. Hence, the bidders may quote their rate accordingly.

8	Additional Performance Security (APS)	:-	The successful bidder, who has quoted less bid price/ rate than the estimated cost put to tender shall have to furnish exact amount of differential cost i.e. estimated cost put to tender minus quoted amount asAdditional Performance Security in shape of Term Deposit Receipt/ Bank Guarantee duly pledged in favour of Project Director, DRDA, Bhadrak issued from any Nationalized/ Scheduled Bank within 7 days of issue of Letter of Acceptance (LoA), otherwise the bid of the successful bidder(s) shall be cancelled and the Earnest Money Deposit /Bid Security shall be For feited followed with initiation of proceeding for black-listing the Bidder(s).
9	Time of completion of works	:-	06 (six) Calender months from the date of WorkOrder.
10	Period of Availability of Tender paper in the website	:-	**From 8.04.2021 (11.00A.M.) to 23.04.2021 (5.30P.M.)** **BHADRAK District Website"www.bhadrak.nic.in"**
11	Last date & time of seeking clarification, if any relating to the tender.	:-	**By 15.04.2021 (05.30PM)** **Email:" "**
12	IssueofclarificationbyDRDA on the points raisedbyBidders.	:-	**By20.04.2021**
13	Last date of receipt to Bids	:-	**Dt.26.04.2021(11.00AM)**
14	Date of opening of Bid	:-	**Dt.26.04.2021 (3.00PM)** AT office of the Project Director D.R.D.A,Bhadrak
15	Validity of Bid Documents	:-	The Bid for the work(s) shall be valid for a period of 90 days from the last date of receipt of Bid (s). **Non-submission of cost of Bid Documents & Bid Security with the tender documents will ead to the Bidder debarred from participating in the bidding system, and his/her name should be informed to The Registering Authority for cancellation ofhis/herregistration.**
16	The bidders have to participate in **OFF-LINE** bidding only. Further details and addendum/ corrigendum/cancellation of tender relating to this tender can be seen from the BHADRAK District Official website"**www.bhadrak.nic.in**".		
17	The Authority reserves the right to reject any orall the tenders without assigning any reason(s) thereof.		

Sd /-

COLLECTOR: BHADRAK

1. The work will be taken up within 7 blocks of Bhadrak District i.e. Bonth, Bhandaripokhari, Dhamnagar, Basudevpur, Bhadrak, Tihidi and Chandabali Block under BIJU GRAMYA JYOTI Yojana for the year 2021-2022(6th Phase).

2. Bid documents consisting of specification, schedule of quantities and a set of terms and conditions of contract and other necessary documents can be had from the office of the Superintending Engineer, Electrical Circle Bhadrak, TPNODL at Motel Chhaka, Gaba sahi ,Bhadrak in person on application & payment of the cost of tender documents **in** cashor Demand draft drawn on any Nationalized Bank in favour of " Project Director, D.R.D.A," Bhadrak payable at Bhadrak or from the official website **www.bhadrak.nic.in.** In case of downloading the tender documents from the website, the bidder should furnish a bank draft for the cost of tender documents along with his bid without which the bid will

be rejected. The draft purchased should be within the period of sale of Tender document and should be kept inside the envelope marked "A". The cost of tender paper is not refundableat any costfor the year **2021-22. The tender document downloaded after last date of sale of Tender paper will not be accepted**. The last date of submission of BID DOCUMENT is on or before **26.04.21 AT 11.00 AM**by Registered /Speed Post Only for the year **2021-2022(6th Phase).**

3.Bids must be accompanied by EMD/Bid security amount specified above in shape of demand draft drawn on any nationalized bank/ scheduled Bank in favour of "Project Director, D.R.D.A," Bhadrak payable at Bhadrak for the year **2021-2022(6th Phase).**

Alternatively the bid security can be furnished in shape of Bank Guarantee for the said amount issued by any nationalize Bank payable at Bhadrak in the prescribed format only. If the Bank Guarantee is not in the required format the bid will be rejected.

4. The sale of bid documents shall start from **08.04.21 TO 23.04.21 AT 5.30PM during Office hours**, sale of bid documents shall be closed on**……23.04.21…….. at 5.30PM** and the completed Bid documents (technical bid & price bid each separately enclosed)shall be received up to **…26.04.21 …….. at 11.00AM** in the office of the undersigned. The authority will not be held responsible for any postal delay, if any, for non receipt of bid documents in time. Request for tender papers through post will not be entertained. In case of purchase of tender papers from the office of the S.E,E.C,Bhadrak , the tenderers should enclose the Xerox copy of the draft paid for the cost of tender papers in envelope marked 'A'.

5. The technical Bids will be opened **BLOCK WISE** as executants will be selected for different Block separately on 26.04.21 **at 3.00** PM. in the office of the undersigned in the presence of the bidders or their authorized representatives who will to attend. If the office happens to be closed on the last date of the receiving or opening of the bids as specified, the bid will be received/ opened in the next working day at the same time and venue.

6.The bidders are required to submit EMD and Tender paper purchase proof such as money receipt, Attested Xerox copy of draft (optional) or original draft as the case may be in an envelope marked **'A'** in Bold.

They should submit the attested Xerox copies of valid HT license from ELBO, ITCC, PAN card, TAN card and up to date GST clearance proof along with the EPF registration , Xerox copy of work experience proof up to 100 lakhs (1 Crore) for similar work done during last three year (i,e during**2018-19**,**2019-20& 20-21**),Xerox copy of audited balance sheet more than 20lakhs for last 3years and ESI registration (not mandatory).They should also produce bank liquidity paper up to 50lakhs from any schedule bank (for each block) .The bidders registered in other state Govt. are required to produce non assessment certificate obtained from the sales tax Commissioner ,Govt. of Odisha at the time of submission of Tender all enclosed in envelope marked **'B'** on bold.

The financial bids as indicated in the "Schedules" duly filling each of item should be enclosed in an envelope marked **'C'** in Bold.

N:B- The financial bids should be legible type written both in letters and words. Computer written will also be accepted. Hand written bids if found ineligible will be rejected outright. The bidders are required to put their signature on any overwriting or any correction made in the bid rate.The bid filled in figures without mentioning in words shall be liable for rejection.

All these envelopes 'A','B', and 'C' should again be placed inside another big envelope marked 'D' and submit the same in the office of the undersigned during office hours from **...8.04.21..... to till ...26.04.21. up to 11.00a.m** after which no further tender documents will be received.

N:B- Person possessing ESI registration will be given preference over others in case the rates quoted by the tenderers are found same for all the items or the sum total of the items taken unit wise

7. The bidders are required to quote their rates both in words and figures. The bidders are required to put their signature after their writing in the tender paper for confirmation of date..

8. **A pre bid meeting** will be held in the office of the undersigned on **15.04.21 at 3.00PM** to give clarification to any doubts of the intending bidders.

9**.** In the bids no cuts in letters or words will be accepted. If any figure/data is found to be cut/whitened/over writing is noticed, the bid will be rejected summarily without further consideration

10. Other details can be seen in the bidding documents.

11. The bidders who have successfully qualified technically will be entertained for next stage .

12. In case, one tenderer intends to apply for more than one Block, He will have to file as many Tender papers as there are blocks he intend to apply and will have to furnish separate documents with each application as if tenderer is filed as Block wise separately.

13. The authority reserves the right to reject any or all the bids or modify / cancelled any condition of tender without assigning any reason thereof.

14. The tenderers will be governed primarily through the general conditions of tenders enshrined in the tender document.

Sd/-

Collector & District Magistrate

BHADRAK

Memo No..... **Dt.....**

Copy to:-

1. All the BDOs / Collectorate, Bhadrak / D.I.P.R.O, Bhadrak/ Tahasildar, Bhadrak/Executive Engineer, Bhadrak North Division& Executive Engineer, Bhadrak South Division/ Superintending Engineer, Electrical Circle, Bhadrakfor information .They are requested to publish the notice in their notice board for wide publication / Office Notice Board.
2. The D.I.O, NIC, Bhadrak for information. He is requested to up load the tender document at an early.
3. The Editor, Samaj/ Sambad.Dharitri for information. They are requested to publish the Tender call Notice in their Daily News Paper as per I & PR rate and submit bill alongwith the copy of advertisement for necessary payment.

Sd/-

Collector & District Magistrate

BHADRAK

Annexure (Enclosure of Tender Call Notice: EMD DETAILS)

Sl. No.	Name of the work	Approximate Estimated Cost (Fig.inRs.)	EMD Required (Fig.inRs.)	Cost of tender paper + GST 12%	Time of completion	Class of Contractor
01	Electrical System **Improvement under** BGJY in Bonth Block	Rs.10121756/-	Rs 100000/-	Rs 10000/- + 12% GST = Rs11200/-	Within 180 days from the date of **issue** of LOA/Work order.	HT Electrical **Contractor**
02	Electrical System Improvement under BGJY in **B**handari pokhari Block	Rs.9996368/-	Rs 100000/-	Rs 10000/- + 12% GST = Rs11200/-	Within 180 days from the date of issue of LOA/Work order.	HT Electrical **Contractor**
03	Electrical System **Improvement** under BGJY in Dhamnagar Block	Rs.9996702/-	Rs 100000/-	Rs 10000/- + 12% **GST** = Rs11200/-	Within 180 days from the date **of** issue of LOA/Work order.	HT Electrical **Contractor**
04	Electrical System **Improvement** under BGJY in Basudevpur Block	Rs.10034071/-	Rs 100000/-	Rs **10000**/- + 12% GST = Rs11200/-	Within 180 days from the date **of** issue of LOA/Work order.	HT Electrical **Contractor**
05	Electrical System **Improvement** under BGJY in Bhadrak Block	Rs.10012086/-	Rs 100000/-	Rs 10000/- + 12% GST = Rs11200/-	Within 180 days from the date of issue of LOA/Work order.	HT Electrical **Contractor**
06	Electrical **System** Improvement under BGJY in Tihidi Block	Rs.10005118/-	Rs 100000/-	Rs 10000/- + 12% GST = Rs11200/-	Within 180 days from the date of issue of LOA/Work order.	HT **Electrical** Contractor
07	Electrical System Improvement under BGJY in Chandabali Block.	Rs.9999131/-	Rs 100000/-	Rs 10000/- + 12% GST = Rs11200/-	Within 180 days from the date of **issue** of LOA/Work order.	HT **Electrical** Contractor

SECTION-I

INVITATION FOR BIDS (IFB)

Tender Notice No: **Date:**

TENDERCALL NOTICE NO: Date:

INVITATION FOR BIDS (IFB)

The Collector & District Magistrate, Bhadrak invites sealed bids from eligible interested bidders on two part bidding system on Turnkey Basis for (a) Electrification of Villages / Habitations having population less than 100, (b) Distribution System Improvement and (c) BPL Household Electrification will be covered under this programme in the district of **Bhadrak.**

01.0 **INTRODUCTION**

01.01 The State Govt. of Odisha has launched "BIJU GRAM JYOTI YOJANA- Rural Electrification Programme of the State Government" for electrification of villages / habitation which are not scheduled to be covered under DDUGJY 12th Plan and DDUGJY.

01.02 (a) Electrification of Villages / Habitations having population less than 100 (b) Distribution System Improvement and (c) BPL Household Electrification will be covered under this programme.

01.03 The scheme envisages Improvement of the distribution system in order to cope with additional load, which may include.

1	Stringing of 1 KM 33KV OH line with 100mm2 AAAC on Existing Pole (4nos. Of CP)
2	Construction of 11KV 2Ph OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC and Average span 60mtr(CP-4 with 2nos. Of SP & 2nos. Of DP)
3	construction of 3 Phase 11KV OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC and Average span 60mtr (CP-4 with 2nos. Of SP & 2nos. Of DP)
4	Erection of 11mtr interposing PSC Pole in 11KV OH line
5	Erection of 9mtr interposing PSC Pole in 11KV OH line
6	Up gradation of 11KV 2Ph line to 3Ph OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC
7	construction of DP Structure (with Existing Plinth Mounted Transformer)
8	construction of 100 KVA(3ph) DP Structure & Plinth Mounted Sub-station (without Transformer)
9	Construction of 100 KVA(3ph) Plinth Mounted Sub-station over 9mtr long PSC Pole
10	construction of 63 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole
11	construction of 25 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole
12	construction of 16 KVA(1ph) Single Pole Mounted Sub-station over 9mtr long PSC Pole
13	construction of 10 KVA(1ph) Single Pole Mounted Sub-station over 9mtr

long PSC Pole

14 Up gradation from 63KVA to 100 (3ph)

15 Up gradation from 25KVA to 63KVA ,11/0.4KV S/S

16 Up gradation from 25KVA to 100VA ,11/0.4KV S/S

17 Up gradation from 16KVA (1Ph) to 25KVA 11/0.4KV S/S

18 Up gradation from 16KVA (1Ph) to 63KVA 11/0.4KV S/S

19 Up gradation from 16KVA (1Ph) to 100KVA 11/0.4KV S/S

20 construction of 1ph 2w LT (NEW)Line over 9mtr Long 300Kg PSC Pole with 1*35+1x25mm2 AB cable

21 construction of 3ph 4w (New) LT Line over 9mtr Long 300Kg PSC Pole with 3*50+1*35mm2 AB cable

22 Conversion of 1ph to 3ph 4w LT Line over existing PSC Pole with 3*50+1*35mm2 AB cable

23 replacement of damaged 1ph 2w LT Line with 1*35+1x25mm2 AB cable

24 Conversion of 3 Ph LT Line having Bare conductor with 3*50+1*35mm2 AB cable

25 construction of 11 KV Guarding (60mtr Span)

26 Installation of 11Kv line AB switch (3 Pole 400A) with DP Structure along with 9mtr long 300kg PSC pole

27 Power supply to BPL Households

01.04 Bhadrak District has a Geographical area of 1721 Sq. Kms. Covering 7 Blocks.

02.00 **DEFINITION OF TERMS:**

In construing this contract and the scope of work, the following words will have same meaning herein assigned to them unless there is something in the subject or context in context in consistent with such construction.

02.01 **Owner / Purchaser:**

The "Owner / Purchaser" shall mean the Collector & District Magistrate, Bhadrak and shall include its legal representative, successors and assignees.

02.02 **Contractor:**

The "Contractor" shall mean the firm whose tender has been accepted by the owner and shall include its legal representatives, successors and assignees.

02.03 **Engineer In Charge:**

02.04 The "Engineer In Charge" shall mean the Executive Engineer of concerned Electrical distribution division of TPNODL under the district of Bhadrak or his authorized representative.

02.05 **Consignee:**

The "Consignee" shall mean the person authorized by the Collector & District Magistrate, Bhadrak to receive the materials, supervise and take measurement of the work.

02.06**Site:**

The "Site" shall mean the actual place of the proposed project as detailed in the specification or other place where work has to be executed under this contract.

02.07**Specification:**

The "Specification: shall mean collectively all terms stipulated in the contract known as General Conditions of contract and technical field requirement, Technical Specification and such amendments as may be made in the Agreement pertaining to the method and manner of performing the work with respect of quantities and qualities of materials and workmanship to be furnished under the contract.

02.08**Contract:**

The "Contract" shall mean and include the following documents:

a) Invitation to Tender
b) Instruction to Tender
c) General Terms of contract and Technical field requirement
d) Technical Specification
e) Contract Agreement
f) Contractor's tender proposal including clarification letter
g) Letter of intend
h) Work Order
i) Agreement

02.09 **Commissioning:**

The "Commissioning" shall mean the first authorized operation of the equipment / installation after Completion of erection, testing, initial adjustment, statutory approvals etc.

02.10**Approved:**

The "Approved" shall mean the written approval of the Consulting Engineer / Engineer–in-charge.

02.11 **Months:**

Months shall mean the calendar month.

02.12 **Performance Test:**

The "Performance Test" shall mean all the tests as prescribed in the specification / ISS to be carried out by the contractor before taking over the installation by the owner.

02.13 **Final Acceptance:**

The "Final Acceptance" shall mean the owner's written acceptance of the works performed under the contract after successful Completion of Performance & Guarantee Test and Commissioning.

03.00 **APPROACH TO SITE**

03.01 Bhadrak District is located in the North Eastern part of Odisha. NH-05 passes through the district. It is well connected with Jajpur, Cuttack, Bhubaneswar, Balasore, Mayurbhanj by road in all seasons.

04.00 **SITE**

04.01 The site is spread in **Bhadrak** revenue district of **Odisha** state. The Bhadrak district is subdivided into **7** Blocks. As detailed below:

Sl.No.	**Name of the Block**	**Census Code**	**Remarks/ Reference**
1	BONTH		
2	BHANDARIPOKHARI		
3	DHAMNAGAR		

4	BASUDEVPUR		
5	BHADRAK		
6	CHANDBALI		
7	TIHIDI		

05.00 **SERVICE CONDITIONS**

All outdoor Equipment/material to be supplied against this specification shall be Suitable for satisfactory continuous operation under tropical conditions as specified below:

1. Maximum ambient temperature (^{0}C) 50
2. Minimum ambient temperature (^{0}C) 0
3. Relative humidity (%) – Range 10 - 100
4. Maximum Annual rainfall (cm) 70 - 200
5. Maximum wind Pressure (Kg/m^2.) 75
6. Moderately hot and humid tropical, climate, Conductive to rust and fungus growth Yes

06.00 **BID DOCUMENTS**

06.01 The bid specification documents are available in the office of the Superintending Engineer, Electrical Circle, TPNODL, Bhadrak for sale to the interested eligible parties on receipt of application for the same alongwith Bank Demand Draft in favour of Project Director, D.R.D.A ,Bhadrak payable at Bhadrak for an amount of **Rs. 10000/-+GST** as applicable for each Block.

06.02 The bid specification documents will be found attached in bid documents which should be purchased from the office of S.E,E.C,(Electrical),Bhadrak / PD,DRDA,Bhadrak during office hours **from Dt. 08.04.2021……. to …23.04.21……, .After which sale of bid documents will be closed in both the offices .Bid documents down loaded from web site after dt 23.04.21.. will not be entertained.**

06.03 Bids received after the due date and without E.M.D. shall be rejected outright. The undersigned reserves the right to reject any or all bids without assigning any reasons if the situation warrants.

06.04 A complete set of bidding documents can be down loaded from the website **www.bhadrak.nic.in**However for the bidders who has obtained the bid document by down loading from the website must submit the cost of the Tender paper in shape of Bank demand draft in favour of Collector & District Magistrate, Bhadrak payable at Bhadrak along with the bid document in order to make them eligible to participate in the tender.

06.05 Request for Bid Document through post will not be entertained, however Bid can be received through post, but owner will not be responsible for any postal delay.

06.06 The Bids will be opened in presence of Bidders / Bidder's representatives as per Guidelines.

06.07 Bids without E.M. Deposit shall be rejected outright. No adjustment of any previous deposit will be entertained. The E.M. Deposit shall be

forfeited in case of withdrawal of bids after the last date of submission and / or non-acceptance of order.

07.00 **SUBMISSION OF TENDER:**

07.01 Sealed tenders together with descriptive and illustrative literature super scribing Tender Notice No. and date of opening are to be sent by **Registered /Speed post**(India Post)only to the Project Director, District Rural Development Agency ,At-Charigharia ,Po-Madhabnagar,Dist-Bhadrak,PIN:756181. However, undersigned will not be held responsible for postal delay, if any, for non-receipt of Bid documents in time.

07.02 The bidders are required to prepare their bid documents on the following manner.

07.03 **Envelope –A** – Bid security (EMD) in the form of Bank Draft for the specified value drawn in favour of "Project Director, D.R.D.A, Bhadrak", payable at Bhadrak or in shape of Bank Guarantee for said amount issued by any Nationalised Bank payable at **Bhadrak** in the prescribed format only & the Bank Demand draft in favour of Project Director, D.R.D.A, Bhadrak, payable at Bhadrak towards the cost of Tender paper, in case, bid documents are down loaded from website.

07.04 **Envelope – B** – Pre-qualification data i.e. attested copies of:

1. Valid H.T. license issued by ElectricalLicensing Board ofOdisha(ELBO).
2. Audited balance sheet in support of Turnover Paper related to yearly turnover duly issued or certified by the CharteredAccountant alongwithAuditReport for last one financial year.
3. Bidders liquidity capacity or access to liquidity supported by letter issued by a schedule Bank which shall have been issued within 6 (six) months from the date of bid opening.
4. E.P.F. Registration certificate
5. ESI Registration certificate.
6. Labour license.
7. ITCC, PAN card, TAN card.
8. GST clearance certificate
9. Experience supported by client's letter.Work Experience Certificate relating to execution of same nature of worksunder BGJY/ BSVY and other schemes, if any issued from the Competent/Authorities.
10. UptodateIncomeTaxClearanceCertificate.

07.05 **Envelope-C**-The price offer shall be furnished items as per Price Bid after proper field survey.

The Bank instrument and other data as described above under each Para shall be kept in different marked envelopes A, B, C duly sealed and appropriately marked with Envelope, Name of the Block, Bid specification number, name of work. All the three sealed envelopes i.e. A, B and C shall

be kept in a big envelope marked **Envelope-D-** super scribing the name of the Block, bid specification No., Name of work and date of opening.

On the stipulated date / time the envelopes marked 'D' containing bids received shall be opened before all the representatives of bidders present. Thereafter the relevant envelopes of marked A and B of each bidder shall be opened in order. If on opening envelope 'A' the bid security/cost of tender in case, the bid documents are down loaded from website is prima face in order then the corresponding envelope 'B' will be opened and the same will be read out as necessary.

The sealed **envelope 'C' containing price bids** shall be kept in safe custody which shall be opened on a date / time to be intimated to all the bidders whose bids will be found to be substantially responsive after due check and scrutiny. During evaluation to find the responsiveness of the bidders, the owner will have the right to seek any clarification that might be necessary. The bidders are expected to respond to such quarries within a reasonable time. However quarries of owner and bidders response shall not affect the eligibility criteria in any manner.

08.00(a) **PERFORMANCE BANK GUARANTEE:**

The Bidder will submit Performance Bank Guarantee alongwith acceptance from any Nationalised / Scheduled Bank, encashable at Bhadrak amounting 10% of total Contract value valid for 18 months from the date of Completion of the work. No interest will be allowed for the Performance Bank Guarantee submitted by the Bidder. This will be asked after tender is finalized & Tender is selected in due process

(b) ADDITIONALPERFORMANCESECURITY(APS):

The additional Performance Security(APS) of exact amount of differential cost between estimatedcost putinthe tender minusthe quoted amount inshape of **BankGuarantee (fromanyNationalized/ScheduledBank)/TermDepositReceipt**pledged in favour of " Project Director, D.R.D.A," Bhadrak payable at Bhadrak or from the official website **www.bhadrak.nic.in.** will be submittedwithin 7 days of issue of Letter ofAcceptance (LoA) (by e-mail) to the successful bidder or else the bid of the successful bidder shallbe cancelled and the EMD/ Bid security shall be forfeited , if permissible in law. Further proceedingforblacklistingshallbeinitiatedagainstthebidder.

09.00 **TERMS OF PAYMENT:**

(i) 80% of cost of materials, and services alongwith 100% taxes and duties shall be paid within 30 days of successful commissioning of works and made operational.

(ii) Balance 10% shall be released within 30 days of taking over of works by the Electrical Engineer in charge duly certifying the system to be free of defects

(iii) Balance 10% shall be kept reserve towards performance guarantee which will be released after one year of competition of works.

10.00 **PAYING AUTHORITY :**

Project Director, D.R.D.A, Bhadrak will be the PAYING authority.

11.00 **GUARANTEE:**

In the event of any defect in the materials arising out of inferior quality of raw materials and bad workmanship within a period of **18 months** of execution of work, the Bidder shall guarantee to replace or repair to the satisfaction of the owner the defective materials at site free of any cost. However if the contractor fails to do so within a reasonable time, the owner reserves the right to effect repair or replacement and recover charges for repair or replacement from the bidder by encashment of Performance Bank Guarantee.

12.00 **INSURANCE:**

12.01 All the materials shall have appropriate insurance cover from the time the same are out of the manufactures premises till work is completed.

13.00 **THIRD PARTY INSURANCE.**

13.01 The Contractor shall, prior to commencement of the jobs under this Work Order, take out a comprehensive insurance policy against any damage or loss or injury which may occur to any property or to any person or any employee or representative of any outside agency / company engaged or not engaged for the performance of the Service and arising out of the execution of the work or temporary work or in carrying out of jobs under this Work Order.

13.02 **SUPERVISION AND VERIFICATION OF QUANTITY OF MATERIALS &WORKS**:

The work after due completion under the supervision of Executive Engineer(Electrical) 'TPNODL' or his authorized representative shall be inspected byElectrical Inspector or any other competent authority as per Guideline ofEnergyDepartment,GovernmentofOdisha.Allarrangementforthisinspection including deposit of statutory fees shall be the responsibility of thecontractor.

13.03**PRE-DESPATCHINSPECTIONOFMATERIALS:**

Beforecommencementofthework,allthemajormaterialsaretobeinspected by the site Engineer of 'TPNODL'& representative of Collector andDistrict Magistrate , Bhadrak in the respective stores of contractor to ensurethe quality and standard of materials.

14.00 **COMMENCEMENT AND COMPLETION OF WORK:**

The work shall have to be commenced within such period so that the total work under this contract shall have to be completed within a specified time (**Maximum 180 days**) from the date of placement of order. The phase wise Completion period shall be intimated by the successful bidder to the Controlling officer in due course. The bidder has to mobilize the erection team adequately to maintain target period for the total Completion of the work as per programme.

15.00 **PROGRAMME / PERFORMANCE& SCHEDULE TO BE FURNISHED:**

The successful bidder has to submit to the **Collector & District Magistrate, Bhadrak** for approval within 15days from the date of issue of

order. A detailed scheduled of programme in the form of Bar chart / GNATT Chart indicating various activities involving drawing, scheduled of material procurement, testing, reliability runs / delivery etc. The **Collector & District Magistrate**, **Bhadrak** reserves the right to call for further necessary detailed programme during currency of the contract so that he may able to follow up adequately the progress of work.

16.00 **SERVICE GUARANTEE**

16.01 **Work Completion**

In no case, the successful bidder shall abandon the scheme till Completion of the work. For the same successful bidder shall have to give an undertaking in proper forms otherwise risk Purchase clause shall be applicable.

16.02 **Nature of Price (s)**

The quoted price shall be firm throughout the contract period including the extension period (s) if any. The price schedule should be properly filled up and submitted along with other documents falling which the tender shall be rejected. Any increase in price, taxes and duties beyond the scheduled period of the order will not be borne by the owner, if the delay is due to any failure on the part of the Bidder.

16.03 **Quantity:**

The quantities mentioned in tender schedules are provisional. The Owner reserves the right to vary the quantities while placing the order with (+/-) 20% of tender Quantities.

16.04 **Risk Purchase:**

The time of Completion of work stipulated in the Purchase order shall be deemed to be the essence of the contract and if the Bidder fails to complete the work within the period prescribed for such delay the purchaser shall be entitled to complete the work by nearest other substitute on the account and at the risk of bidder and Bidder shall be liable to compensate for any loss or damage which the Purchaser may sustain by reason of such failure on the part of the Bidder.

17.00 **USE OF CONTRACT DOCUMENTS AND INFORMATION:**

a) The contractor shall not, without the purchaser's prior written consent, disclose the Contract, or any provision thereof, or any specification, plan, information furnished by or on behalf of the purchaser in connection therewith, to any person.
b) The manufacturer shall not without the Purchaser's prior written consent, make use of any document or information except for purpose of performing the Contract.

18.00 **STATUTORY OBLIGATION AGAINST THE CONTRACT**

The contractor shall be responsible to comply with all statutory obligations arising out of the Law of the Land. The contractor should be duly registered with PF, ESI Authority and the liability for such payment to the concerned authority shall be entirely borne by them. They should mention

in the application submitted for purchase of Tender document, their PF, ESI Code No. / Registration No.

No Service tax shall be paid to the contractor against this contract. The Work Contract Tax, if applicable also shall not be paid. If Service Tax/Work Contract Tax is applicable during the period of execution of the job the same shall be borne by the contractor. Utility shall not accept any responsibility whatsoever on the taxes and duties as stated above. The bidder is expected to take these into account in his price bid indicating their break up.

19.00 **RESERVATION:**

The purchaser reserves the right to deviate any of the terms and conditions stated herein and to split up the orders as and when necessary and reject any or all tenders without assigning any reasons what-so-ever and does not bind himself to accept the lowest tenders.

20.00 **PRE-BID DISCUSSION:**

A pre-bid meeting will be held on the stipulated date to clarify doubts (if any) of the intending bidders on the bid specification documents. The owner may also modify the stipulating in the bidding documents on its own. Bidders needing clarification shall forward their quarries to the owner well in advance of pre-bid meeting date. Clarification / modification if any shall be issued by the purchaser / owner to all the bidders who have purchased the bidding document in the form of addendum which shall for all practical purposes be part of bidding document.

22.00 **ACCEPTANCE OF ORDER**

The **Collector & District Magistrate, Bhadrak** will communicate acceptance of Bid to the successful Bidder or his Authorized agent by a letter of intent/formal order. The successful bidder shall communicate the acceptance of the order alongwith Performance Bank Guarantee so as to reach the Purchaser within 15 days from the date of issue of the said letter of intent/ order. **If the acceptance of order and the Performance Bank Guarantee is not received within the above period,** then the earnest money against the Tender is liable to be forfeited.

23.00 **EMD**:

23.01 Earnest Money in shape of D.D / Bank Guarantee in favour of **"Project Director,D.R.D.A, Bhadrak"** must be from any Nationalised / Scheduled Bank payable at **Bhadrak for block wise & year wise separately.**

- Cost of Bidding Scheduled Contract Document = **Rs 10000/-+ GST 12% as applicable) in separate Bank draft)**
  - Date of beginning of sale of Bidding documents = **Dt.**8.04.21. during office hours.
  - Last date and time of receipt of Bids =**Dt…26.04.21…….. upto 11.00AM.**
  - Date and time of opening of bid (Tech.) = **Dt. 26.04.21…… at 3.00PM**. in office of Project Director D.R.D.A,Bhadrak
  - Date and time of opening of bid (Financial.) will be intimated to all responsive bidders after evaluation of technical proposal**.**

- Date of Pre Bid discussion (if any) = **Dt 15.04.21 at 3.00PM** in the office of the Project Director D.R.D.A,Bhadrak.

  Owner reserves the right to cancel / withdraw the invitation for bids without assigning any reasons and shall bear no liability whatsoever consequent upon such a decision.

23.02 The Bidders shall be required to keep their offers valid up to 180 days from the date of opening of bids.

23.03 Telex, E-mail or in-complete offers shall be rejected outright.

23.04 The correspondences with regard to the above shall be made at the following address

Project Director, District Rural Development Agency
At-Charigharia,Po-Madhabnagar
Dist.-Bhadrak, Pin-756181
Tel:06784-242864
FAX:06784-240800, E-Mail: ori-dbhadrak@nic.in

Sd/-

Collector & District Magistrate,
Bhadrak

SECTION- II

INSTRUCTION TO BIDDERS

Tender Notice No: **Date:**

TENDERCALL NOTICE NO: Date:

INSTRUCTION TO BIDDERS

01.00 **SCOPE**

The Collector & District Magistrate, Bhadrak invites sealed bids from eligible interested bidders on Turnkey basis for construction / conversion of new 11KV lines, Reconductoring / up gradation of conductor of 11 KV lines, Erection of Distribution substations of different capacities, up gradation of existing distribution sub-stations of different capacities, replacement of burnt transformers,installation of new transformers at theft cases, construction of L.T. line, Conversion of Bare conductor toAB cable, Construction of LT/11KV intermediate poles, Construction of Boundary walland other essential works related to strengthen the electrical system under 7 nos. ofBlocks of this district.

02.00 **COST OF BIDDING:**

The bidder shall bear all costs associated with the survey, preparation and submission of the bid and Collector & District Magistrate, Bhadrak, hereinafter referred to as the Purchaser / owner shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

03.00 **CONTENT OF BIDDING DOCUMENTS:**

BIDDING DOCUMENTS:

4.1 The Scope of Work, Bidding Procedures and Contract Terms are described in the Bidding Documents. In addition to the covering Letter accompanying Bidding Documents, the Bidding documents include:

a)	INVITATION FOR BIDS (IFB)	SECTION - I
b)	INSTRUCTION TO BIDDERS (ITB)	SECTION - II
c)	QUALIFICATION REQUIREMENTS	SECTION - III
d)	GENERAL CONDITIONS OF CONTRACT & TECHNICAL FIELD REQUIREMENTS	SECTION - IV
e)	TECHNICAL SPECIFICATIONS	SECTION - V
f)	LIST OF ANNEXURES (SCHEDULES & FORMATS)	SECTION - VI
g)	PRICE BID FORMAT	SECTION - VII
h)	LIST OF MATERIALS AS PER STANDARD ESTIMATE	SECTION – VIII
i)	GENERAL CONDITION OF CONTRACT/TENDER	

4.2 The Bidder is expected to examine the Bidding Documents, including all Instructions,Forms, Terms and Specifications. Failure to furnish all information required in the Bidding documents or submission of a Bid not substantially responsive to the Bidding Documents in every respect will / may result in the rejection of the Bid.

The goods required, bidding procedures and contract terms are prescribed in the bidding documents. In addition to the invitation for bids, the Bidding Documents include:

(a) General Conditions of Contract
(b) Qualification Requirements
(c) Schedule of requirements
(d) Technical specification
(e) Price Schedules & Schedule of Bids.
(f) Earnest Money
(g) Performance Security Form

The bidder is expected to examine all instructions, forms, terms and specification in the bidding documents. Failure to furnish all information required as per the bidding documents, the bid so submitted shall come under non-responsive category and liable for rejection.

04.3 **CLARIFICATION OF BIDDING DOCUMENTS:**

A prospective Bidder requiring any clarification of the Bidding Documents may notify the Purchaser / Owner in writing or by fax at the Purchaser's mailing address indicated in the invitation for Bids. The Purchaser/ Owner shall respond in writing to any request for clarification of the Bidding Documents which it receives not later than 10 days prior to the deadline for the submission of bids prescribed by the Purchaser. Written copies of the Purchaser's response (including an explanation of the query but without identifying the source of inquiry) shall be sent to all prospective Bidders who have purchased the bidding document.

05.00 **AMENDMENT TO BIDDING DOCUMENTS**

05.01 At any time prior to the deadline of final submission of bids, the Purchaser /Owner 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 amendment.

05.02 The amendment shall be notified in writing or by fax or by E-mail to all prospective Bidders who have received the Bidding Documents and shall be binding on them.

05.03 In order to afford prospective Bidders reasonable time in which to take the amendments into account in preparing their bids, the Purchaser may, at his discretion, extend the deadline for the submission of bids.

06.00 **PRELIMINARY EXAMINATION:**

06.01 The Purchaser / Owner shall examine the bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the bids are generally in order.

06.02 Arithmetical errors shall be rectified on the following bases. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If the Bidder does not accept the correction of the errors, his bid shall be rejected. If there is a discrepancy between words and figures, the amount in words shall prevail.

06.03 Prior to the detailed evaluation, the Purchaser / Owner shall determine the substantial responsiveness of each bid to the Bidding Documents. For purpose of these Clauses, a substantially responsive bid is one which conforms to all the terms and conditions of the Bidding Documents without material deviations. The Purchaser's determination of a bid's responsiveness shall be based on the contents of the bid itself without recourse to extrinsic evidence.

06.04 A bid determined as not substantially responsive shall be rejected by the Purchaser and may not subsequently be made responsive by the Bidder by correction of the non-conformity.

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

07.00 **CONTACTING THE PURCHASER:**

07.01 No Bidder shall contact the Purchaser / Owner on any manner relating to its bid, from the time of the bid opening to the time the contract is awarded, unless requested by the purchaser for any clarification, if any.

07.02 Any effort by a Bidder to influence the Purchaser in the Purchaser's Bid evaluation, bid comparison or contract award decision may result in the rejection of the Bidder's bid.

08.00 **PURCHASER'S / OWNER'S RIGHT TO VARY QUANTITIES AT TIME OF AWARD:**

The Purchaser reserve the right to increase or decrease by up to 20% the quantity of goods services specified in the Schedule of Requirement during execution of Contract without any change in price or other terms and conditions.

09.00 **PURCHASER'S / OWNER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS:**

The Purchaser reserves the right to accept or reject any Bid and reject all Bids at any time prior to award of contract, without thereby incurring liability to affected Bidders or any obligation to inform the affected Bidders of the grounds for the purchaser's action.

10.00 **CONTRACTOR'S / FIRMS' CONSTRUCTION MANAGEMENT:**

10.01 **Contractor's / Firm's Representative**:

The Contractor's/Firm's shall, in addition to a project coordinator, employ one or more competent representative to supervise the carrying out of the works on Site. He shall be fluent in the language for day to day communications. Their names shall be communicated in writing to the Purchaser before works on Site begins.

Any instruction or notice which the Purchaser gives to the Contractor's / Firm's representatives shall be deemed to have been given to the Supplier.

At least one of the Contractor's competent representatives on each Site shall be fluent in speaking, writing, reading and understanding Oriya / English / Hindi.

11.00 **OBJECTION TO CONTRACTOR'S / FIRM'S EMPLOYEES:**

The Contractor's / Firm's shall, upon the Purchaser's written instructions, remove from the Works any person employed by him in the execution of the Works, who misconduct himself or is incompetent or negligent.

12.00 **SAFETY PRECAUTIONS:**

The Contractor's shall observe all applicable regulations regarding safety on the Site.

13.00 **ELECTRICITY AND WATER:**

The Supplier shall be entitled to use for the purpose of performing the Services such supplies of electricity and water as may be available on the Site and shall provide any apparatus necessary for such use. The Supplier shall pay the Purchaser at the applicable tariff plus the Purchaser's overheads, if any, for such use. Where such supplies are not available, the Supplier shall make his own arrangement for provision of any supplies he may require.

14.00 **CLEARANCE OF SITE:**

The Contractor's shall from time to time during the progress of the Works clear away and remove all surplus materials and rubbish disposal in an approved manner. On Completion of the work the Supplier shall remove all Suppliers' equipment and leave the whole of the Site clean and in a workable condition, to the satisfaction of the Purchaser. The Supplier shall obtain prior approval of the Purchaser to remove the surplus materials.

15.00 **OPPORTUNITIES OF OTHER CONTRACTORS:**

The Supplier shall in accordance with Purchaser's instructions, cooperate with and afford to other contractors engaged by the Purchaser to work on the Site and persons lawfully so engaged upon the Site all reasonable opportunities for carrying out their work provided that the same shall not obstruct or disturb the progress of the work. The Supplier shall also afford such opportunities to the employees of the Purchaser.

16.00 **AUTHORITY FOR ACCESS:**

No persons other than the employees of the Contractor and his sub-contractors shall be allowed on the Site except with the written consent of the Purchaser.

Facilities to inspect the work shall at all times be afforded by the Supplier to the Purchaser and his representatives, authorities and officials.

17.00 **OBLIGATIONS OF THE PURCHASER:**

17.01 **Access to and Possession of the Site:**

The purchaser shall in reasonable time grant the Supplier access to the possession of the Site, which shall not be exclusive to the Supplier.

17.02 **Assistance with Local Regulations:**

The Purchaser shall assist to the extent possible the Supplier in ascertaining the nature and extent of any laws, regulations orders or bye-laws and customs in India where the Goods are to be erected, which may affect the Supplier in the performance of his obligations under the Contract. The Purchaser shall if so requested procure for the Contractor

copies thereof where available and information relating thereto at the Supplier's cost.

18.00 **LABOUR**:

18.01 **Engagement of Labour:**

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all labour and for their payment, housing, feeding and transport.

The Contractor / Firm shall pay rates of wages and allowances according to the nature of the work and observe hours and working conditions of his employees, so as to be no less favorable to the employees than those generally prevailing in the region where the work is to be carried out. At the same time, the Supplier shall observe all regulations prescribed by the law of the Government and shall strictly comply with any agreement, custom, practice or award relating to the wages.

The Contractor /Firm is encouraged, to the extent practicable and reasonable, to employ staff and labour with the required qualifications and experience from sources within the region of work.

18.02 **Return of Labour**

The Supplier shall submit detailed returns showing the supervisory staff and the numbers of the several classes of labour from time to time employed by the Supplier and his subcontractors on the Site. The returns shall be submitted in such form and at such intervals as the Purchaser may prescribe.

The Supplier shall within twenty-four (24) hours of the occurrence of any accident at or about the Site or in connection with the execution of the work, report such accident to the Purchaser. The Supplier shall also report such accident to the competent authority whenever such report is required by the Law.

The Supplier shall keep proper wages books and time sheets showing the wages paid to and the time worked by all workmen employed by him in and for the performance of the Contract and shall produce such wages books and time sheets on demand for inspection by any persons duly authorized by the Purchaser and shall furnish to the Purchaser such information relating to the wages and conditions of employment of such workmen as the Purchaser or his duly authorized representative may from time to time require.

18.03 The Contractor shall take all steps, necessary to comply with the various applicable laws/ rules/ regulations / notifications, including but not limited to the provisions of Contract Labour (Regulation and Abolition Act),1970 as amended, Minimum Wages Act. 1984, Workman Compensation Act, 1923, Employee State Insurance Act, 1948 ("ESI"), Public Provident Fund Act, 1968, Payment of Bonus Act, 1985 and all other applicable laws and rules framed there under including any statutory approval required from the Central/State Governments, Ministry of Labour in relation to the Contractor's employee/ labourer/ Workmen deployed to perform the Service under this Work Order.

19.00 **WORKMAN COMPENSATION**.

19.01 The Contractor shall take out a comprehensive insurance policy under the Workman Compensation Act 1923, to cover such workers, who will be engaged to undertake the jobs covered under this Work Order and a copy of this insurance policy will be given to Company solely for its information, reference and records. The Contractor shall ensure that such insurance policies are kept at all times.

19.02 The Contractor shall keep the Company indemnified at all times, against all claims that may arise under this Work Order, including claims of compensation under the provisions of Workmen Compensation Act 1923, and as amended from time to time or any compensation payable under any other law for the time being in force by any workman engaged by the Contractor/Sub-Contractor/Sub-agent in carrying out the job involved under this Work Order and against costs and expenses, if any, incurred by the Company in connection therewith and without prejudice to any of the Company's rights make recovery.

19.03 The Company shall be entitled to deduct from any money due to or to become due to the Contractor under this Work Order or under any other contract, moneys paid or payable by way of compensation as aforesaid or cost or expenses in connection with any claims thereto. The Contractor shall abide by the decision of the Company as to the sums payable by the Contractor under the provisions of this Clause.

19.04 Nothing contained in this Work Order, shall establish any relationship of any kind between the Company on the one hand and the employees, workmen and labourers, of any kind whatsoever of the Contractor on the other hand.

20.00 **RESTRICTION ON WORKING HOURS:**

No work shall be carried out on the Site outside normal working hours or on the locally recognized days of rest, unless

a) The Contract so provides, or
b) The work is unavoidable or necessary for the saving of life or property or for the safety of the work, in which case the Supplier shall immediately advise the Purchaser, or
c) The Purchaser gives his consent.

20.01 The Contractor shall be expected to employ on the work only his regular skilled employees with experience of the particular type of work. No female labour shall be employed after dark. No person below the age of eighteen years shall be employed.

20.02 In case the Purchaser becomes liable to pay any wages or dues to the labour or any Government agency under any of the provisions of the Minimum Wages Act, Workmen Compensation Act, Contract Labour Regulation Act or any other law due to act of omission of the Contractor, the Purchaser may make payments and shall recover the same from the Contractor's invoices.

20.03 **PERMISSION TO DELIVER:**

20.04 The Contractor shall apply in writing to the Purchaser for permission to deliver any Goods or Supplier's equipment to the Site.

20.05 The Supplier shall be responsible for the receipt at Site of all Goods and Supplier's equipment, delivered for the purposes of the Contract and shall, upon arrival at Site, advise the Purchaser when and where it has arrived and/or been stored.

21.00 **TAKING OVER:**

21.01 The Goods and Services shall be taken over by the Purchaser when they have been completed in accordance with the Contract, except in minor respects that do not affect the use of the Goods and Services for their intended purpose, have passed the Test on Completion and a Taking Over Certificate has been issued.

22.00 **INDEMNITY BOND:**

For the Goods to be provided by the Supplier, it shall be the responsibility of the Supplier to take delivery, unload and store the Goods at Work Site and execute an Indemnity Bond, trust receipt and obtain authorization letter from the Purchaser in favor of the Supplier against loss, damage and any risks involved, for the full value of the Goods. This Indemnity Bond shall be furnished by the Supplier before commencement of the supplies and shall be initially valid till the scheduled date of testing, commissioning and handing over of the Goods to the Purchaser.

23.00 **NOTIFICATION OF AWARD:**

23.01 Prior to expiry of the bid validity, the Purchaser shall notify the successful Bidder in writing or by Fax, that its bid has been accepted.

23.02 The notification of award shall constitute the formation of the Contract.

23.03 Upon the successful Bidder's furnishing of Security Bank Guarantee, the purchaser shall promptly notify each unsuccessful Bidder and shall discharge their Earnest Money.

24.00 **SIGNING OF CONTRACT:**

24.01 At the same time as the purchaser notifies the successful bidder that its bid has been accepted, the purchaser shall send the bidder a Contract Form to be executed between the bidder & purchaser.

24.02 Within 15 days of receipt for the Contract Form, the successful Bidder shall sign and date the Contract Form and return it to the purchaser alongwith the Performance Bank Guarantee.

24.03 The Contract is to be executed on Rs. 100.00 Non-Judicial Stamp Paper.

25.00 **CONFIDENTIALITY**

The technical information, drawing and other related documents forming part of this work order and the information obtained during the course of investigation under this Work Order shall be the Company's exclusive property and shall not be used for any other purpose except for this execution of this Work Order. The technical information drawing, records and other document shall not be copied, transferred, or divulged and/ or

disclosed to third party in full/ part, not misused in any form whatsoever except to the extent for the execution of this Work Order

25.01 In the event of any breach of this provision, the Contractor shall indemnify the Company against any loss, cost or damage or claim by any party in respect of such breach.

25.02 The provisions of this Clause shall remain effective for a period of Two (2) years from the expiry or termination of this Work Order.

25.03 The Contractor shall not use the name of the Company in any manner either for credit arrangement or otherwise and it is agreed that the Company shall not in any way be responsible for the debts, liabilities or obligations of the Contractor and/ or his employees.

26: VALIDITY:-

The offer shall be valid for a period not less than **180 days** from the date of bid opening.

27.0 PRICE:-

Bidders are required to quote firm price as per the prescribed format enclosed in **Section –VII**, Bid Proposal sheets. The quoted price shall be firm and inclusive of all taxes, duties, freight & insurance and other levies, if any. The purchaser shall not be liable to pay any thing extra over and above the quoted price.

27.01 The additional Performance Security(APS) of exact amount of differential cost between estimatedcost putinthe tender minusthe quoted amount inshape of **Bank Guarantee (from any Nationalized / Scheduled Bank) / Term Deposit Receipt** pledged in favour of " Project Director, D.R.D.A," Bhadrak payable at Bhadrak or from the official website **www.bhadrak.nic.in.** will be submitted within 7 days of issue of Letter of Acceptance (LoA) (by e-mail) to the successful bidder or else the bid of the successful bidder shall be cancelled and the EMD / Bid security shall be forfeited , if permissible in law. Further proceeding for blacklisting shallbe initiated against the bidder.

28. TESTING AND INSPECTION:-

All the materials shall be inspected by any authorized representative of the 'TPNODL' orjointly by the'TPNODL'for the Govt. Programme for safety Measures for avoiding electrocution as per relevant ISS at the Contractor's or its Sub-Vendors store side.They shall give the advance notice in writing about the place of Inspection and or testing at least 15 days before the scheduled at on which the materials will be ready for Inspection & Testing.

- TheEngineer-in charge shall be entitled at all reasonabl etimes during installation to inspect examine and test the materials at the contractor's premises / erection site about workmanship of the materials to be supplied under this contract. The contractor shall provide un hindered clearance, giving full rights to the purchaser to inspect, examine and test as if the materials were being manufactured in his premises. Such inspection / examination and testing shall not relieve the contractor of his obligations to execute the contract by letter and spirit. The contractor shall give the purchaser advance notice in writing of the Date and the Place at which the materials will be ready for inspection & testing. The inspecting officer's coordinating office for the entire work shall be the "**Superintending Engineer (Electrical)"** Bhadrak.

29.0 COMPLETION AND COMPLETENESS OF THE EQUIPMENT:-

Time being the essence of the contract; the work shall be completed within 180 days including supply of all the materials, erection, Testing & Commissioning.

The work shall be treated as complete item wise when each item shall be complete in all respects with all mountings, fixtures and standard accessories which are normally supplied even though not specifically detailed in the specification. No extra payment shall be payable for such mounting, fittings, fixtures and accessories which are needed for safe operations of the equipment as required by applicable code of the country though this might not have specifically been included in the contract.

All similar components and / or parts of similar equipment supplied shall be inter-changeable with one another. All equipment supplied under this contract shall be subject to'TPNODL'sapproval.

Purchaser how ever reserves the right to re-schedule the Completion period, if required.

30. REJECTIONOFMATERIALS:-

Inthe event of thematerials supplied by the contractor and / or the installation works are found to be defective in quality and the workmanship is poor or other wise not in conformity with the requirements of the contract specification as persection-V (Technical specification), the owner shall reject such materials / services and ask the contractor in writing to replace / rectify the defects. The contractor on receipt of such notification shallrectify or replace the defective materials and /orre-install the work already executed, free of cost. If the contactor fails to do so the Purchaser may at his option take the following actions which could be on concurrent basis.

A) Replace or rectify such defective materials andrecover the extra cost so involved plus 25% from the Contractor.

B) Terminate the contract for balance supply and erection with enforcement of penalty as per contract.

C) Acquire the defective ematerials at reduced price considered acceptable under the circumstances.

D) Forfeit the Contract Per formance Bank Guarantee.

31.0 DEVIATION FROM SPECIFICATION:-

The bidders are requested to study the specification and the attached drawings thoroughly before tendering sothat if they make any deviations, the same are prominently brought on a separate sheet under the headings"Deviations"as per formats provided under**Section-VI, Annexure – VII(A) & VII(B).**All such deviations to the technical & commercial terms of the specification shall be indicated in a separate list as indicated above. Inabsence of such deviation schedule, it will be presumed that the bidder has accepted all the conditions stipulated in the tender specification, not withstanding any deviations mentioned elsewhere in the Bid. However the acceptance of deviation is not binding on theTPNODL.

32.0 CONTRACTOR TOINFORMHIMSELFFULLY:-

The contractor shall examine the instructions, general conditions of the contract, specificationsandthe schedule of quantity anddelivery tosatisfy himself as toall the terms and conditionsand circumstancesaffecting the contract price. He shall quote prices according to his own judgment and

shall understand that no additional cost except as quoted shall only be considered.

33.0 PATENTRIGHT:-

The contractor shall indemnify the Purchaser against all claims, actions, suits and proceedings for the alleged in fringement any patent design or copy right protected either incountry of origin or in India by the use of any equipment supplied by the contractor but such indemnity shall not cover any use of the equipment other than for the purpose indicated by or reasonable to be in formed from the specification.

34.0 PENALTY FOR DELAY IN COMPLETION OF CONTRACT:-

If the contractor fails to complete the works by the scheduled period or any extension granted there by, the contractor shall be liable for payment of penalty amounting to **0.5% (half percent)** of the contract price per week o fun-finished works subject to the Maximum of **5% (five percent)** of the total contract value and subject to force majeure conditions. After receiptof LOA, the Contractor shall sign a contract agreement with the Purchaser within 15 days along with the detail work plan through PERT chart / BAR chart. The penalty for liquidated damage as mentioned above will be levied if any deviation to be schedule on any item of work due to the fault of the contractor is observed.

Penalty amount can be realized from the proceeds of the Contract Performance Bank Guarantee,if the situation so warrants.

Extension of delivery period could be with / without levy of penalty with the discretion of the Purchaser.

35.0 RIGHT OF WAY:

Right of way issues, if any, arising during execution of the works shall have no liability on the Purchaser. These issues shall be settled at the sole discretion of the Contractor. The Purchaser shall however extend all possible help to the Contractor including discussion with the local authorities of Utility or early resolution of these issues.

36.0 CONTRACTOR'S DEFAULT:

If the Contractor neglects to execute the works with due diligence and expedition or refuses or neglects to comply with any reasonable order given to him, in writing by the Engineer in connection with the works or contravenes the provisions or the contract, the Purchaser may give notice in writing to the Contractor to make good the failure, neglect or contravention complained of. Should the Contractor fail to comply with the notice within thirty (30) days from the date of serving the notice, the Purchaser shall be at liberty to employ other workmen and forthwith execute such part of the works as the contractor may have neglected to do or if the Purchaser thinks fit, without prejudice to any other right, he may have under the Contract to take the work wholly or in part out of the Contractor's hands and re-contract with any other person or persons to complete the works or any part thereof and in that event the Purchaser shall have free use of all Contractor's equipment that may have been at the time on the Site in connection with the works without being responsible to the Contractor for fair wear and tear thereof and to the exclusion of any right of the Contractor over the same, and the Purchaser shall be entitled to retain and apply any balance which may otherwise be due on the Contract by him to the Contractor, or such part thereof as may be necessary, to the payment of the cost of executing the said part of works or of completing the works as the case may be. If the cost of completing of works or executing part thereof as aforesaid shall exceed the balance due to the Contractor, the Contractor shall pay such excess. Such payment of excess amount shall be independent of the liquidated damages for delay which the Contractor

shall have to pay if the Completion of works is delayed.
In addition, such action by the Purchaser as aforesaid shall not relieve the Contractor of his liability to pay liquidated damages for delay in Completion of works.

Such action by the Purchaser as aforesaid the termination of the Contract under this clause shall not entitle the Contractor to reduce the value of the Contract Performance Guarantee nor the time thereof. The Contract Performance Guarantee shall be valid for the full value and for the full period of the Contract including guarantee.

37.0 TERMINATION OF CONTRACT ON PURCHASER'S INITIATIVE:

Purchaser reserves the right to terminate the Contract either in part or in full due to reasons other than those mentioned under clause entitled "Contractor's Default". The Purchaser shall in such an event give fifteen (15) days notice in writing to the Contractor of his decision to do so.

The Contractor upon receipt of such notice shall discontinue the work on the date and to the extent specified in the notice, make all reasonable efforts to obtain cancellation of all orders and Contracts to the extent they related to the work terminated and terms satisfactory or the Purchaser, stop all further sub-contracting or purchasing activity related to the work terminated, and assist Purchaser in maintenance, protection, and disposition of the works acquired under the Contract by the Purchaser. In the event of such a termination the Contractor shall be paid compensation, equitable and reasonable, dictated by the circumstance prevalent at the time of termination to be determined by the arbitrator without stopping the work but to carry out the left over work to other agency.

If the Contractor is an individual or a proprietary concern and the individual or the proprietor dies and if the Contractor is a partnership concern and one of the partners dies then unless the Purchaser is satisfied that the legal representatives of the individual Contractor or of the proprietor of the propriety concern and in the case of partnership, the surviving partners, are capable of carrying out and in the case of partnership, the surviving partners, are capable of carrying out and completing the Contract the Purchaser shall be entitled to cancel the Contract as to its uncompleted part without being in any way liable to payment of any compensation to the estate of deceased Contractor and /or to the surviving partners of the Contractor's firm on account of the cancellation of the contract. The decision of the Purchaser that the legal representatives of the deceased Contractor or surviving partners of the Contractor's firm cannot carry out and complete the contract shall be final and binding on the parties. In the event of such cancellation the Purchaser shall not hold the estate of the deceased Contractor and/ or the surviving partners of the Contractor's firm liable to damages for not completing the Contract.

38.0 FORCE MAJEURE: -

The Contractor shall not be liable for any penalty for delay or for failure to perform the contract for reasons of Force Majeure such as "acts of God, acts of the Public enemy, acts of Govt., Fires, Flood, Epidemics, Quarantine restrictions, Strikes, Freight Embargos and provided that the Contractor shall within ten (10) days from the beginning of such delay notify the purchaser in writing of the cause of delay. The purchaser shall verify the facts and grant extension as facts justify.

39.0 EXTENSION OF TIME: -

If the delivery of the equipments / materials is delayed due to reasons beyond the control of the Contractor, the Contractor shall immediately inform within 3 days to the Purchaser in writing of his claim for an extension of time. The Purchaser on receipt of such notice may agree to extend the contract period as may be reasonable but without prejudice to other terms & conditions of the contract.

40.0 SAFETY PRECAUTIONS:-

The agency shall observe all applicable regulations regarding safety at the Site. Any compensation due on account of accident at site shall be to the contractor's account.

41.0 STORE:-

Storing of materials from supply to erection shall be arranged by the contractor at his own cost. No compensation shall be made by the Purchaser for any damage or loss of materials during storing, transit transportation and at the time of erection.

42.0 INSURANCE: -

Contractor shall arrange adequate Transit-cum-storage-cum-erection policy and shall submit the copy of the same to the Purchaser. The policy shall initially remain valid for a period of sixty days over & above of the contractual guarantee period and shall be extended as required till handing over. Contractor shall be responsible for lodging of claim with the insurer as well as for all required follow up with the insurer for settlement of claim in case of loss/damage/theft of material during transit/storage/erection till the completed works is handed over to the Purchaser and is accepted by the authorized representative of the Purchaser in writing.

Contractor shall also arrange adequate cover for his employees / labourers engaged in the works as well as arrange third party insurance cover to indemnify any possible damages to public at large not connected with the works process. Any claim(s) pertaining to this shall be the responsibility of the Contractor.

The contractor shall undertake free replacement of the materials damaged or lost during transit, which will be intimated by the Consignee within 30 days of receipt of the materials.

43.0 ENGINEER IN CHARGE:-

Concerned Divisional Head / authorized Engineer of the NESCO Utility shall be theEngineer in charge for the Project.

44.0 DISTINCT MARK ON EQUIPMENT AND MATERIALS:

HT insulated conductor, AB Cables and its accessories, shall have distinct mark of "**BGJY Scheme, Bhadrak "** either by way of punching on metal part(s) and/or in built during casting and painting on insulation cover as per common practice. This should be clearly visible in day light in naked eye.

45.0 DISPUTE RESOLUTION AND JURISDICTION: -

a) Any disputes arising out of this contract shall be referred to the Collector & District Magistrate, Bhadrak whoshall decide the case as sole Arbitrator.

b) For the purpose of dispute resolution, this agreement shall be governed by the provisionof Arbitration and Conciliation Act, 1996.

c) All disputes shall be subjected to exclusive jurisdiction of the Courts at Bhadrak andthe writ jurisdiction of Hon'ble High Court of Odisha at Cuttack.

46.0 TRANSFER AND SUB-LETTING

The Contractor shall not sublet, transfer, assign or otherwise part with the Contract or any part thereof, either directly or indirectly, without prior written permission of the Purchaser.

47.0 SUBMITTALS REQUIRED AFTER AWARD OF CONTRACT

Within 30 days of the effective date of contract the contractor shall provide three copies of an outline program of production, inspection, testing, delivery, survey, erection, pre- commissioning and commissioning in chart form. Included in the program will be the detailed schedule of drawing to be submitted.

The periodic progress report as required by the Purchaser shall be

submitted by the contractor as per the format prescribed by the Engineer in Charge.

48.0 DRAWINGS

Within 7 days of contract commencement the contractor shall submit, for approval by the Purchaser, a schedule of the drawings to be produced. The schedule shall also provide a program of drawing submission, for approval by the Engineer in Charge. All drawings and design should be submitted to Engineer-In-Charge within the period specified above.

49.0 APPROVAL PROCEDURE OF SUB VENDORS & DRAWINGS OF BOUGHT OUT MATERIALS

The contractor shall submit all drawings, documents and type test reports, QAP, Name of Sub vendor, samples (as applicable) etc, to the purchaser within 7 days of award of LOA for approval. If modifications to be made if such are deemed necessary, the contractor has to resubmit them for approval without delaying the initial deliveries or Completion of the contract work.

Three copies of all drawings, GTP, QAP shall be submitted for approval and three copies for any subsequent revision.

If the drawings are as per the technical specifications, the competent authority of the Purchaser will return the drawings & documents to the contractor marked with "Approved" stamp.

49. TAKING OVER

Upon successful Completion of all the tests to be performed at site on equipment / materials supplied, erected and commissioned by the contractor, the supply engineer shall issue to the contractor a taking over certificate as a proof of the final acceptance of the equipment / materials on a written request within 10 days of commercial operation. Such certificate shall not be un-reasonably withheld nor will the engineer delay the issuance thereof on account of minor omission or defects, which do not affect the commercial operation and / or cause any serious to the equipment/material. A conditional Taking over Certificate can be issued if any minor omission or defects pointed by the Engineer- in-Charge/Supervising Officer/Electrical Inspector. The Contractor should rectify those defects within a month of conditional T.O.C failing which Purchaser will rectify those by replacing those materials or engaging other agencies. The amount so involved will be fully recovered from the Contractor's bill. Such certificate shall, however, not relieve the contractor of any of his obligations which otherwise survive by the terms & conditions of the contract after issuance of such certificate.

For the satisfaction of Purchaser about quality, the purchaser shall have unreserved right for arrangement of testing of equipment/ materials and the complete system independently by self or any other agency chosen by the Purchaser. The contractor is expected to agree and extend necessary help during such test if necessary.

Sd/-

Collector & District Magistrate,

Bhadrak

SECTION-III

QUALIFICATIONREQUIREMENTS

TENDERCALL NOTICE NO: Date:

QUALIFICATION REQUIREMENTS

01.00 a) The Bidder must have valid HT Electrical Contractor license issued by ELBO.

b) In addition to above the bidder(s) should submit the following valid documents in bid as qualifying terms.

i. Electrical HT license for Electrical Construction works.

ii. PF registration

iii. PAN & TIN Registration No.

iv. GST Registration Certificate.

v. ESI Registration.

vi. Valid Labour License.

c) Bidder must declare its sub-contractors name, if any, who will execute the work. The contractor must be having labour license for at least 50 Nos. labour.

d) Bidder shall be financially sound and must have an annual turnover of minimum **Rs. 100** lakhs during last financial year of business.

02.00 The Bidder should furnish the information on all past works and satisfactory performance.

(a) The bidder should have installed and commissioned at least following quantum of works during the immediate last 3 financial years proceeding to the year of Tender notification. Bidder must enclose the copies of relevant work orders along with client certified copies of final Invoices and/or performance certificates duly signed by the competent authority of the client or Final Inspection certificate issued by Electrical Inspector in proof of having executed the desired quantum of work during immediate last 3 financial years.

(b) Priority will be given to the bidders those who have experience in cyclone restoration work.(Work certificate from supply engineer should be attached.)

(c) The bidders who have earlier failed to execute the work order(s) of TPNODL shall not be eligible to participate in this tender.

(d) The Purchaser reserves the right to waive minor deviation, if they do not materially affect the capacity of the bidder to perform the contract.

(e) The bidders should agree to hand over the dismantled materials to concern division, of TPNODL.

03.00 All bids submitted shall also include the following information.

i) Copies of original documents defining the constitution or legal status, place of registration and principal place of business of the Company or Firm or Partnership etc.

ii) The Bidder should furnish a brief write up, backed with adequate data, explaining his available capacity and experience (both technical and commercial) for the manufacture and supply of the required materials within the specified time of Completion after meeting all his current commitment.

iii) The Bidder should clearly confirm that all the facilities exist in the factory from the where materials to be procured for inspection and testing and these will be made available to the Purchaser or his representative for inspection before any material dispatch to work site.

iv) Reports on financial status of the Bidder such as profit and loss statement, balance sheets and auditors report for the past three years, bankers certificate etc.

v) Certificate from Chartered Accountant on supply / execution in any one year i.e. a continuous period of 12 months (as a proof of meeting the requirements.

04.00 The Bidder shall furnish Type Test Reports for materials required at site. The Bids received without type test reports may be treated as Non-responsive.

05.00 Even though the Bidder meets the above qualifying criteria, he is subject to be disqualified if he has (I) made misleading or false representation in the Statements and attachments submitted in proof of qualification requirements and / or (II) record of poor performance such as not properly completing the contract, inordinate delays in supply Completion, litigation history or financial failure etc.

06.00 Not withstanding anything stated above, the purchaser reserves the right to access bidder's capability and capacity to perform the contract.

07.0 Bidder participating, if not have facility to manufacture materials required for the work, must submit their vendors list from where they will procure the material with their credential and annual turn over should not less than **100 Lakhs** . While choosing vendors the bidder must ensure that vendor must have supplied the equivalent quantity of material in any one year during last three years.

Sd/-

Collector & District Magistrate,

Bhadrak

SECTION – IV

GENERAL CONDITIONS OF CONTRACT & TECHNICAL FIELD REQUIREMENTS

1.00 **Introduction:**

01.01 The State Govt. of Odisha has launched "BIJU GRAM JYOTI YOJANA- Rural Electrification Programme of the State Government" for electrification of villages / habitation which are not scheduled to be covered under DDUGJY 12th Plan and DDUGJY.

01.02 (a) Electrification of Villages / Habitations having population less than 100 (b) Distribution System Improvement and (c) BPL Household Electrification will be covered under this programme.

01.03 The scheme envisages Improvement of the distribution system in order to cope with additional load, which may include.

Sl.No.	Description of work
1	Stringing of 1 KM 33KV OH line with 100mm2 AAAC on Existing Pole (4nos. Of CP)
2	Construction of 11KV 2Ph OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC and Average span 60mtr(CP-4 with 2nos. Of SP & 2nos. Of DP)
3	Construction of 3 Phase 11KV OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC and Average span 60mtr (CP-4 with 2nos. Of SP & 2nos. Of DP)
4	Erection of 11mtr interposing PSC Pole in 11KV OH line
5	Erection of 9mtr interposing PSC Pole in 11KV OH line
6	Up gradation of 11KV 2Ph line to 3Ph OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC
7	Construction of DP Structure (with Existing Plinth Mounted Transformer)
8	Construction of 100 KVA(3ph) DP Structure & Plinth Mounted Sub-station (without Transformer)
9	Construction of 100 KVA(3ph) Plinth Mounted Sub-station over 9mtr long PSC Pole
10	Construction of 63 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole
11	Construction of 25 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole
12	Construction of 16 KVA(1ph) Single Pole Mounted Sub-station over 9mtr long PSC Pole
13	Construction of 10 KVA(1ph) Single Pole Mounted Sub-station over 9mtr long PSC Pole
14	Up gradation from 63KVA to 100 (3ph)
15	Up gradation from 25KVA to 63KVA ,11/0.4KV S/S
16	Up gradation from 25KVA to 100VA ,11/0.4KV S/S

17 Up gradation from 16KVA (1Ph) to 25KVA 11/0.4KV S/S

18 Up gradation from 16KVA (1Ph) to 63KVA 11/0.4KV S/S

19 Up gradation from 16KVA (1Ph) to 100KVA 11/0.4KV S/S

20 Construction of 1ph 2w LT (NEW)Line over 9mtr Long 300Kg PSC Pole with 1*35+1x25mm2 AB cable

21 Construction of 3ph 4w (New) LT Line over 9mtr Long 300Kg PSC Pole with 3*50+1*35mm2 AB cable

22 Conversion of 1ph to 3ph 4w LT Line over existing PSC Pole with 3*50+1*35mm2 AB cable

23 Replacement of damaged 1ph 2w LT Line with 1*35+1x25mm2 AB cable

24 Conversion of 3 Ph LT Line having Bare conductor with 3*50+1*35mm2 AB cable

25 construction of 11 KV Guarding (60mtr Span)

26 Installation of 11Kv line AB switch (3 Pole 400A) with DP Structure along with 9mtr long 300kg PSC pole

27 Power supply to BPL Households

01.04 Bhadrak District has a geographical area of 1721 Sq. Kms. covering 7 Blocks.

02.00 **APPROACH TO SITE**

02.01 Bhadrak District is located in the North eastern part of Odisha, NH- 5 passes through the district. It is well connected with Jajpur, Cuttack, Bhubaneswar, Balasore, Mayurbhanj by road in all seasons.

03.00 **SITE**

03.01 The site is spread in **Bhadrak** revenue district of **Odisha** state. The **Bhadrak** district is subdivided into **7** Blocks out of which this tender is meant for **7** blocks as detailed below:

Sl.No.	**Name of the Block**	**Census Code**
1	BONTH	
2	BHANDARIPOKHARI	
3	DHAMNAGAR	
4	BASUDEVPUR	
5	BHADRAK	
6	CHANDBALI	
7	TIHIDI	

(Fordetails the Technical Specification specified in Section-V may be referred.)

GENERAL CONDITION OF CONTRACT & TECHNICAL FIELD REQUIREMENT

01.00 SCOPE OF WORKS

The scope of works include execution on ***Turnkey Basis*** with complete system design, procurement / manufacture, manufacturer's quality assurance, shop testing (including type testing where specified/required), transportation, storage, erection, including all civil/structural works, site testing, commissioning of all items & materials as elaborated below including all associated activities that though not exclusively specified here in but are required for the Completion of the entire works under this package.

01.01 This specification intends to cover but not restrict to the following activities, services and works.

i) Complete design and engineering of all the systems, sub-systems, equipment, material and services.

ii) Providing engineering data, drawings and O&M manuals for Owner's review, approval and records.

iii) Manufacturing, supply, testing, packing, transportation and insurance from the manufacturer's work to the site.

iv) Receipt, storage, insurance, preservation and conservation of equipment at the site.

v) All civil and structural works as required.

vi) Fabrication, pre-assembly (if any), erection, testing and putting into satisfactory operation of all the equipment/material including successful commissioning.

vii) In addition to the requirements indicated in this section (Technical Specifications), all the requirements as stated in other sections shall also be considered as a part of this specification as if completely bound herewith.

Viii) The Bidder shall be responsible for providing all material, equipment and services specified or otherwise which are required to ensure operability, maintainability and the reliability of the complete work covered under this specification.

viii) All services & activities required to be given contractually, by the bidder, during warranty period.

01.02 The package envisages following works at different locations in Bhadrak district in the state of Odisha

i. Survey, Pole Spotting for all HT & LT Lines and Finalisation of DT Location.
ii. Construction of new 11KV line with 55mm2 AAAC.
iii. Stringing of 33KV line with 100mm2 AAAC with existing Pole.
iv.New installation of Sub-station with different capacity (25KVA 11/.4KV, 63KVA 11/.4KV & 100KVA 11/.4KV)
v. Up-gradation of Sub-station capacity from 10/16/25KVA to 63KVA 11/.4KV or 100KVA 11/.4KV.
vi. Conversion of 2ph2w 11KV line to 3ph3w 11KV line.
vii. Up-rating of conductor size of 11KV line from 34/55mm2 to 100mm2 AAAC.
viii. Construction of Double Pole (D.P) Structure.

ix. Construction of Sub-station on existing D.P structure (Excluding transformer)
x. Construction of new 3ph4w LT line with 3x50+1x35+1x16mm2 AB Cable.
xi. Conversion of 1ph2w LT line with AB Cable to 3ph4w LT line with 3x50+1x35+1x16mm2 AB Cable.
xii. Conversion of LT line with bare conductor to 3ph4w 3x50+1x35+1x16mm2 AB Cable.
xiii. Guarding for road crossing
xiv. Installation of 11Kv line AB switch (3 Pole 400A) with DP Structure along with 9mtr long 300kg PSC pole
xv. Power supply to BPL Households.

02.00 **DETAILED SCOPE**

02.01 **Survey**

The scope covers detailed route survey for all existing and proposed 11KV & LT lines, location of tap-off on existing feeders, pole spotting, optimization of pole location, crossing of roads, rail track, rivers, distribution transformer station location etc. The survey shall, as a minimum, identify/cover the following:

02.02 Block wise maps shall be prepared on the background of Survey of India (SOI) map of 1:25000 scales indicating the following.

i. Village boundaries and their respective census codes
ii. Existing and proposed 33/11KV substations & 33 kV Lines.
iii. Existing and proposed 33KV lines and Distribution transformer Stations.

02.03 Village level map shall be created from the map with a scale of 1:5000 or better indicating the following

i) Village geographical features and landmarks with clear depiction and label
ii) All the habitations that exist in the village
iii) Existing & proposed HT & LT lines, DTs
iv) List of individual consumer fed from each pole
v) Estimated loading.
vi) All distance and locations of electrical system from key reference points.

03.00 **Village / Hamlet Electrification**

03.01 The list of villages / Habitation which are to be electrified under the scheme alongwith their census code, approximate electrical scope of work will be indicated in the work order. However the bidders shall verify the actual scope at site during field survey before execution of work.

Annexure

LIST OF VILLAGES / HABITAITON TO BE ELECTRIFIED UNDER THE SCHEME WITH APPROXIMATE SCOPE

(REFER SEPARATE FILE ATTACHED)

4.00 **Construction of Line & Sub-station**

04.01 Besides electrification of village / habitations, for better Distributions Net Work Infrastructure Stability and improvement of voltage and to avoid over loading of Power Transformer the following works are to be taking up under the Scheme.

a) Construction of 11KV linking line to divert load from one primary Sub-station to another.

04.02 **New 11KV line for village/habitation electrification:**

Construction of 11KV spur line from the existing or to be constructed lines for electrification of villages/habitations with a span length of 60 meters with 9 mtr.long 300 Kg P.S.C. pole.

These lines shall emanate from existing lines and shall have provision of AB Switches of 400Amp. rating at T-off points only where the spur line length exceeds 2 Km.

04.03 **Reconductoring of 11KV lines**

Reconductoring of 11KV lines with 55mm^2 AAA Conductor with all allied materials will be taken up where the conductor has been stolen in the existing route.

Reconductoring of 11KV line with 55mm^2 AAA Conductor will also be taken up where the existing line has GI wire or under size conductor. The dismantled conductor to be returned to Executive Engineer of concerned electrical division of TPNODL.

All damaged insulators, cross arm and other line materials to be replaced.

Aligning / re-erection of tiled / bend poles where found in the route of line alongwith strengthening of its foundation is in the scope of the bidder.

While reconductoring disconnection / connection of the existing DT shall be in the scope of the bidder

However, bidders is to assess the actual scope of re-conductoring of the 11KV lines while carrying out the route survey.

05.00 **Construction of Distribution Transformer Centers**

Construction of Distribution Transformer Centers (DTC) using the type of transformers & configurations as given in the table below.

Sl No.	Type of	Voltage ratio (KV)	Rating(KVA)	Arrangement	No. of earthing
1	3 Phase	11/0.433	25/63/100	9Mtr. PSC Double pole structure with AB switch & HG fuse	5 Nos.

05.01 The scope includes supply, installation, testing and commissioning the following

i) 3 Phase 25/63/100KVA Distribution Transformers shall be fitted with LA 11KV line.

ii) All structures, cables, earthing and all other items, not specifically mentioned but necessary for safe operation of the distribution transformer is included in scope. The cable from DT to DB and from DB to Overhead lines shall be run properly, duly clamped with poles for protection of cable.

iii) LT Distribution Box with MCCB & Energy Meter on LT side of DT. The Distribution box shall have proper locking arrangement.

05.02 The contractor shall survey the area, fix the location of DT keeping in view that DT is as close as practically possible to the load centre of the area to be fed.

05.03 Contractor shall obtain the approval for final DT location from engineer in the field.

05.04 The no. of LT feeders/ service connections to be connected to a particular DT shall be decided during detailed engineering.

05.05 For three phase DTs, Gang operated AB switches shall be mounted between 11 KV line dropper & HG fuse.

05.06 In case of up-gradation of sub-station capacity one additional DT of appropriate capacity will be installed on pole / plinth depending on the existing DT. If the existing DT is a pole mounted one the additional DT will be on a plinth or vice versa.

05.07 Similarly in case of Up gradation of Sub-station capacity, if the existing DT is of 10/16/25/63KVA it is to be upgraded to next higher capacity i.e 63/100KVA 11/0.4KV. And in such case LT PVC cable is to be upgraded to the required size.

06.00 **Construction of LT Lines**

The LT lines shall be of following configurations

Sl No.	Type of line	Conductor	Support	Average span in mtr.
1	3Phase 4Wire	AB cable of size 3X35mm^2+1X25 mm^2) of XLPE INSULATION	9Mtr. 300KG PSC	40
2	3Phase 4Wire	AB cable of size 3X50mm2+1X35mm^2 of XLPE INSULATION	9Mtr. 300KG PSC	40
3	1Phase ABC	Aerial Bunched Cable (ABC) of size 1X35+1X25 of XLPE INSULATION	9Mtr. 200KG PSC	40

06.01 LT Lines using AB Cable shall be constructed on 9 mtr 300KG PSC Pole complete with eye hook, suspension/dead end clamp including belting of clamps etc. complete as required for supporting LT AB conductor, earthing arrangement, anti climbing device, danger plate, stay sets as required, bolts, nuts & washers and any other hardware required to complete the work, as finalized during detailed engineering.

07.00 **Service Connections to BPL**:

07.01 The scope includes providing service connections to the consumers Below Poverty Line (BPL consumers) including 2 points wiring and coil earthing to the installation. The

service cable shall travel from service pole to the premises of the consumer with the provision of

i) PVC insulated double core with outer sheath 2.5 sq. mm single strand Alluminium cable
ii) UDC (Universal Distribution Connector) ABC cable with piercing type connector and distribution box at DT
iii) Supporting GI wire 10 SWG
iv) GI pipe 20 mm, bend etc.
v) Electro Static Energy meter at the consumer premises as per the specification enclosed.
vi) Providing 2Nos. CFL Bulb (18W+11W – 1 No. each) lamp in the consumer premise

07.02 **L.T. consumer connection from service pole**

The contractor shall provide the service connections to the identified households. The service connection shall be complete with energy meters with TP Box in consumer's premises. Service Connection shall be provided with 'PVC' insulated 650/1100 V grade, twin core Aluminum solid Conductors of size 2.5 sq.mm (3/22 cu equivalent) these wires shall be supported by a bearer GI wire (3.15 mm) as per REC Spec. No. 45/1986. Cable shall be tied to bearer wire with an insulated (Porcelain or bakelite) ring of adequate size and strength. The bidder shall provide his own arrangements for anchoring the bearer wire at the premises of customers in case of BPL households.

07.03 **Pole Top Distribution Box**

Locations, where the numbers of consumers are in excess of 2 (say 3 to 5), a pole top LT distribution box shall be provided. If the number of consumers exceeds 5, then the connection has to be provided from adjacent pole having separate distribution box.

07.04 **Piercing Connector**

Wherever, the consumers for a particular pole are 1 or 2, piercing type connectors, having provision for main conductor and service conductor of appropriate size for ABC & UDC for bare conductor, shall be used. For LT main lines with bare conductors, service connection shall be provided using 'UDC' or wedge type connectors of suitable dimension/size as per REC specification.

Cost of all items/material required to complete the service connections shall be included in the quoted price. The installation of all the material is in the scope of contractor.

As far as possible the service connection shall be given from the DT/pole of the LT line, which is nearest to the consumer's premise.

The service cable shall enter to the meter of the consumer premises through GI pipe of 20mm dia up to the meter board. GI pipe will be fixed to the wall with suitable

clamps. The supporting GI wire will be suitably tied to the GI pipe. Coil earthing is to be done with GI lead wire to main switch.

07.05 **House Wiring**

For all the identified BPL households, the contractor shall carry out complete works of house wiring with installation of energy meters.

ISI marked Double Pole 16Amp main switch shall be used.
ISI marked PVC conduct with single core 2.5 sq mm. aluminum wire shall be used for house wiring.
Two point wiring for lighting points shall include two piano type ISI marked 5A switch, Bakelite/plastic holder, 2Nos. CFL Lamp (18W & 11W).

The wooden box shall be fixed in the consumer premises at a suitable height and shall house

i) 16Amp. DP Main Switch
ii) Earthing terminal
iii) One 5 Amp. Switch
iv) One 18W CLF bulb with holder

Another wooden distribution board shall be fixed in the consumer premises at a suitable height and shall house

i) 5 Amp switch
ii) 11 Watt CFL lamp with holder

The internal wiring shall be done using PVC conduits.

The Electrostatic meter with TP Box will be fixed separately.

08.00 **GENERAL REQUIREMENTS & INSTRUCTIONS**

08.01 Sub-stations or Transformers upgraded / installed or PSC poles installed and BPL households electrified under this scheme will be inscribed with the name of the scheme i.e "Biju Gram Jyoti Yojana" and year of electrification in white paint in the back ground of deep green paint.

08.01 For substation equipment the scope covers survey, structure, soil resistively measurements design, fabrication and supply of all type of structures and including bolts, nuts and washers, hanger. Design, selecting type of foundation for different structures and casting of foundation for structure footing; and erection of structure, tack welding of bolts and nuts, supply and application of zinc rich paint, structure earthing, fixing of insulator string, stringing of conductors, earth wires along with all necessary line accessories and commissioning of the Sub Stations.

08.02 All the raw materials such as steel, zinc for galvanizing, reinforcement steel and cement for foundation, coke and salt for earthing, bolts, nuts, washers, danger plates, phase plate, number plate etc. required for substation & its structures shall be included in the scope of supply. Bidders shall clearly indicate in their offer, the sources from

where they propose to procure the raw materials and the components. Vender list must be provided with their credentials.

08.03 In case of augmentation of existing sub-station, the Bidder shall visit site to ascertain the structures and foundations, dismantling and new construction of structures and foundations works to be done before quoting. Bidder must furnish the design and drawings in support of the activities mentioned above that are to be carried out for augmentation of existing sub-station site.

08.04 For HT & LT line the scope covers detailed survey, proposal for feeder bifurcation, pole spotting, optimization of pole location, pole design, testing, fabrication and supply of all type of transmission line poles including cross arms, angles, channels, braces, top brackets, stay sets, bolts, nuts and washers, D-shackle, all types of insulators, and all type of pole accessories like, phase plate, number plate, danger plate, anti-climbing device, stay sets. Guarding arrangements, etc.; design, selection of type of foundation for different poles and casting of foundation for pole footing; and erection of poles, supply and application of zinc rich paint, pole earthing, fixing of insulators, supply of conductors & accessories, stringing of conductors along with all necessary line accessories and testing and commissioning of

08.05 Bidder is required to follow statutory regulations stipulated in Electricity Act 2003, Indian telegraph act 1889, I.E. Act 1910, Electricity (Supply) Act 1948, Indian Electricity Rules 1956 with all amendments till date and other local rules and regulations referred in this specifications.

08.06 The bidder shall comply with all the statutory rules and regulations prevailing in the state including those related to safety of equipment and human beings.

08.07 The successful bidder shall acquire electrical license from the ELBO Bhubaneswar, as required for executing the works.

08.08 The Bidder shall do complete coordination with all local & statutory agencies for execution of complete works including obtaining clearance for energising of the HT systems upon Completion of erection.

08.09 Bidder shall obtain approvals & clearances and right of way from all agencies involved. All lines shall generally be routed through public land / along the road.

08.10 The bidder shall be responsible for transportation to site of all the materials to be provided by the Contractor as well as proper storage and preservation of the same at his own cost, till such time the erected line is taken over by the Owner.

08.11 Bidder shall set up required number of stores along the line to expedite quick execution.

08.12 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 the equipment. Rejection of any equipment 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.

ROUTE SURVEY

Successful bidder shall carry out detailed survey and prepare the detailed route of 33KV, 11KV & LT lines, location of Distribution Transformer on topographical sheets / mouja maps available from government agencies. The bidder shall make his own arrangements for obtaining the topographical maps/mouzas maps from the concerned agencies. The final route map for 33 KV, 11KV & LT lines, shall be prepared and submitted by the bidder, showing the proposed pole position, ground clearance, conductor sag and various crossings i.e. railway lines, communication lines, EHT lines, rivers, road and stream crossings on the map to a scale of 1:25000. All LT lines along with pole locations are to be marked on village / mouza maps / patwari maps to a scale 1:5000.

GENERAL CONSTRUCTIONAL PRACTICES (11KV)

The following types of poles shall be used at respective locations given below.

a) SP (Single Pole support) 0o - 10o deviation.
b) DP (Double Pole support) 0o - 60o deviation
c) FP (Four Pole support) 60o - 90o deviation

Pole Spotting

a) Span

Average span of HT & LT lines with proposed conductors is given in the table below.

Sl No.	**Line Class**	**Support (Height in mtrs / KG class)**	**Conductor Type**	**Nominal Conductor size in sq. mm**	**Max. span in mtrs.**
1	11KV 3Ph (for new line & spur line)	PSC (9/300)	AAAC Or XLPE CABLE	55 Or $55MM^2$ SINGLE CORE	60 60
2	LT 3Ph 4W	PSC (9/300)	ABC	3X35+1X25	40
3	LT 3Ph 4W	PSC (9/300)	ABC	3X50+1X35	40
4	1 PH ABC	PSC (9/300)	ABC	1x35+1X25	40

(b) Road Crossing

At all major road crossings, if required the contractor will use 11 mtr. PSC Pole with approval of the owner, maintaining required ground clearance at the roads under maximum temperature and in still air shall be such that even with conductor broken in adjacent span, ground clearance of the conductor from the road surfaces shall not be less than 6.1 meters.

(c) Power Line Crossings

Where the proposed lines require to cross over another line of the same voltage or lower voltage, provisions to prevent the possibility of its coming into contact with other overhead lines shall be made in accordance with the Indian Electricity Rules, 1956 as amended from time to time. All the works related to the above proposal shall be deemed to be included in the scope of the Contractor. Where existing lines of higher voltages are to be crossed under another line, the bidder shall take up suitable re-routing so as to obtain necessary sectional clearances, other wise crossing through 11 kV cable shall be proposed.

(d) Telecommunication Line Crossings

The angle of crossing shall be as near to 90 degree as possible. However, deviation to the extent of 30 degree may be permitted under exceptionally difficult situations.

HT line shall be routed with requisite suppression with parallel telecom line to avoid inductance during faults.

(d) Details Enroute.

All topographical details, permanent features, such as trees, telecommunication lines, building etc. 5.5 meter on either side of the alignment shall be detailed on the route plan.

(e) Clearance from Ground, Building, Trees etc.

Clearance from ground, buildings, trees and telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended upto date. The bidder shall select the height of the poles such that all electrical clearances are maintained. PSC/rail poles/116x100 R S joist shall be used for all road & drain crossings, if required. In case of exceptional terrain, rail pole/150x150 RS Joist may be used with the approval of owner.

(f) The minimum planting depth of poles shall be governed by IS : 1678. However, if due to the ground conditions, e.g. water logged area etc. depth of planting of poles shall be suitably increased the bidder will supply the poles of suitable height in order to maintain the required clearances, the vendor will submit the details of the same on case to case basis.

(h) Guarding mesh shall be used in all electric line / telecom line / road / drain / canal crossing and at all points as per statutory requirements. The bidder shall provide & install anti climbing devices and danger plates on all poles and DT stations.

DESIGN PARAMETERS

a) Factor of safety 2.5 in Normal condition for 11 kV line & LT line PSC supports.
b) Wind Pressure on Pole & conductor– As per IS 802

c) In addition to wind load on cross-arms, insulators guy-wire etc. shall be considered.
d) Wind load on full projected area of conductors and pole is to be considered for design.
e) Ground clearance shall be minimum 5.2m for 33 kV line & 4.6 m for 11 KV line & LT line for bare conductor at locations other than road crossings.
f) Ground clearance shall be minimum 4m for 11 kV ABC line & LT ABC line.
g) The live metal clearance shall be as per IS: 5613 and shall be min. 330 mm for 33 KV line.
h) Distribution design will be attached with the final order.
Pole accessories like danger plates, phase plates and number plates shall be provided.

POLES

Erection of Pole, PSC footing and compaction of soil

Pits are to excavated to a size of 0.6 meter x 1.2 meter with its longer axis in the direction of the line. In case bidder employs Earth augers, the Pit size can be considered 0.6 meter dia with 1.5 meter depth.

For hard rock locations, 1 meter deep hole of diameter 20% in excess of the longest dimension of the bottom most portion of pole shall be excavated. The pole shall be grouted in the pit with 1:2:4 nominal concrete mix at the time of pole erection.

The planting depth of pole over the base precast concrete slab shall be 1500 mm in the ground except in wet soil and black cotton soil where depth shall be increased by 0.2 mtr. to 0.3 mtr. with reduced wind span.

Following arrangement shall be adopted for proper erection of PSC type poles and properly Compacting of the soil around the base / foot of the poles, under this package.

1. All the PSC poles shall be provided with a RCC block base having dimensions and constitutions as per REC Construction Standard K-1.
2. The poles shall then be lifted to the pit with the help of wooden supports. The pole shall then be kept in the vertical position with the help of 25 mm (min.) manila ropes, which will act as the temporary anchor. The verticality of the pole shall be checked by spirit level in both longitudinal & transverse directions. The temporary anchor shall be removed only when poles set properly in the foundation after compacting the soil.
3. Entire void space above the block is to be filled with uniform pieces of bricks and rigidly compacted by ramming in layers maintaining verticality of the PSC pole.
4. Concreting of foundation upto a height of 1.8 mtrs. from the bottom of the pit with a circular cross-section of radius 0.25 mtrs. (volume of 0.3 cu.mtr. per pole) in the ratio of 1:2:4 shall be done at the following locations:
   i) At all the tapping points and dead end poles.
   ii) At all the points where DT is to be installed.

iii) At all the points as per REC construction dwg. No. A-10 (for the diversion angle of 10-60 degree)
iv) Within a maximum distance of 1 km from the last Jhama filled pole structure.
v) Both side poles at all the crossing for road, nallaha railway crossings etc.
vi) Where Rail poles, double pole and four pole structures.

5. In case the route of 33/11 kV lines encounters marshy low laying area, special type of foundations shall be used. In such a case, difference in excavation quantity, concreting & reinforcement between special foundation and normal foundation shall be paid extra as per Delhi Schedule of Rate (DSR) applicable on the date of bid opening. No other payment incidental to special foundation locations shall be made to the contractor.

Earthing of Poles

In 11 kV & LT line, each pole shall be earthed with coil type earthing as per REC Construction Standard J-1.

All DP & Four pole structures & the poles on both sides of railway, Telecommunication, road, drain & river crossing shall be earthed by pipe earthing as per enclosed REC Construction Standard J-2.

Extension Pole

PSC pole with pole extension arrangement up to *two meters* shall be used at low ground level locations for maintaining ground clearance and for road crossings for HT & LT lines. Extension of poles shall be by use of *100x50x6mm galvanise channel* up to three meters. A overlap of one meter shall be maintained with the pole.

Wherever such extended poles will be used the span on both sides of the extension pole shall be suitably reduced to take care of loading on the pole.

PROVIDING OF GUYS/STRUT POLES TO SUPPORTS

Strut poles/flying guys wherever required shall be installed on various pole locations as per REC construction standards .For selection of guing locations REC guidelines & construction practices shall be followed.

In this work anchor type guy sets are to be used. These guys shall be provided at

i) angle locations
ii) dead end locations
iii) T-off points
iv) Steep gradient locations.
v) Double Pole, & four poles

The stay rod should be placed in a position so that the angle of rod with the vertical face of the pit is 300/450 as the case may be.

G.I. stay wires of size 7/3.15 mm (10 SWG) with GI turn buckle rod of 16 mm dia & 16 mm dia GI stay rods, shall be used for 11KV & LT line.

G.I. stay wires of size 7/4 mm with GI turn buckle rod of 20 mm dia & 20 mm dia GI stay rods, shall be used for 33 KV line.

For double pole structure (DP), four stays along the line, two in each direction and two stays along the bisection of the angle of deviation (or more) as required depending on the angle of deviation are to be provided. Hot dip galvanised stay sets are to be used.

The anchor plate shall be fixed to 200mm x 200mm MS plate of 6mm thickness. M.S. rod with a bolt arrangement at one end and other end is given shape of 40mm dia circle to bind one end of the stay wire. The anchor plate shall be buried in concrete. The dimensions for concreting & earth & boulder fill shall be as per the drawing mentioned in clause no **3.01.00**.

The turn buckle shall be mounted at the pole end of the stay and guy wire so fixed that the turn buckle is half way in the working position, thus giving the maximum movement for tightening or loosening.
If the guy wire proves to be hazardous, it should be protected with suitable asbestos pipe filled with concrete of about 2 m length above the ground level, painted with white and black strips so that, it may be visible at night.

CROSS ARMS

Cross Arms for 33 KV and 11 KV Overhead Power Lines shall be made out of 100x50x6 mm and 75 x 40 x6 mm M.S. channel. Cross Arms made out of M.S. angle shall not be used. Cross arms shall conform to specification given under the head miscellaneous items in this specifications.

Fixing of Cross Arms

After the erection of supports and providing guys, the cross-arms are to be mounted on the support with necessary clamps, bolts and nuts. The practice of fixing the cross arms before the pole erection can also be followed. In case, the cross-arm shall be mounted after the pole is erected, the lineman should climb the pole with necessary tools. The cross-arm shall then tied to a hand line and pulled up by the ground man through a pulley, till the cross-arm reaches the line man. The ground man should station himself on one side, so that if any material drops from the top of the pole, it may not strike him. All the materials should be lifted or lowered through the hand line, and should not be dropped.

INSTALLATION OF LINE MATERIALS

Insulator and Bindings

Prior to fixing, all insulators shall be cleaned in a manner that will not spoil, injure or scratch surface of the insulator, but in no case shall any oil be used for that purpose. Pin insulators shall be used on all poles in straight line and disc or shackle insulators on angle and dead end poles. Damaged insulators and fittings, if any, shall not be used. The insulator and its pin should be mechanically strong enough to withstand the

resultant force due to combined effect of wind pressure and weight of the conductor in the span.

Strain insulators shall be used at terminal locations or dead end locations and where the angle of deviation of line is more than 100. Strain insulators shall be used at major crossings.

The pins for insulators shall be fixed in the holes provided in the cross-arms and the pole top brackets. The insulators shall be mounted in their places over the pins and tightened. In the case of strain or angle supports, where strain fittings are provided for this purpose, one strap of the strain fittings is placed over the cross-arm before placing the bolt in the hole of cross-arms. The nut of the straps shall be so tightened that the strap can move freely in horizontal direction.

Handling of Conductor

Running Out of the Conductors: The contractor shall be entirely responsible for any damage to the pole or conductors during stringing. Care shall be taken that the conductors do not touch and rub against the ground or objects, which could scratch or damage the strands.

The sequence of running out shall be from the top to down i.e. the top conductor shall be run out first, followed in succession by the side conductors. Unbalanced loads on poles shall be avoided as far as possible. When lines being erected run parallel to existing energized power lines, the Contractor shall take adequate safety precautions to protect personnel from the potentially dangerous condition.

Monitoring of Conductors during Stringing

The conductor shall be continuously observed for loose or broken strands or any other damage during the running out operations. Repair to conductors, if necessary, shall be carried out with repair sleeves. Repairing of the conductor surface shall be carried out only in case of minor damage, scuff marks, etc. The final conductor surface shall be clean, smooth and free from projections, sharp points, cuts, abrasions, etc. The Contractor shall be entirely responsible for any damage to the poles during stringing.

Crossings :

All crossings shall be at right angles. Derricks or other equivalent methods ensuring that normal services need not be interrupted nor damage caused to property shall be used during stringing operations where roads, channels, telecommunication lines, power lines and railway lines have to be crossed. The contractor shall coordinate with state electricity board for obtaining work permit and shut down of the concerned line. However.shut down shall be obtained when working at crossings of overhead power lines. The Contractor shall be entirely responsible for the proper handling of the conductor, earthwire and accessories in the field.

Guarding shall be provided at major crossings. The Guardings shall consists of GI guard cross arm of length 2.5 mtrs made out of 75 x 40 x 6 mm channel & shall be hot dipped galvanized generally conforming to IS:2633/72. The clamps shall also be hot dipped galvanized generally conforming to IS:2633/72. Guardings shall be erected with ground & line clearances as per the I.E. rules. The guarding shall be provided with GI wire 8 SWG for 11KV & LT line & 4 SWG for 33KV line. Binding wire & suitable I bolt &

nut bolts for cross arm to cross arm. Guard wire shall be separately earthed at both ends. Crossings the roads / canals or any other lines shall be as per the enclosed drawing No. CC: 9404: NESCL: ENGG: RGGVY:LT LINE: 06.For 33KV line guarding arrangement shall be as per REC construction standard M6.

Anti-climbing Devices

Anti Climbing Devices shall be provided with G.I. Barbed wire, they shall be provided and installed by the Contractor for all poles. The barbed wire shall conform to IS:278 (Grade A1). The barbed wires shall be given chromating dip as per procedure laid down in IS:1340.

Painting Materials

All the metal parts except G.I. parts are to be painted with one coat of red oxide and one coat of aluminium paint.

STRINGING OF CONDUCTOR

The works include spreading of conductors or HT/LT AB Cables without any damage and stringing with proper tension without any kinks/damage including binding of conductor at pin points, jumpering at cut points etc. The ground & line clearances at road crossings along roads, L.T. crossings & other crossings shall be as per the relevant I.E. rules.

While transporting conductors drums to site, precautions are to be taken so that the conductor does not get damaged. The drum shall be mounted on cable drum support. The direction of rotation of the drum shall be according to the mark in the drum so that the conductor could be drawn. While drawing the conductor, it shall not rub causing damage. The conductor shall be passed over poles on wooden or alluminium snatch block (pulley) mounted on the poles for this purpose.

The conductor shall be pulled through come-along clamps to stringing the conductor between the tension locations.

Conductor splices shall not crack or otherwise be susceptible to damage in the stringing operation. The Contractor shall use only such equipment / methods during conductor stringing which ensures complete compliance in this regard. All the joints including mid span joints on the conductor and earth-wire shall be of the compression type, in accordance with the recommendations of the manufacturer, for which all necessary tools and equipment like compressors, dies, etc., shall be obtained by the Contractor.

Each part of the joint shall be cleaned by wire brush till it is free of rust or dirt, etc., and be properly greased with anti-corrosive compound, before the final compression is carried out with the compressors. After completeting the jointing, tensioning operation shall be commenced.

All the joints or splices shall be made at least 15 meters away from the pole. No joints or splices shall be made in spans crossing over main roads, railways and small river spans. Not more than one joint per sub-conductor per span shall be allowed. The compression type fittings shall be of the self centering type. After compressing the

joint, the alluminium sleeve shall have all corners rounded; burrs and sharp edges removed and smoothened.
During stringing of conductor to avoid any damage to the joint, the contractor shall use a suitable protector for mid span compression joints in case they are to be passed over pulley blocks / aerial rollers. The pulley groove size shall be such that the joint along with protection can be passed over it smoothly.

TAPPING ARRANGEMENT FROM EXISTING 11KV LINE

Tapping of existing 11kV line shall be taken by providing a horizontal cross arm below the existing V cross arm of the pole & mounting disc insulators on it. The tapping conductors may be guided by providing pin insulators as required. A new two pole structure shall be erected within 10-15 meters of this tapping pole & the new line will emerge from this two pole structure with disc insulators. The Taping pole to the double pole conductor tension should be such that it avoids looseness & sag to the extent possible & it should avoid extra tension on the tapping pole.
Wherever the proposed spur line length is more than two km after the tapping an AB switch arrangement shall be provided at the double pole for isolation of the line.
Aligning/re-erection of tilted/bent poles wherever found in the route of line along with strengthening of its foundation is in the scope of the bidder.
Before undertaking the Re-conductoring work in the given line, the bidder shall make assessment of type and quantity of the existing conductor in consultation/presence of owner's representative.
While Re-conductoring of 11 KV line, disconnection/connection of existing Distribution Transformer shall be in the scope of the contractor/bidder. The supply and erection of line material for achieving the DT disconnection and connection shall be in the scope of the contractor.
The empty conductor drums, available after laying of conductor, shall be disposed of by the contractor at his cost. These drums may be used for rewinding of Conductor removed from the line at the later stage of Re-conductoring work.
Any other work not mentioned above exclusively but required for accomplishing desired work will be in the scope of the bidder/contractor.
For all above activities shut down will be provided for the line by owner. Restoring the disturbance/damage caused by above activities to the existing infrastructure e.g. road, water/sewerage pipes, telecommunication lines etc. will be in the scope of the bidder/contractor.
While Repairing & Replacing the equipment, if any equipment gets damaged due to negligent handling of the contractor the same shall be replaced by the contractor, at his cost, to the owner/employer's satisfaction.

Survey of existing lines

Survey shall have to be carried out by the contractor of existing lines.
Due to heavy conductor being used for Re-conductoring, failure containment structures (normally DP/four pole structure) may be required along the entire length shall be provided for HT kV lines. Such structures are generally required at the following points and is in the scope of contractor's work.

i) At the tapping points.
ii) At points where a DT is installed/to be installed.
iii) At angle points i.e. with diversion angle of 10-60 degree.
iv) At the distance of 2 km max. from the last DP or four pole structure.

Four Pole structures shall be use as per REC construction Dwg. No. A-10 (for the diversion angle of 60-90 degree).

Span

Since the work shall be done on the existing line, the existing span shall be maintained. However, if any new pole is required to be erected along the route of existing line, the span should be as near as possible to the basic design span indicated below.

11 KV line : 60 meter

Sd/-

CollectorcumDistrictMagistrateBhadrakDistrict

SECTION-V

TECHNICAL SPECIFICATION OF MATERIALS

FOR STRENGTHANING OF INFRASTRUCTURE FOR ELECTRIFICATION OF VILLAGES / HABITATIONS UNDER BIJU GRAM JYOTI YOJANA FOR THE YEAR 2021-22

TENDER NOTICE NO:- **Date:**

TECHNICAL SPECIFICATION FOR STRENGTHENING 33KV, 11KV HT LINES AND LT DISTRIBUTION LINES.

NATURE OF WORK

The work covered by this Specification is for Strengthening of **33KV & 11KV lines with interposing poles, 11KV lines renovation with HT insulated conductor , LT distribution lines with AB cables , New installation of Sub-station with different capacity (25KVA 11/.4KV, 63KVA 11/.4KV & 100KVA 11/.4KV), Up-gradation of Sub-station capacity from 10/16/25KVA to 25KVA 11/.4KV, 63KVA 11/.4KV or 100KVA 11/.4KV for** (a) Electrification of Villages / Habitations having population less than 100 (b) Distribution System Improvement and (c) BPL Household Electrification under **Biju Gram Jyoti Yojana** for the year **2021-22 (6th Phase)** as mentioned in the tender schedule under **Bhadrak** District on Turnkey basis .

SCOPE OF WORK

The scope of work Block wise under the District for which Strengthening of 33KV lines with interposing poles, 11KV lines renovation with HT insulated conductor & interposing poles , LT distribution lines with AB cables ,Distribution Transformers in details mentioned below:

Sl.No.	Description of work
1	Stringing of 1 KM 33KV OH line with 100mm2 AAAC on Existing Pole (4nos. Of CP)
2	Construction of 11KV 2Ph OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC and Average span 60mtr(CP-4 with 2nos. Of SP & 2nos. Of DP)
3	construction of 3 Phase 11KV OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC and Average span 60mtr (CP-4 with 2nos. Of SP & 2nos. Of DP)
4	Erection of 11mtr interposing PSC Pole in 11KV OH line
5	Erection of 9mtr interposing PSC Pole in 11KV OH line
6	Up gradation of 11KV 2Ph line to 3Ph OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC
7	construction of DP Structure (with Existing Plinth Mounted Transformer)
8	construction of 100 KVA(3ph) DP Structure & Plinth Mounted Sub-station (without Transformer)
9	Construction of 100 KVA(3ph) Plinth Mounted Sub-station over 9mtr long PSC Pole
10	construction of 63 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole
11	construction of 25 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole
12	construction of 16 KVA(1ph) Single Pole Mounted Sub-station over 9mtr long PSC Pole
13	construction of 10 KVA(1ph) Single Pole Mounted Sub-station over 9mtr long PSC Pole
14	Up gradation from 63KVA to 100 (3ph)
15	Up gradation from 25KVA to 63KVA ,11/0.4KV S/S

16	Up gradation from 25KVA to 100VA ,11/0.4KV S/S
17	Up gradation from 16KVA (1Ph) to 25KVA 11/0.4KV S/S
18	Up gradation from 16KVA (1Ph) to 63KVA 11/0.4KV S/S
19	Up gradation from 16KVA (1Ph) to 100KVA 11/0.4KV S/S
20	construction of 1ph 2w LT (NEW)Line over 9mtr Long 300Kg PSC Pole with 1*35+1x25mm2 AB cable
21	construction of 3ph 4w (New) LT Line over 9mtr Long 300Kg PSC Pole with 3*50+1*35mm2 AB cable
22	Conversion of 1ph to 3ph 4w LT Line over existing PSC Pole with 3*50+1*35mm2 AB cable
23	replacement of damaged 1ph 2w LT Line with 1*35+1x25mm2 AB cable
24	Conversion of 3 Ph LT Line having Bare conductor with 3*50+1*35mm2 AB cable
25	construction of 11 KV Guarding (60mtr Span)
26	Installation of 11Kv line AB switch (3 Pole 400A) with DP Structure along with 9mtr long 300kg PSc pole
27	Power supply to BPL Households

Location details : Block wise location with scope of work for infrastructure development in BGJY SCHEME mentioned in separate file attached for reference of the bidder.

Item Description : The electrical installation work to be carried out for (a) Electrification of Villages / Habitations having population less than 100 (b) Distribution System Improvement and (c) BPL Household Electrification under **Biju Gram Jyoti Yojana** for the year **2021-22 (6th Phase)** , on "turnkey" basis with supply of materials . Details item description shall include the material

Sl no.	**Item Particulars**	**Include the supply materials**
1 i)	Supply & Erection of 33KV interposing Poles. (Using 11mtr RS Joist with all accessories)	11 mtr long, (150x150mm) R.S Joist (34.6 Kg/Mtr.) , Make: SAIL/TATA/JINDAL) MS
		33 KV 'V' Cross Arm (22 Kg each) GI
		Back Clamp for 'V' Cross Arm (1.7 Kg each) with through bolt GI
		33 KV Pole Top Bracket 100X50x6mm MS Channel (5.5 Kg each)GI
		33 KV top bracket Clamp GI
		33 KV Pin Insulator 10KN(Polymer type)
		Nuts & Bolts GI
		Coil Earthing GI
		Padding 100mm , Concreting including Couping with size (7.01'x1'x1' =7.01cft PCC 1:4:8)
2 i)	Supply & Erection of 11KV interposing Poles. (Using 9mtr 300Kg PSC Pole with all accessories)	11 KV 'V' Cross Arm (10.2 Kg each)GI
		Back Clamp for 'V' Cross Arm (1.2 Kg each)
		11 KV Pole Top Bracket 75X40mm MS Channel (2.9 Kg each)GI
		11 KV Pin Insulator 10KN(Polymer type)
		Nuts & Bolts GI
		Coil Earthing GI
		Padding per PSC pole

ii)	Supply & Erection of 11KV interposing Poles. (Using 11mtr PSC pole withall accessories)	11mtr long, 415Kg PSC Pole
		11 KV 'V' Cross Arm (10.2 Kg each)GI
		Back Clamp for 'V' Cross Arm (1.2 Kg each) with through bolt GI
		11 KV Pole Top Bracket 75X40mm MS Channel (2.9 Kg each)GI
		11 KV top bracket Clamp GI
		11 KV Pin Insulator 10KN(Polymer type)
		Nuts & Bolts GI
		Coil Earthing GI
		Padding 100mm , Concreting including Couping with size (5.46'x1'x1' =5.46cft PCC 1:4:8)
3	Renovation of 11KV line with supply & erection of HT insulated conductor and all accessories in compete. (Using 55mm² AAAC HT insulated conductor with all accessories)	HT insulated conductor (55 mm² AAAC) , • Make: Apar / Rechem/ Havels/other reputed mfgr.having valid type test report
		Including insulator Ties , Dead End Clamp, Suspension Clamp, Piercing connect, Pre- insulated Junction Sleeves , 11 KV Pin Insulator 10KN (Polymer type), 11KV 70KN Disc insulator (Polymer type) with hard-ware fittings at cut points / end points , GI Nut & bolts , "T' joint tap off , 11KV jointing kit , termination kit etc. as per requirement.
		Replacement of old 11 KV Pole Top Bracket 50x8 flat to 75X40mm Channel (2.9 Kg each) GI as per requirement.
4	Supply & Erection of 18mm HT Stay Set Complete	18 mm HT Stay Set (GI)
		7/8 SWG GI Stay Wire (7 strand each of 4.06 mm dia.)
		HT GI Stay Clamp (1.9 Kg per pair)
		Nuts & Bolts (GI)
		HT Stay Insulator
		Concreting of Stay (0.5m X 0.5m X 0.5m, PCC 1:4:8)
5i)	Supply & Erection of LT interposing Poles. (Using 9mtr 300Kg PSC Pole with all accessories)	9mtr long, 300Kg PSC Pole
		Pole Clamp for Eye Hook
		Eye Hook for AB Cable
		Nuts & Bolts GI
		Padding of Pole
ii)	Supply & Erection of LT interposing Poles. (Using 9mtr 300Kg PSC Pole with all accessories)	9 mtr long, ,(100x116mm) R.S Joist (34.6 Kg/Mtr.) , Make: SAIL/TATA/JINDAL) MS
		Pole Clamp for Eye Hook
		Eye Hook for AB Cable
		Nuts & Bolts GI
		Concreting including Couping with size (5.92'x1'x1' =5.92cft PCC 1:4:8)

6	Supply & erection / conversion of 3-Ph AB Cable (3x50+1x35+1X16)mm2 with all accessories	(3X50+1X35+1X16)mmsq LT AB Cable
		Suspension Clamp with Eye hook
		Dead End Clamp
		Sundries
7	Supply & Erection of 16mm LT Stay Set Complete	16 mm Stay Set (GI)
		7/12SWG GI Stay Wire (7 strands each 2.642 mm dia.)
		LT Stay Clamp (1.4 Kg/pair) GI
		Nuts & Bolts GI
		LT Stay Insulator
		Concreting of Stay (0.5m X 0.5m X 0.5m=0.125cum PCC 1:4:8)
8	Fencing of Sub-station with barbed wire	Fencing of S/S (including Supply of Cement post, barbed wire , Gate& other materials) as per drawing.

N.B : 1. All MS materials should be hot dip galvanized as per IS : 2629 except RS Joist. All RS Joist should be painted with double coat of Red oxide primer & two coat Aluminium paint.

2. The bidders have to furnished type test reports of offered major materials with bid such as polymer insulator, Stay wire , AB Cable, ,AB cable accessories, HT insulated conductor , Hardware fitting , termination Kit etc to be used in the turnkey project . The bid shall accompanying with type-test reports conducted at Central Power Research Institute / NABL accredited laboratory for offered materials conducted within **Five** years before the date of opening of the tender. Bid not accompanied with type test reports conducted within five years & the drawings of the offered Materials duly approved by the Type Testing Agency shall not be considered for evaluation. For other offered materials should have been Inspected/Tested by any Distribution / Reputed Private Organization/ State Govt./ Central Govt. or their undertaking(s)/NABL or CPRI.
3. The bidders should furnish GTP formats duly filled and signed for the offeredmaterials with bid .

Methodology:-

The complete procedures for the execution of the project are explained herewith;

i. Detailed survey of lines , Sub-stations, interposing poles on longitude/latitude basis and preparation of SLD & BOQ.
ii. Complete manufacture details, including shop testing & supply of materials from the approved vendors (materials which are to be supplied by the bidder) as per technical specification on prior approval of the TPNODL .
iii. Providing Engineering drawing, data, operational manual, etc wherever applicable for the TPNODL "s approval;
iv. Packing and transportation from the manufacturer's works to the site.
v. Receipt, storage, preservation and conservation of equipment at the site.
vi. Pre-assembly, if any, erection testing and commissioning of all the equipment;
vii. Reliability tests and performance and guarantee tests on completion ofcommissioning;
viii. Loading, unloading and transportation as required.
ix. Erection of interposing RS Joist /PSC poles in HT line / LT line.

x. Renovation of 11KV line with HT insulated conductor and LT line with AB Cable.
xi. All MS materials should be hot dip galvanized as per IS : 2629. But all RS Joist should be painted with double coat of Red oxide primer & two coat Aluminium paint
xii. Fitting of spikes in the poles (both new & existing) with proper welding the clamp to prevent theft.
xiii. Couping of existing Joist poles.
xiv. Fencing of S/S with Barbed wire.
xv. Stringing of HT insulated conductor on existing & new poles by using all fittings & accessories.
xvi. During execution of erection work any damaged or inclined / defective materials or pole on existingsystem found at adjacent site to be replaced/ rectified by the agency for strengthening of network.
xvii. Testing, Commissioning of lines / installations.
xviii. Getting the lines inspected by Electrical Inspector after completion of work including deposit ofrequired inspection fees without claim to Purchaser.
xix. All expenditure towards inspection of materials at manufacturer's site and inspection of work aftercompletion shall be borne by the executive agency.
xx. Dismantling of existing electrical network if any and return of these dismantled items at theTPNODL 's stores including transportation cost.

For details the Technical Specification specified in Section-IV may bereferred.

SURVEY (detail & check, estimating of quantities & spotting of Poles mentioning longitude & latitude of the poles)

Walk over survey shall have to be carried out to ascertain the location wise nature of work tobe executed.

GENERAL: The Right of way shall be resolved by the contractor and all expenses there of shall be borne by him. However, TPNODL shall render all helps in co-ordination with law and order and forest department for solving the same.

Provisional quantities/numbers of different types of work have been estimated and indicated in the BOQ Schedule given. However final quantities for work shall be as determined by the successful bidder, on completion of the detail survey.

After completing the detailed survey, the contractor shall submit the final survey report for approval of the employer. .

(a) Optimization of Pole Location

I. Pole Spotting

The contractor shall spot the interposing poles in such a way so that proper ground clearance should be maintained and there shall be minimum sag in a span.

II. Anti-climbing Devices (Spikes)

The vendor shall provide and install anti-climbing device on all 11 KV DP Structures, and at all poles as per CEA guide lines. This shall be done with modified spikes as specified. The spike clamp to be fitted with pole by bolting and welding in such a way to avoid theft.

The spike clamp is made up 50x6 mm

III. Fittings Common to all Line

Pin Insulator Binding: The contractor shall use AL. Binding wire for binding shall be asper REC Construction Standards No. C-5 or better thereof.

IV. Stringing of Aerial Bunched Cable (ABC)

Fixing of Suspension & Tension/ Dead end fittings to the Poles.

The suspension clamp is to be hung on eye hook/ suspension hook, which is fixed to the pole at a minimum distance of 0.15 mt. from top end of the pole. The messenger

wire of bunched cable resting on a pulley is separated from the cable by separating wedges and inserted in the conductor groove of the suspension clamp.

The bolt is tightened to a torque of 20 N after which the pulley and wedges are to be removed.

The cable is tied to the messenger wire with nylon tie on both sides of clamps. Pole clamps 50 x 8 mm flat shall be used. Eye hook of 16mm dia MS rod to be used as per the drawing. The pole clamp shall be made to suite the pole width. This shall be installed as per Fig. No. 2

(a) of REC Construction Standard. All ferrous items shall be hot dip galvanized with zinc coating of 610gms / m^2.

Fittings & Accessories of AB Cables:

The following hardware fittings and accessories shall be used to install, erect & join the aerial bunched cable.

a) Suspension Clamp with Eye-Hook – The Contractor shall install the suspension clamp with eye hook. This hook shall be used to attach the AB cable on the pole by means of a dead end clamp in terminal poles and for attaching a suspension clamp suitable for holding AB cables of size 35mm^2 to 95mm^2 in straight lines and angle up to 90 Deg.-

b) Suspension fittings & the corresponding eye hook shall be as per REC Construction Standard No. e –34. The eye hooks shall be made from minimum 16mm dia MS rods with eye on one end and the other end being suitably flattened with two holes for M16 bolt & nut to fix with the back clamps made from minimum 50x8mm flats as per drawing. The eye hook, back clamp and bolts & nuts are to be hot dip galvanized.

c) Dead End fittings shall be bolted type as per REC Construction Standard No. E-35 & the corresponding eye hook shall be as specified above. The dead clamps are to be anchored with the pole with similar arrangement of eye hook & back clamp. In this case, the back clamp shall have two nos. of holes on both sides for M16 bolts. One side of the clamp shall be used for holding the eye hook with dead end clamp and the other side shall be used for anchoring the Stay.

d) Nylon Tie- The contractor shall supply nylon ties. These ties shall be used for tying the conductors with the messenger wire to prevent the phase conductors from chatting against suspension clamp. The nylon tie is made of weather resistant black nylon.

e) Connectors- The contractor shall supply connector. These shall be used as non-tension aluminum to aluminum connections for conductor joints.

f) Plastic Covers for Connectors- The contractor shall install Plastic Covers for Connectors. These covers shall be used with aluminum/aluminum connectors to protect connectors against corrosion caused by climatic conditions.

Installation of Cable/ Conductor

The contractor shall be fully responsible for all activities related to installation of AB cable/ HT insulated conductor. His responsibilities consists of handling, pulling, stringing & jointing of the cable and effecting service connection to consumers as per direction of the Engineer-in- charge.

Handling of AB Cable/ HT Insulated Conductor

The contractor shall observe following precautions while handling the AB Cable and HT insulated conductor. The conductor/cable drums must be stored and transported in an upright position.

While loading/unloading, the drums shall not be thrown from transport vehicles. Cable contact with sharp articles shall be avoided.

In order to prevent damage to the insulation, the cable shall not be dragged on the ground. Pulleys shall be used for this purpose.

In order to prevent strands from spreading, always cut the cable with a cutter.

Use nylon ties or electrical tape to prevent the cable from spreading away from messenger wire after the cutting. Staple the end of the cable on to the drum in order to

prevent loosening. Do not remove the protective boards from the cable drum before the cable is pulledoff the drum.

While moving the drum by rolling it on ground, always roll the drum in the direction indicated by the arrow on the flange. When pulling the cable, the spinning direction must be opposite.

Do not store the drums on wet soil, sandy or humid places.

Store the accessories in good order for quick easy and correct handling.

Pulling the Cable/Conductor

The principle is to pull the cable under mechanical tension so that contact with the ground or any other obstacles is avoided. The cable drum should be perfectly in alignment with line to be strung and fixed about 15-20 mtrs from the holding the first pulley. Open the cover of the drum to check and ensure that the insulation is not damaged.

The pulling which is sent up to the cable drum is about 15-20 mtrs from the pole holding to the last pulley. The pulleys are directly hung to such hook on the poles. The pulley tandem is to be used on angle poles if the line is deviating more than 60º Pull the guiding rope through all the pulleys.

Normal care shall be taken to assume a smooth passage of whole cable through the pulleys, especially in the first pole and on angle poles. One worker should act s brakeman at the cable drum so that the cable is not loosened during the pulling. One worker should follow the cable going through the pulleys and stop the pulling if anything goes wrong.

Final Checking, Testing and Commissioning

After stringing have been done as approved by the engineer, to ensure that everything is complete in all respects, the works shall be thoroughly inspected keeping in view the following main points.

All the bolts and nuts should be of hot dip galvanized materials as per relevant IS.

The stringing of the cable has been done as per the approved sag and desired clearances are achieved.

No damage, minor or major to the cable, messenger wire and accessories

The contractor shall submit a report to the above effect to the Engineer in Charge, who shallinspect and verify the correctness of the report. In case it is noticed that some or any of the

above is not fulfilled, the engineer shall get such items rectified by the contractor no extra cost to the purchaser. After final checking, the line shall be tested for insulation resistance in accordance with IS 1255:1983.

All arrangements for such testing or any other test desired by the Engineer-in-charge shall be done by the contractor and necessary labour, transport and equipment shall be provided by him. Any defect found out as a result of such tests shall be rectified by the contractor, forthwith at no extra cost to the purchaser.

In addition to the above, the contractor shall be responsible for testing and ensuring that the total and relative sags of the cable as within the specified tolerance. Such tests shall be carried out at selected points along the route as required by the Engineer-in-charge and the contractor shall provide all necessary equipment and labour to enable the tests to be carried out. After satisfactory test on the line and approval by the Engineer in Charge, the line shall be energized at full operating voltage before handling over. The cable shall be megger tested before and after jointing. The AB cable shall be tested for.

i) Continuity of messenger wire and conductors
ii) Absence of cross phasing
iii) Insulation resistance to earth
iv) Insulation resistance between conductors

v) DC Resistance
vi) Capacitance

As per the latest issue IS 1255:1983 and as per manufacturer's instructions. Sufficient backfilledearth covers each foundation pit and is adequately compacted.

All poles are used strictly according to final approved drawing and are free of anydefect or damage whatsoever.

The stringing of the conductors and earth wire has been done as per the approvedsag and tension charts and desired clearances are clearly available.

All conductor and messenger wire accessories are properlyinstalled.

The insulation of the line as a whole is tested by the Contractor through provision of his ownequipment, labour etc., to the satisfaction of the TPNODL .

3.0 PSC POLES

In case of 33 KV, 11KV and LT lines the conventional PSC poles may be used. . The materials must conform to IS: 800. All the test on materials and fabrication etc will be as per the relevant Indian standards.

ERECTION WORK

When the survey is approved, the contractor shall submit to the employer a complete detail schedule of all materials to be used in the line. Size and length of conductor etc. are also to be given in the list. This schedule is very essential for finalizing the quantities of all line materials. The contractor shall furnish the same.

SCHEDULE OF ERECTION PROGRAMME

After due approval of the detailed and check survey, the contractor shall submit to the employer a complete detailed schedule of erection programme with a Bar-Chart for construction of the lines indicating there in the target date of completion.

CONSTRUCTION OF FOUNDATION FOR PSC POLES

ERECTION OF POLE, CONCRETING OF POLES AND COMPACTION OF SOIL

Drawing for the excavation of pits, Foundation of both wet and Black cotton soil is enclosed which are to be adopted. If better design with less volume approved or tested by any other distribution agencies will also be acceptable.

Following arrangement shall be adopted for proper erection of poles and properly compacting of the soil around the base / foot of the poles, under this package.

(a) Excavation has to done as per the drawing to the required depth and size. After final excavation the pit should be dressed properly so that uneven portion and loose soil should be removed before PCC (**M-7.5**) i.e. 1:4:8 of thickness 75 mm are laid. The base footing of the pole concreting RCC (M-12.5) i.e. 1:3:6 has to be done by proper alignment and verticality.

(b) The verticality and leveling of pole/structure should be done by the help of plum bob or with theodolite and leveling instrument.

(c) In case of PSC pole RCC Pre –cast slab of size (450 x 4 50 x 75) mm has to be provided over the Lean concrete.

CEMENT CONCRETE AND BACK FILLING etc.

A) Materials

All materials whether to be consumed in the work or used temporarily shall conform torelevant IS specification, unless stated otherwise, and shall be of the best approved quality.

B) Cement

Cement to be used in the work under the contract shall generally conform to IS:269/455- 1989. Cement bags shall be stored by the contractor in a water tight well ventilated store sheds on raised wooden platform (raised at least 150 mm above ground level) in such a manner as to prevent deterioration due to moisture or intrusion of foreign matter. Cements to be used within three months from the date of manufacture. Sub-standard or partly set cement shall not be used and shall be removed from the site by the contractor at his cost.

C) Coarse Aggregates i.e. Stone chips or stone ballast. For M15 concrete (mix 1:2:4) the aggregate will be in the ranges from 12mm to 20mm.size and for M7.5 concrete (mix1:4:8) these will be from 25mm to 40mm size.

D) Pole erection

1. **After proper alignment**, checking of verticality and leveling, the pole or structure should be properly tied before placing of base concrete of required height. Again the verticality and leveling should be checked.
2. **The PCC pedestal concrete** (M-12.5) is to be done by providing good quality of shutters, so that there will no leakage of cement slurry during concreting. The cooping height should be 450 mm above the existing ground level. The top portion of the cooping should be made tapered.
3. **The back filling** of locations should be done by using the excavated soil only in layers (each layer should not be more than 500 mm) by putting water and ramming by using wooden rammers. In no case stone of size more than 75mm used for back filling. Back-filling has to be done 75mm above ground level or as specified.6.

All the persons working on poles shall wear safety helmet, safety belt and safety shoes; similarly all the persons working on ground shall wear safety helmet and safety shoes.

If there is any LT/HT power line near the vicinity of erection, necessary shutdown of the power line shall be obtained in writing from the concerned Agency in order to avoid electrical hazards caused by accidental touching of stay/Guy ropes with power line.

Safety precaution Safety shall be given utmost importance during stringing. The following need to be ensured.

Safe working conditions shall be provided at the stringing site.

Full proof communication through walky- talkie / mobile phones shall be used in order to avoid any damage to workmen or public on ground.

In case of HTand LT lines (PSC)

(A) PSC Pole (9Mtr x 300 Kg)

TECHNICAL SPECIFICATIONS OF PSC POLE

I. Qualification Criteria of Sub Vendor / Manufacturer:-

The prospective bidder may source PSC Poles from manufacturers. The bidder should enclose Performance Certificates from the users, issued in favour of the Sub Vendor / manufacturer, as proof of successful operation in field.

Applicable Standard:

The Poles shall comply with latest standards as under:

REC Specification No. 15/1979, REC Specification No. 24/1983, IS 1678, IS 2905, IS 7321.

II. Materials: Cement

Cement to be used in the manufacture of pre-stressed concrete poles shall be ordinary for rapid hardening Portland cement confirming to IS: 269-1976 (Specification for ordinary

and low heat Portland cement) or IS: 8041 E-1978 (Specification for rapid hardening Portland cement).

Aggregates

Aggregates to be used for the manufacture of pre-stressed concrete poles shall confirm to IS: 383 (Specification for coarse and fine aggregates from natural sources for concrete) .Thenominal maximum sizes of aggregates shall in no case exceed 12 mm.

Water

Water should be free from chlorides, sulphates, other salts and organic matter. Potable water willbe generally suitable.

Admixture

Admixture should not contain Calcium Chloride or other chlorides and salts which are likely topromote corrosion of pre-stressing steel. The admixture shall conform to IS: 9103.

Pres-Stressing Steel

Pre-stressing steel wires including those used as un tensioned wires should conform to IS:1785 (Part-I) (Specification for plain hard-drawn steel wire for pre-stressed concrete, Part-I cold drawn stress relieved wire).IS:1785 (Part-II)(Specification for plain hard-drawn steel wire) or IS:6003 (Specification for indented wire for pre-stressed concrete).The type design given in the annexure are for plain wires of 4 mm diameter with a guaranteed ultimate strength of 160 kg/mm². All pre-stressing steel shall be free from splits, harmful scratches, surface flaw, rough, aged and imperfect edges and other defects likely to impair its use in pre-stressed concrete.

Concrete Mix

Concrete mix shall be designed to the requirements laid down for controlled concrete (also called design mix concrete) in IS: 1343-1980 (Code of practice for pre-stressed concrete) and

IS: 456 – 1978 (Code of practice for plain and reinforced concrete) subject to the followingspecial conditions:

Minimum works cube strength at 28 days should be at least 420 Kg/cm².The concrete strength at transfer should be at least 210 Kg/cm².

The mix should contain at least 380 Kg of cement per cubic meter of concrete.

The mix should contain as low water content as is consistent with adequate workability. It becomes necessary to add water to increase the workability the cement content also should be raised in such a way that the original value of water cement ratio is maintained.

III. Design Requirements

The poles shall be designed for the following requirements:

The poles shall be planted directly in the ground with a planting depth as per IS: 1678. Wherever, planting depth is required to be increased beyond the specified limits or alternative arrangements are required to be made on account of ground conditions e.g. water logging etc., the same shall be in the scope of the bidder at no extra cost to TPNODL . The bidder shall furnish necessary design calculations/details of alternative arrangements in this regard.

The working load on the poles should correspond to those that are likely to come on the pole during their service life.

The factor of safety for all poles 9.0Mts. Shall not be less than 2.0 and for 8.0 M poles, the factor of safety shall not be less than 2.5.

The average permanent load shall be 40% of the working load. The F.O.S. against first load shall be 1.0. At average permanent load, permissible tensile stress in concrete shall be 30 kg/cm².

At the design value of first crack load, the modulus of rupture shall not exceed 53.0kg/cm² for M-40. The ultimate moment capacity in the longitudinal direction should be at least one fourth of that in thetransverse direction.

The maximum compressive stress in concrete at the time of transfer of pre-stress should not exceed 0.8times the cube strength.

The concrete strength at transfer shall not be less than half, the 28 days strength ensured in the design, i.e. 420x0.5=210kg/cm². For model check calculations on the design of poles, referred to in the annexure, a reference may be made to the REC "Manual on Manufacturing of solid PCC poles, Part-I-Design Aspects".

IV. Dimensions and Reinforcements

The cross-sectional dimensions and the details of pre-stressing wires should conform to the particulars given in the enclosed drawing. The provisions of holes for fixing cross-arms and otherfixtures should conform to the REC specification No.15/1979.

All pre-stressing wires and reinforcements shall be accurately fixed as shown in drawings and maintained in position during manufacture. The un-tensioned reinforcement as indicated in the drawings should be held in position by the use of stirrups which should go round all the wires.

All wires shall be accurately stretched with uniform pre-stressed in each wire. Each wire or group of wires shall be anchored positively during casing. Care should be taken to see that the anchorages do not yield before the concrete attains the necessary strength.

V. Cover

The cover of concrete measured from the outside of pre-stressing tendon shall be normally 20 mm.

VI. Welding and Lapping of Steel

The high tensile steel wire shall be continuous over the entire length of the tendon. Welding shall not be allowed in any case. However, joining or coupling may be permitted provided the
strength of the joint or coupling is not less than the strength of each individual wire.

VII. Compacting

Concrete shall be compacted by spinning, vibrating, shocking or other suitable mechanical means. Hand compacting shall not be permitted.

VIII. Curing

The concrete shall be covered with a layer of sacking, canvass, Hessian or similar absorbent material and kept constantly wet up to the time when the strength of concrete is at least equal to
the minimum strength of concrete at transfer of pre-stress. Thereafter, the pole may be removed from the mould and watered at intervals to prevent surface cracking of the unit the interval should depend on the atmospheric humidity and temperature. The pre-stressing wires shall be de- tensioned only after the concrete has attained the specified strength at
transfer (i.e. 200 or 210 kg/cm² as applicable).The cubes cast for the purpose of determining the strength at transfer should be coursed, a sear as possible, under condition similar to those under which the poles are cured. The transfer stage shall be determined based on the daily tests carried out on concrete cubes till the specified strength indicated above is reached. Thereafter the test on concrete shall be carried out as detailed in IS: 1343(code of practice for pre-stressed concrete). The manufacture shall supply, when required by the TPNODL or his representative, result of compressive test conducted in accordance with IS: 456 (Code of practice for plain and reinforced concrete) on concrete cubes made from the concrete used for the poles. If the manufacture so desired, the manufacture shall supply cubes for test purpose and such cubes shall be tested in accordance with IS: 456 (Code of practice for plain and reinforced concrete).

IX. Lifting Eye-Hooks or Holes

Separate eye-hooks or hoes shall be provided for handling the transport, one each at a distance of 0.15 times the overall length, from either end of the pole. Eye-hooks, if provided, should be properly anchored and should be on the face that has the shorter dimension of the cross-section. Holes,if provided for lifting purpose, should be perpendicular to the broad face of the pole.

X. Holes for Cross Arms etc

Sufficient number of holes shall be provided in the poles for attachment of cross arms and otherequipments.

XI. Stacking & Transportation

Stacking should be done in such a manner that the broad side of the pole is vertical. Each tier in thestack should be supported on timber sleeper located as 0.15 times the overall length, measured from the end. The timber supported in the stack should be aligned in vertical line.

XII. Earthing

(a) Earthing shall be provided by having length of 8 / 6 SWG GI wire embedded in Concrete during manufacture and the ends of the wires left projecting from the pole to a length of 100mmat 250 mm from top and 1000 mm below ground level.

(b) Earth wire shall not be allowed to come in contract with the pre-stressing wires

B. PSC Pole (9 Mtr x 300 Kg)

GUARANTEED TECHNICAL PARTICULARS

(To be submitted along with offer in line with the Standard Design)

	Description	Unit	Bidder's Offer
			9 Mtr X 300 Kg
1			
2	Factor of Safety		
3	Overall Length of Pole Meters	meters	
4	Working Load Kg	Kg	
5	Overall Dimensions		
A	Bottom Depth	mm	
B	Top Depth		
C	Breadth		
6	Reinforcement Detail:		
7	Diameter o prestressing wire		
8	No. of Tensioned Wires		
9	No. of Untensioned wire		
10	Length of each untensioned wire		
11	Concrete Detail		
A	Cement Type		
B	Grade		
C	Type		
D	Quantity	Cubic meter/pole	
E	Standard confirming to:		
	Steel Quality	Kg/Pole	
A	Ultimate Tensile Strength (UTS)	Km/Cm²	
B	Weight		

All the poles shall be provided with a RCC block base having dimensions as mentioned at 5.0.2 © as per the site requirement to be decided by Engineer in Charge. The decision of Engineer in Charge will be Final.

The poles shall then be lifted to the pit with the help of wooden supports. The pole shall then be kept in the vertical position with the help of 25 mm (min.) manila ropes, which will act as the temporary anchor. The verticality of the pole shall be checked by spirit level in both

longitudinal & transverse directions. The temporary anchor shall be removed only when **poles set properly in the pit for foundation concreting & backfilling with proper compacting the soil.**

Concreting of foundation up to a minimum height of 1/6 th of the height of the pole from the bottom of the pit with a circular cross-section of radius 0.25 mtrs. (Volume of 0.3 cu.mtr. per pole) in the ratio of 1:3:6 shall be done at the following locations: The **depth** has to be increased to 2mtr or as required at site condition if poles more than 11 Mts. are to be used.

i) At all the tapping points and dead end poles.

ii) At all the points as per REC construction dwg. No. A-10 (for the diversion angle of 10-60 degree) or **better there of as per the instruction of Engineer in charge. The decision of Engineer in charge will be final.**

iii) Both side poles at all the crossing for road, Nallaha railway crossings etc.

iv) Where Rail poles, Joist poles, double pole and four pole structures are to be erected.

CROSS ARMS

"V" and straight Cross Arms should be made by using GI 100x50 ISMC mm for 33 KV &75 x 40 ISMC for 11 KV line.

33KV , 11 KV "V" CROSS ARM, BACK CLAMP FOR "V"CROSS ARM &POLE TOP BRACKET (GI)

(F CLAMP)

TECHNICAL SPECIFICATIONS

Qualifying Criteria :-

The prospective bidder may source the above items from manufacturers /suppliers full filling the technical specification.

a) Hot Dip Galvanised Cross arms and Pole Top Brackets for both 33KV & 11KV construction at intermediate and light angle pole shall be fabricated from grade 43A mild steel of channel section and for heavy angle poles, end poles and section poles fabricated from grade 43A mild steel of angle section. The grades of structural steel shall conform to IS – 226: 1975.

b) The Back Clamp for both 33KV & 11 KV shall be made out of 50 x 8 GI Flat and shall be suitably designed to fit PSC Pole 9 Mtr x 300 Kg and 150x150 mm RS Joist.

c)The Pole Top Bracket (F Clamp) shall be made out of 100x50 mm MS Channel (GI) for 33 KV & 75x40 MS channel (GI) suitably designed to fit PSC Pole 9 Mtr x 300 Kg and 150x150 mm RS Joist.

Except where otherwise indicated all dimensions are subject to the following tolerances: dimensions up to and including 50mm: +1mm: and dimensions greater than 50mm: +2%

All steel members and other parts of fabricated material as delivered shall be free of warps, local deformation, unauthorized splices, or unauthorized bends. Bending of flat strap shall be carried out cold. Straightening shall be carried out by pressure and not by hammering.

Straightness is of particular importance if the alignment of bolt holes along a member is referred to its edges.

Holes and other provisions for field assembly shall be properly marked and cross referenced. Where required, either by notations on the drawing or by the necessity of proper identification and fittings for field assembly, the connection shall be match marked. A tolerance of not more than 1mm shall be permitted in the distance between the center lines of bolt holes.

The holes may be either drilled or punched and, unless otherwise stated, shall be not more than 2mm greater in diameter than the bolts. When assembling the components force may be used to bring the bolt holes together (provided neither members nor holes are thereby distorted) but all force must be removed before the bolt is inserted. Otherwise strain shall be deemed to be present and the structure may be rejected even though it may be, in all other respects, in conformity with the specification.

The back of the inner angle irons of lap joints shall be chamfered and the ends of the members cut where necessary and such other measures taken as will ensure that all members can be bolted together without strain or distortion. In particular, steps shall be taken to relieve stress in cold worked steel so as to prevent the onset of embitterment during galvanizing.

Similar parts shall be interchangeable.

Shapes and plates shall be fabricated and assembled in the shop to the greatest extent practicable. Shearing flame cutting and chipping shall be done carefully, neatly and accurately. Holes shall be cut, drilled or punched at right angles to the surface and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges, and burrs resulting from drilling or reaming operations shall be removed with the proper tool.

Shapes and plates shall be fabricated to the tolerance that will permit field erection within tolerance, except as otherwise specified. All fabrication shall be carried out in a neat and workmanlike manner so as to facilitate cleaning, painting, galvanizing and inspection and to avoid areas in which water and other matter can lodge.

Contact surfaces at all connections shall be free of loose scale, dirt, burrs, oil and other foreign materials that might prevent solid seating of the parts.

Fabrication has to be made as per drg. of „ V „ X-arm, Back clamp & „ F „ clamp.

GALVANISING

All type of cross arms back clamps, F clamps & stay clamps shall be hot dip galvanized, are as following:

All galvanizing shall be carried out by the hot dip process, in accordance with SpecificationIS

2629. However, high tensile steel nuts, bolts and spring washer shall be electro galvanized to Service Condition 4. The zinc coating (610 gms per sq.mt) shall be smooth, continuous and uniform. It shall be free from acid spot and shall not scale, blister or be removable by handling or packing.

There shall be no impurities in the zinc or additives to the galvanic bath which could have a detrimental effect on the durability of the zinc coating.

Before picking, all welding, drilling, cutting, grinding and other finishing operations must be completed and all grease, paints, varnish, oil, welding slag and other foreign matter completely removed.

All protuberances which would affect the life of galvanizing shall also be removed.

The weight of zinc deposited shall be in accordance with that stated in Standard IS 2629 and shall not less than 0.61kg/m² with a minimum thickness of 86 microns for items of thickness more than 5mm, 0.46kg/m² (64 microns) for items of thickness between 2mm and 5mm and 0.33kg/m² (47 microns) for items less than 2mm thick.

Parts shall not be galvanized if their shapes are such that the pickling solutions cannot be removed with certainty or if galvanizing would be unsatisfactory or if their mechanical strength would be reduced. Surfaces in contact with oil shall not be galvanized unless they are subsequently coated with an oil resistant varnish or paint.

In the event of damage to the galvanizing the method used for repair shall be subject to the approval of the Engineer in Charge or that of his representative.

In no case the repair of galvanisation on site will be permitted.

The threads of all galvanized bolts and screwed rods shall be cleared of spelter by spinning or brushing. A die shall not be used for cleaning the threads unless specifically approved by the Engineer in Charge. All nuts shall be galvanized. The threads of nuts shall be cleaned with a tap and the threads oiled.

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

After galvanizing no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. To avoid the formation of white rust galvanized materials shall be stacked during transport and stored in such a manner as to permit adequate ventilation. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

The galvanized steel shall be subjected to test as per IS-2633.

33KV/11 KV V CROSS ARM

GURANTEED TECHNICAL PARTICULARS

(To be submitted along with offer)

Sl. No.	**Description Unit**	Unit	Bidder's offer	
			11 KV	**33 KV**
1	Type of cross arm			
2	Grade of steel			
3	Steel standard			
4	Fabrication Standard			
5	Dimensions	Mm		
6	Steel section utilized			
7	Steel tensile strength	N/cm²		
8	Working load	Kg		
9	Details of galvanizing method utilized and standard/specification conforming to?			
10	Weight of cross arm	Kg		
11	Whether drawing has been submitted with thebid			

Signature of the bidder with Seal

POLE TOP BRACKETS (F CLAMP)

GURANTEED TECHNICAL PARTICULARS

(To be submitted along with offer)

Sl. No.	Description Unit	Unit	Bidder"s offer	
			11 Kv	**33 Kv**
1	Type of crossarm			
2	Grade of steel			
3	Steel standard			
4	Fabrication Standard			
5	Dimensions	Mm		
6	Steel section utilized			
7	Steel tensile strength	N/cm²		
8	Working load	Kg		
9	Details of galvanizing method utilized and standard/specification conforming to?			
10	Weight of Top bracket	Kg		
11	Whether drawing has been submitted with the bid			

Signature of the bidder with Seal

BACK CLAMP FOR "V" CROSS ARMGURANTEED TECHNICAL PARTICULARS

(To be submitted along with offer)

Sl. No.	Description Unit	Unit	Bidder"s offer	
			11 Kv	**33 Kv**
1	Type of Clamp			
2	Grade of steel			
3	Steel standard			
4	Fabrication Standard			
5	Dimensions	Mm		
6	Steel section utilized			
7	Steel tensile strength	N/cm²		
8	Working load	Kg		
9	Details of galvanizing method utilized and standard/specification conforming to?			
10	Weight of back clamp	Kg		
11	Whether drawing has been submitted with the bid			

Signature of the bidder with Seal

TECHNICAL SPECIFICATION FOR 11KV AND 33KV POLYMER PIN INSULATOR

Scope : This specification cover the design, manufacturing, testing at manufacturers works, transport to site, insurance, unloading & storage of 11 KV & 33KV Polymer Pin Insulator suitable for use in 11 KV & 33KV Overhead Lines situated in any part of under jurisdiction of TPNODL .

General Requirements:

1. The Composite insulators will be used on lines on which the conductor will be size of conductor up to 232 Sq. mm. The insulators should withstand the conductor tension, the reversible wind load as well as the high frequency vibrations due to wind.
2. Insulator shall be suitable for 3 Phase, 50 Hz effectively earthed 11KV Overhead Lines and 33 KV Impedance Grounded distribution systems in a moderately/heavily polluted atmosphere.
3. Bidder must be an indigenous manufacturer and supplier of composite insulators of rating 11KV or above or must have developed proven in house technology and manufacturing process for composite insulators of above rating. The Bidder shall furnish necessary evidence in support of the above a long with the bid, which can be in the form of certification from the utilities concerned, or any other documents to the satisfaction of the owner.
4. Insulator shall be suitable for the long Rod Type.
5. Insulators shall have sheds with good self-cleaning properties. Insulator shed profile, spacing, projection etc. and selection in respect of polluted conditions shall be generally in accordance with the commendation of IEC- 60815/ IS: 13134.
6. The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed asfollows in line with-IEC 61109: ± (0.04d + 1.5) mm when d ≤ 300 mm
   ± (0.025d+6) mm when d > 300 mm

   Where, d being the dimensions in millimeters for diameter, length or creepage distance as the case maybe. However, no negative tolerance shall be applicable to creepage distance.
7. The composite insulators including the end fitting connection shall be standard design suitable for use with the hardware fittings of any make conforming to relevant IEC/IS standards.
8. All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating conditions.

Service condition: The insulators to be supplied against this specification shall be suitable forsatisfactory continuous operation under the following topical condition:

a) Max. ambient temperature : 50 º C
b) Min. ambient temperature : -5 º C
c) Relative humidity : 10 % to 100 %d) Avarage number of rainy days: 100 / annum.
e) Max. Anual Rainfall : 1500 mm
f) Max. Wind Pressure : 150 Kg/ sq. Meter
g) Max. Wind Velocity : 50 Km/ hourh) Max. Altitude above MSL : 1000 Meter.

i) Seismic level : 0.3 g (Horizontal acceleration)j) Avarage Thunder storm : 45 Days per annum.

k) Climatic condition : Moderately hot and humid tropical climate, conductive to rust and fungus growth. Pollution level is high. Some area with seashores having saline atmosphere

System Parameters:

a) Nominal system voltage : 11 KV & 33 KV.

b) Highest system voltage : 12 KV & 36 KV.c) Power frequency : 50 Hz.

d) Number of Phases : Three.

e) System earthing : 11 KV Solidly earthed, 33 KV Impedence earth.

Standard: The following Indian / International Standards with latest revisions and amendments shall be referred while accessing conformity of insulators with this specification.

Sl. No.	Indian Standard	Title	International Standard
1.		Definition, test methods and acceptance criteria for composite insulators for a.c.overhead lines above 1000V	IEC : 61109
2.	IS : 731	Porcelain insulators for overhead power lineswith a nominal voltage greater than 1000V	IEC : 60383
3.	IS : 2071	Methods of High Voltage Testing	IEC : 60060-1
4.	IS : 2486	Specification for insulator fittings for overhead power lines with a nominal voltage greater than 1000V General Requirements and Tests Dimensional Requirements Locking Devices	IEC : 60120 IEC : 60372
5.		Thermal Mechanical Performance test and mechanical performance test on stringinsulator units	IEC : 60575
6.	IS : 13134	Guide for the selection of insulators inrespect of polluted conditions	IEC : 60815
7.		Characteristics of string insulator units of thelong rod type	IEC : 60433
8.		Hydrophobicity classification guide	STRI guide 1.92/1
9.		Radio interference characteristics of overheadpower lines and high-voltage equipment	SPR:18-2 part2
10.	IS : 8263	Methods of RI Test of HV Insulators	IEC : 60437
11.		Standard for insulators – Composite-Distribution Dead-end type	ANSI C29 13-2000
12.	IS : 4759	Hot dip zinc coatings on structural steel &other allied products	ISO : 1459 ISO : 1461
13.	IS : 2629	Recommended Practice for Hot, DipGalvanization for iron and steel	ISO-1461 (E)
14.	IS : 6745	Determination of weight of zinc coating onzinc coated iron and steel articles	ISO : 1460
15.	IS : 3203	Methods of testing of local thickness ofelectroplated coatings	ISO : 2178
16.	IS : 2633	Testing of Uniformity of coating of zinccoated articles	
17		Standard specification for glass fiber strands	ASTMD 578-05
18		Standard test method for compositionalanalysis by Thermo-gravimetric	ASTM E 1131-03
19	IS : 4699	Specification for refined secondary zinc	

Technical Requirement:

1. Composite Insulators shall be designed to meet the light quality, safety and reliability and are capable of withstanding a wide range of environmental conditions.

(a) Core : The internal insulating part

(b) Housing : The external insulating part.

(c) Metal end fittings: For attaching to hardware to support conductor.

Core: It shall be a glass-fibber reinforced epoxy resin rod of high strength (FRP rod). Glass fibbers and resin shall be optimized in the FRP rod. Glass fibbers shall be Boron free electrically corrosion resistant (ECR) glass fibber or Boron free E-Glass and shall exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP shall be manufactured through Pultrusion process. The FRP rod shall be void free.

Housing (Sheath):

The FRP rod shall be covered by a seamless sheath of a silicone elastomeric compound or silicone alloy compound of a thickness of 3 mm minimum. It shall be one-piece housing using injection Moulding Principle to cover the core. The elastomer housing shall be designed to provide the necessary creepage distance and protection against environmental influences, external pollution and humidity. Housing shall conform to the requirement of IEC

61109/92-93 with latest amendments.

It shall be extruded or directly moulded on core and shall have chemical bonding with the FRP rod. The strength of the bond shall be greater than the tearing strength of the polymer. Sheath material in the bulk as well as in the sealing / bonding area shall be free from voids.

Manufacturer should furnish a description of its quality assurance programme including fabrication; testing and inspection for any material (i.e rubber) Components (i.e rod) or hardware (i.e. end filings). The manufacturer has had fabricated by others should also be included. Manufacturing methods and material composition documentation will be a part of Technical Bid to be submitted along with offer.

WEATHERSHEDS:

The composite polymer Weathersheds made of silicone elastometric compound or silicon alloy shall be firmly bonded to the sheath, vulcanized to the sheath or moulded as part of the sheath and shall be free from imperfections. The weathersheds should have silicon content of minimum 30% by weight. The strength of the weathershed to sheath interface shall be greater than the tearing strength of the polymer. The interface, if any, between sheds and sheath (housing) shall be freefrom voids.

METAL END FITTINGS:

End fittings transmit the mechanical load to the core. Hardware of respective specified mechanical load and shall be hot dip galvanized in Zinc coated with minimum 99.95 % purity of electrolytic high grade Zinc in accordance with IS 2629. The material used in fittings

shall be corrosion resistant.

Metal end fittings shall be uniform and without sharp edges or corners and shall be free of cracks, flakes, silvers, slag, blow-holes shrinkages defects and localized porosity.

They shall be connected to the rod by means of a controlled compression technique. As the main duty of the end fittings is the transfer of mechanical loads to the core the fittings should be property attached to the core by a coaxial or hexagonal compression process and should not damage the individual fibers or crack the core.

The gap between fittings and sheath shall be sealed by flexible silicone elastometric compound or silicone alloy compound sealant, system of attached of end fitting to the rod shall provide

superior sealing performance between housing, i.e. seamless sheath and metal connection. The sealing must be moisture proof.

The dimensions of end fittings of insulators shall be in accordance with the standard dimensions stated in IEC: 60120/IS:2486 Part-II/1989.

Nominal dimensions of the pin insulator shall be in accordance with the Specific Technical Particulars. No joints in pin will be allowed. Outer portion of Pin should be Zinc coated with minimum 99.95% purity of electrolytic high grade Zinc.

The finished surface shall be smooth and shall have a good performance. The surface shall not crack or get chipped due to ageing effect under normal and abnormal service conditions or while handling during transit or erection.

The design of the fittings and the insulators shall be such that there is no local corona formation or discharges likely to cause the interference to either should or vision transmission. Bottom end metal fitting (Shank) of Pin Insulator should be as per IS: 2486.

Length of thread on shank should be minimum 110 mm f o r 1 1 K V P i n and 130 mm for 33 KV Pin insulator. Shank diameter is 20 mm for 11 KV Pin Insulator & 24 mm for 33 KV Pin Insulator. Minimum Collar diameter should be 40 mm and its minimum thickness should be of 5 mm. Two numbe r n uts as per IS 1363 (P-III) and 4 mm thick Spring Washer shall be as per IS 3063 with latest amendments if any, Nuts and spring washer shall be hot dip galvanized.

Workmanship :

a) All the materials shall be of latest design and conform to the best engineering practices adopted in the high voltage filed. Bidders shall offer only such insulators as are guaranteed by them to be satisfactory and suitable for continued good service in power transmission lines.

b) The design, manufacturing process and material control at various stages shall be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish and elimination of sharp edges and corners.

c) The design of the insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.

d) The core shall be sound and free of cracks and voids that may adversely affect the insulators.

e) Weather sheds shall be uniform in quality. They shall be clean, sound and smooth and shall be free from defects and excessive flashing at parting lines.

f) End fittings shall be free from cracks, seams, shrinks, air holes and rough edges. End fittings should be effectively sealed to prevent moisture ingress. Effectiveness of sealing system must be supported by test documents. All surfaces of the metal parts shall be perfectly smooth without projecting points or irregularities, which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.

g) All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 610 gm/sq.m. or 87µm thickness and shall be in accordance with the requirement of IS:4579. The zinc used for galvanizing shall be of purity 99.5% as per IS: 4699. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. The galvanized metal parts shall be guaranteed to withstand at least four successive dips each lasting for one (1) minute duration under the standard preece test. The galvanizing shall be carried out only after any machining.

Drawing:
The bidder shall furnish along with the bid the outline drawing of each insulator unit including a cross sectional view of the long rod insulator unit. The drawing shall include but not be limited to the following information:

(a) Long rod diameter with manufacturing tolerances
(b) Minimum Creepage distance with positive tolerance
(c) Protected creepage distance
(d) Eccentricity of the long rod unit
(i) Axial run out
(ii) Radial run out
(e) Unit mechanical and electrical characteristics
(f) Weight of composite long rod units
(g) Identification mark
(h) Manufacturer's catalogue number

Marking: Each insulator shall be legibly and indelibly marked (embossing/engraved) to showthe following:

a) Name & Trade mark of the manufacturerb) Month & Year of manufacturing

c) Voltage & Type

d) Minimum Failling Load (in KN)e) marking

N.B. Marking with sticker/written by Ink is not acceptable.

Type Test: The following Type Test shall have to be conducted on insulator unit, omponents, materials or complete strings;

a) Dry Positive & Negative Lightning Impulse voltage withstand test b) Dry Positive & Negative Lightning Impulse Flashover voltage testc) Dry & Wet Power Frequency Voltage withstand test

d) Dry & Wet Power Frequency Voltage Flashover teste) Mechanical Failing Load test.

f) Radio Interference test

g) Recovery of Hydrophobicity testh) Dye Penetration Test.

i) Water Diffusion Test

j) Chemical composition test for Silicon contentk) Brittle facture resistance test.

Routine Test :

a) Identification of markingb) Visual inspection

c) Mechanical routine test

Acceptance Test : The following test will be carried out at manufacturers works during inspection ofthe offered insulators before delivery :

a) Visual examination

b) Verification of dimensionc) Galvanizing test

d) Mechanical performance teste) Mechanical Failing Load test

Inspection:

All Acceptance tests shall be carried out at manufacturer's works in presence of the supply engineer/ Owner's / Representive of Owner and manufacturers representatives. In addition to above, all routine tests are also to be carried on the insulator as per relevant IS / IEC. The entire cost of acceptance and routine test that to be carried out as per relevant IS / IEC shall be treated as included in the quoted price of Insulator.

The manufacturer shall give at least 15(Fifteen) days advance notice intimating the actual date of inspection and details of all tests that are to be carried out from the date when the tests will be carriedout. Routine tests on all insulators shall be carried out as per IEC / IS and test reports shall besubmitted along with respective inspection offer to Superintending Engineer, Bhadrak Electrical circle, TPNODL .

Sampling & Rejection during inspection:

The sampling and rejection procedure for Acceptance Test shall be as per IEC 61109.

Packing :

a) All insulators shall be packed in strong corrugated box of min. 7 ply duly palette or wooden crates. The gross weight of the crates along with the material shall not normally exceed 100 Kg to avoid handling problem. The crates shall be suitable for outdoor storage under wet climate during rainy season.

b) The packing shall be of sufficient strength to withstand rough handling during transit,storage at site and subsequent handling in the field.

c) Suitable cushioning, protective padding or dunn age or spacers shall be provided toprevent damage or deformation during transit and handling.

d) Each wooden case / crate / corrugated box shall have all the markings stenciled on it inindelible ink.

e)The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

Guarantee :

In the event of any defect in the equipment / materials arising out of faulty design, materials, workmanship within a period of 24 (twelve) months of commissioning or 30(eighteen) months from the date of last despatch of any integral part of the equipment / materials whichever is earlier the supplier shall guarantee to replace or repair the same to the satisfaction of the purchaser.

If the supplier fail to do so within a reasonable time, Owner reserves the right to effect repair or replacement by any other agency and recover charges for repair or replacement from the supplier.

Quality Assurance Plan:

- The successful bidder shall submit following information along with the bid.
- Test certificates of the raw materials and bought out accessories.
- Statement giving list of important raw material, their grades along with names of sub- suppliers for raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in presence of bidder's representative.
- List of manufacturing facilities available.
- Level of automation achieved and lists of areas where manual processing exists.
- List of areas in manufacturing process, where stage inspections are normally carried out for quality

control anddetails of such tests and inspections.

- List of testing equipments available with the bidder for final testing equipment along with valid calibrationreports.
- The manufacturer shall submit Manufacturing Quality Assurance Plan (QAP) for approval & the same shall befollowed during manufacture and testing.
- The successful bidder shall submit the routine test certificates of bought out raw materials/accessories and centralexcise passes for raw material at the time of inspection.
- The Owner's representative shall at all times be entitled to have access to the works and all places of manufacture, where insulator, and its component parts shall be manufactured and the representatives shall have full facilities for unrestricted inspection of the Supplier's and sub- Supplier's works, raw materials, manufacture of the material and for conducting necessary test as detailed herein.
- The material for final inspection shall be offered by the Supplier only under packed condition. The owner shall select samples at random from the packed lot for carrying out acceptance tests. The lot offered for inspection shall be homogeneous and shall contain insulators manufactured in 3-4 consecutive weeks.
- The Supplier shall keep the Owner informed in advance of the time of starting and the progress of manufactureof material i/n their various stages so that arrangements could be made for inspection.
- No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested unless the owner in writing waives off the inspection. In the later case also the material shall be dispatched only after satisfactory testing specified herein has been completed.
- The acceptance of any quantity of material shall in no way relieve the Supplier of his responsibility for meeting all the requirements of the specification and shall not prevent subsequent rejection, if such materials are later found to be defective.

ANNEXURE: A

Test on Insulator units

- RIV Test (Dry): The insulator string along with complete hardware fittings shall have a radio interference voltage level below 100 micro volts at one MHz when subjected to 50 Hz voltage of 10 kV & 30 kV for 11 kV & 33 kV class insulators respectively under dry condition. The test procedure shall be in accordance with IS: 8263/IEC:437/CISPR 18-2.
- Brittle Fracture Resistance Test: Brittle fracture test shall be carried out on naked rod along with end fittings by applying "1n HNO3 acid" (63 g conc. HNO3 added to 937 g water) to the rod. The rod should be held at 80% of SML for the duration of the test. The rod should not fail within the 96 Hour test duration. Test arrangement should ensure continuous wetting of the rod with Nitric acid.
- Recovery of Hydrophobicity & Corona Test:
- The surface of selected samples shall be cleaned with isopropyl alchohol. Allow the surface to dry and spray with water. Record the Hydrophobicity classification in line with STRI guide for Hydrophobicity classification (Extract enclosed at Annexure-D) Dry the sample surface.

(ii) The sample shall b e subjected to mechanical stress by bending the Sample over a ground electrode. Corona is continuously generated by applying 12 kV to a needle like electrode placed 1 mm above the sample surface. Tentative arrangement shall be as shown in Annexure- E. The test shall be done for 100 hrs.

(iii) Immediately after the corona treatment, spray the surface with Water and record the HC classification. Dry the surface and repeat the corona treatment as at Clause-2 above. Note HC classification. Repeat the cycle for 1000 Hrs. or until an HC of 6 or 7 is obtained. Dry the sample surface.

Allow the sample to recover and repeat hydrophobicity Measurement at several time intervals. Silicone rubber should recover to HC 1 – HC 2 within 24 to 48 hours, depending on the Material and the intensity of the corona treatment.

- Chemical composition test for Silicon content:

The content of silicon in the composite polymer shall be evaluated by EDX (Energy Dispersion X-ray) Analysis or Thermo-gravimetric analysis. The test may be carried out atCPRI or any other NABL accredited laboratory.

GUARANTED TECHNICAL PARTICULARS FOR 11 KV PIN INSULATOR(POLYMER TYPE)

Sl. No.	Particulars	11 KV Pin Insulator	Bidders Offer
1	Type of insulator	Polymeric composite Pin Insulator	
2	Reference Standard	IEC 61109	
3	Material of FRP Rod	Borron free ECR	
4	Material of sheds	Silicon Rubber	
5	Material of Top End Fittings	SGCI /MCI/ FORGED STEEL	
6	Material of Bottom End Fittings	FORGED STEEL	
7	Material of sealing compound	RTV Silicon	
8	Colour of sheds	Grey	
9	Rated voltage	11 KV	
10	Highest voltage	12 KV	
11	Dry Power Frequency Withstand voltage	60 KV	
12	Wet Power Frequency Withstand voltage	35 KV	
13	Dry Power Frequency Flashover Voltage	75 KV	
14	Wet Power Frequency Flashover Voltage	45 KV	
15	Dry Lightning Impulse withstand voltage	Positive : 75 KV Negative : 80 KV	
16	Dry Lightning Impulse Flashover voltage	Positive : 95 KV Negative : 100 KV	
17	RIV at 1 MHz when energised at 10 KV / 30 KV (rms) under dry condition	< 50 microvolt	
18	Creepage distance (min)	320 mm	
19	Min Failing load	5 KN	
20	Dia of FRP Rod	20 mm	
21	Length of FRP Rod (min)	165 mm	
22	Dia of weather sheds	100 mm	
23	Thickness of housing	3 mm	
24	Dry arc distance	150 mm	
25	Method of fixing sheds to housing	Injection moulding	
26	Visible Discharge Voltage (PF)	9 KV	
27	No of weather sheds (min)	Three	
28	Type of sheds	Aerodynamic	
29	Dia of bottom end fitting	20 mm	
30	Thread length of bottom end fitting	110 mm (min)	
31	Type of packing	Wooden / Corrugated box	
32	No of insulator in each pack	Thirty	
33	Guarantee	24 months from commissioning or 30 months from the date of last despatch.	

GUARANTED TECHNICAL PARTICULARS FOR 33 KV PIN INSULATOR(POLYMER TYPE)

Sl. No.	Particulars	33 KV Pin insulator	Bidders Offer
1	Type of insulator	Polymeric composite Pin Insulator	
2	Reference Standard	IEC 61109	
3	Material of FRP Rod	Borron free ECR	
4	Material of sheds	Silicon Rubber	
5	Material of Top End Fittings	SGCI /MCI/ FORGED STEEL	
6	Material of Bottom End Fittings	FORGED STEEL	
7	Material of sealing compound	RTV Silicon	
8	Colour of sheds	Grey	
9	Rated voltage	33 KV	
10	Highest voltage	36 KV	
11	Dry Power Frequency Withstand voltage	95 KV	
12	Wet Power Frequency Withstand voltage	75 KV	
13	Dry Power Frequency Flashover Voltage	130 KV	
14	Wet Power Frequency Flashover Voltage	90 KV	
15	Dry Lightning Impulse withstand voltage	Positive : 170 KV Negative : 180 KV	
16	Dry Lightning Impulse Flashover voltage	Positive : 210 KV Negative : 230 KV	
17	RIV at 1 MHz when energised at 10 KV / 30 KV (rms) under dry condition	< 70 microvolt	
18	Creepage distance (min)	900 mm	
19	Min Failing load	10 KN	
20	Dia of FRP Rod	24 mm	
21	Length of FRP Rod (min)	300 mm	
22	Dia of weather sheds	110 mm	
23	Thickness of housing	3 mm	
24	Dry arc distance	300 mm	
25	Method of fixing sheds to housing	Injection moulding	
26	Visible Discharge Voltage (PF)	27 KV	
27	No of weather sheds (min)	Eight	
28	Type of sheds	Aerodynamic	
29	Dia of bottom end fitting	24 mm	
30	Thread length of bottom end fitting	130 mm (min)	
31	Type of packing	Wooden / Corrugated box	
32	No of insulator in each pack	Twenty	
33	Guarantee	24 months from commissioning or 30 months from the date of last despatch.	

Technical specification of Composite Disc Insulators (B&S)Polymer type

SCOPE :

This specification covers the design, manufacture, testing and supply of 11KV Composite Insulators. Thecomposite insulators shall be of the following type:

i)Long rod insulators for conductors in tension application at angle / cut points the insulators shall beof Ball & Socket type.

ii) Line post insulators or pin insulators for straight line locations

2) SERVICE CONDITIONS :

The insulators to be supplied against this specification shall be suitable for satisfactory continuousoperation under the following tropical conditions.

Maximum ambient temperature (Degree C)	…	50
Minimum ambient temperature (Degree C)	…	5
Relative Humidity (%)	…	95
Maximum Annual Rainfall (mm)	…	1450
Maximum Wind pressure (kg/m.sq.)	…	260
Maximum wind velocity (km/hour)	…	50
aximum altitude above mean sea level (meter)	…	1000
Isoceraunic level (days/year)	…	50
Seismic level (Horizontal acceleration)	…	0.3 g

Moderately hot and humid tropical climate
Conductive to rust and fungus growth

3) SYSTEM PARTICULARS:

a) Nominal System Voltage	11 kV	22 kV	33 kV
b) Corresponding highest system Voltage	12 kV	24kV	36 kV
c) Frequency	50 Hz with 3% tolerance		
d) Number of phase	3	3	3
e) Neutral earthing	effectively grounded.		

4) STANDARDS :

Unless otherwise specified elsewhere in the specifications insulators shall confirm to the latest revisionsof all relevant standards available at the time of placement of the order. The standards are listed in Annexure 'A'.

5) GENERAL REQUIREMENTS

i) The composite insulators shall generally conform to latest Standards as listed in Annexure 'A

ii) The Composite Insulators will be used on lines on which the conductors will be AAA Conductor of size up to 232 sq. mm. and AAAC of any size up to Panther (0.2 sq. inch copper equivalent). The insulators should withstand the conductor tension, the reversible wind load as well as the high frequency vibrations due to wind.

iii) Supplier must be an indigenous manufacturer and manufacturer of composite insulators of rating 33 kV or above OR must have developed proven in house technology and

manufacturing process for composite insulators of above rating OR possess technical collaboration /association with a manufacturer of composite insulators of rating 33kV or above. The Manufacturer shall furnish necessary evidence in support of the above, which can be in the form of certification from the utilities concerned, or any other documents to the satisfaction of the Employer.

iv) Insulator shall be suitable for both the suspension and strain type of load & shall be of Ball & Socket type. The diameter of Composite Insulator shall be less than 200 mm. The center-to-center distance between B&S shall be max. 300 mm for
11 kV, 450 mm for 22 kV & 550 mm for 33 kV composite Insulator.

v) Insulators shall have sheds with good self-cleaning properties. Insulator shed profile, spacing, projection etc. and selection in respect of polluted conditions shall be generally in accordance with the recommendation of **IEC-60815/IS: 13134**.

vi) The size of Composite insulator, minimum creepage distance and mechanical strength along with hardware fittings shall be as follows:

Sr. No.	Type of Composite insulators	Nominal System Voltage kV (rms)	Highest System Voltage kV(rms)	Visible Discharge Test Voltage kV(rms)	Wet Power Frequency Withstand Voltage kV(rms)	Impulse Withstand voltage kV(rms)	Minimum Creepage Distance (mm) (Heavily Polluted 25mm/kV)	Center to Center Distance Between B&S (mm)	Min. Failing load kN	Shed Diameter (mm) (min)
i.	Long Rod insulator	11	12	9	35	75	320	300	45	100
		22	24	18	55	125	600	450	70/90	100
		33	36	27	75	170	900	550	70	100
ii.	Post/Pin Insulator	11	12	9	35	75	320		5	
		22	24	18	55	125	560		10	
		33	36	27	75	170	900		10	

vii) Dimensional Tolerance of Composite Insulators

The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed as follows in line with-**IEC 61109**:

(0.04d+1.5) mm when d≤300mm.

(0.025d+6) mm when d>300 mm.

Where, d being the dimensions in millimeters for diameter, length or creepage distance as the case may be. However no negative tolerance shall be applicable to creepage distance.

viii) Interchange ability:

The composite insulator together with the Ball & Socket fittings shall be of standard design suitable for use with the hardware of any other indigenous make conforming to relevant standards referred above.

ix) Corona and RI Performance

All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and

not generate any radio interference beyond specified limit under the operating conditions.

6) TECHNICAL DESCRIPTION OF COMPOSITE INSULATORS

Polymeric Insulators shall be designed to meet the high quality, safety and reliability and are capable of withstanding a wide range of environmental conditions.
Polymeric Insulators shall consist of THREE parts, at least two of which are insulating parts:-

(a) Core- the internal insulating part
(b) Housing- the external insulating part
(c) Metal end fittings.

i) CORE

It shall be a glass-fiber reinforced epoxy resin rod of high strength (FRP rod). Glass fibers and resin shall be optimized in the FRP rod. Glass fibers shall be Boron free electrically corrosion resistant (ECR) glass fiber or Boron free E-Glass and shall exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP rod shall be manufactured through Pultrusion process. The FRP rod shall be void free.

ii) HOUSING:

The FRP rod shall be covered by a seamless sheath of a silicone elastometric compound or silicone alloy compound of a thickness of 3mm minimum. It shall be one- piece housing using Injection Molding Principle to cover the core. The elastomer housing shall be designed to provide the necessary creepage distance and protection against environmental influences. Housing shall conform to the requirements of IEC61109/92-93 with latest amendments

iii) WEATHERSHEDS

The composite polymer weather sheds made of a silicone elastometric compound or silicone alloy compound shall be firmly bonded to the sheath, vulcanized to the sheath or molded as part of the sheath and shall be free from imperfections It should protect the FRP rod against environmental influences, external pollution and humidity. The weather sheds should have silicon content of minimum 30% by weight. The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer. The interface, if any, between sheds and sheath (housing) shall be free from voids.

iv) METAL END FITTINGS:

End fitting transmit the mechanical load to the core. They shall be made of spheroidal graphite cast iron, malleable cast iron or forged steel or aluminum alloy. They shall be connected to the rod by means of a controlled compression technique. Metal end fittings shall be suitable for Ball & Socket hard wares of respective specified mechanical load and shall be hot dip galvanized after, all fittings have been completed. The material used in fittings shall be corrosion resistant. As the main duty of the end fittings is the transfer of mechanical loads to the core the fittings should be properly attached to the core by a coaxial or hexagonal compression process & should not damage the individual fibers or crack the core. The gap between fitting and sheath shall be sealed by a flexible silicone elastomeric compound or silicone alloy compound sealant. System of attachment of end fitting to the rod shall provide superior sealing performance between housing, i.e. seamless sheath and metal

connection. The sealing must be moisture proof. The dimensions of end fittings of insulators shall be in accordance with the standard dimensions stated in IEC: 60120/ IS: 2486 - Part-II/1989.

7) WORKMANSHIP

All the materials shall be of latest design and conform to the best engineering practices adopted in the high voltage field. Manufacturers shall offer only such insulators as are guaranteed by them to be satisfactory and suitable for continued good service in power transmission lines.

The design, manufacturing process and material control at various stages shall be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish and elimination of sharp edges and corners.

The design of the insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.

The core shall be sound and free of cracks and voids that may adversely affect the insulators.

Weather sheds shall be uniform in quality. They shall be clean, sound, smooth and shall be free from defects and excessive flashing at parting lines.

End fittings shall be free from cracks, seams, shrinks, air holes and rough edges. End fittings should be effectively sealed to prevent moisture ingress; effectiveness of sealing system must be supported by test documents. All surfaces of the metal parts shall be perfectly smooth with out projecting points or irregularities, which may cause corona.

All load bearing surfaces shall be sooth and uniform so as to distribute the loading stresses uniformly.

All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 610 gm/sq.m. or 87 microm thickness and shall be in accordance with the requirement of IS:4759. the zinc used for galvanizing shall be of purity 99.5% as per IS:4699. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. The galvanized metal parts shall be guaranteed to withstand at least four successive dips each lasting for one (1) minute duration under the standard preece test. The galvanizing shall be carried out only after any machining.

8) TESTS AND STANDARDS

Insulators offered shall be manufactured with the same configuration & raw materials as used in the insulators for which design & type test reports are submitted. The manufacturer shall submit a certificate for the same. The design & type test reports submitted shall not be more than five years old.

DESIGN TESTS :

For polymeric insulators it is essential to carry out design test as per clause 4.1 of IEC 61109 / 92-93 with latest amendments. The design tests are intended to verify the suitability of the design, materials and method of manufacture (technology). When a composite insulator is submitted to the design tests, the result shall be considered

valid for the whole class of insulators, which are represented by the one tested and having the following characteristics:

- Same materials for the core, and sheds and same manufacturing method;
- Same material of the fittings, the same design, the same method of attachment;
- Same or greater layer thickness of the shed material over the core (including a sheath where used);
- Same or smaller ratio of the highest system voltage to insulation length;
- Same or smaller ratio of all mechanical loads to the smallest core diameter between fittings
- Same or greater diameter of the core.

The tested composite insulators shall be identified by a drawing giving all the dimensions with the manufacturing tolerances.
Manufacturer should submit test reports for Design Tests as per IEC – 61109 (clause – 5). Additionally following tests shall be carried out or reports for the tests shall be submitted after award of contract:
UV test: the test shall be carried out in line with clause 7.2 of ANSI C29.13.

TYPE TESTS :
The type tests are intended to verify the main characteristics of a composite insulator.

The type tests shall be applied to composite insulators, the class of which has passed thedesign tests.

Following Type test shall be conducted on a suitable number of individual insulator units, components, materials or complete strings:

SI. No	Description of type test	Test procedure / standard
1	Dry lightning impulse withstand voltage test	As per IEC 61109(Clause 6.1)
2	Wet power frequency test	As per IEC 61109(Clause 6.2)
3	Mechanical load-time test	As per IEC 61109(Clause 6.4)
4	Radio interference test	As per IEC 61109(Clause 6.5)
5	Recovery of Hydrophobicity test	Revised Annexure – B This test may be repeated every 3yrs by themanufacturer
6	Chemical composition test for silicon content	Annexure – B Or any other test method acceptable to the Employe

The Manufacturer shall submit type test reports as per IEC 61109. Additional type tests required if any shall be carried out by the manufacturer, after award of contract for which no additional charges shall be payable. In case, the tests have already been carried out, the manufacturer shall submit reports for the same.

ACCEPTANCE TESTS :

The test samples after having withstood the routine test shall be subject to thefollowing acceptance tests in order indicated below:

(a)	Verification of dimensions	: Clause 7.2 IEC: 61109,
(b)	Verification of the locking system (if applicable)	: Clause 7.3 IEC: 61109,
(c)	Verification of tightness of the interface Between end fittings & Insulator housing	: Clause 7.4 IEC: 61109 amendment 1of 1995
(d)	Verification of the specified mechanical load	: Clause 7.4 IEC: 61109, amendment 1of 1995
(e)	Galvanizing test	: IS:2633/IS:6745

ROUTINE TESTS:

Sr.No.	Description	Standard
1	Identification of marking	As per IEC: 61109 Clause 8.1
2	Visual Inspection	As per IEC: 61109 Clause 8.2
3	Mechanical routine test	As per IEC: 61109 Clause 8.3

Every polymeric insulator shall withstand mechanical routine test at ambient temperaturetensile load at RTL corresponding to at least 50 % of the SML for at least 10 sec.

TESTS DURING MANUFACTURE:

Following tests shall also be carried out on all components as applicable

(a) Chemical analysis of zinc used for galvanizing
(b) Chemical analysis, mechanical, metallographic test and magnetic particle inspection for malleable castings.
(c) Chemical analysis, hardness tests and magnetic particle inspection for forgings.

SAMPLE BATCH FOR TYPE TESTING :

The Manufacturer shall offer material for sample selection for type testing only after getting Quality Assurance Plan approved by Employer. The sample for type testing will be manufactured strictly in accordance with the approved Quality Assurance Plan.

9) QUALITY ASSURANCE PLAN :

The Manufacturer shall submit following information:

i) Test certificates of the raw materials and bought out accessories.
ii) Statement giving list of important raw material, their grades along with names of sub-

Manufacturers for raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in presence of Manufacturer's representative.

iii) List of manufacturing facilities available.

iv) Level of automation achieved and lists of areas where manual processing exists.

v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

vi) List of testing equipments available with the Manufacturer for final testing of equipment along with valid calibration reports.

vii) The manufacturer shall submit Manufacturing Quality Assurance Plan (QAP) for approval

& the same shall be followed during manufacture and testing.

The Manufacturer shall submit the routine test certificates of bought out raw materials/accessories and central excise passes for raw material at the time of inspection.

The Employer's representative shall at all times be entitled to have access to the works and all places of manufacture, where insulator, and its component parts shall be manufactured and the representatives shall have full facilities for unrestricted inspection of the Manufacturer's and sub-Manufacturer's works, raw materials, manufacture of the material and for conducting necessary test as detailed herein.

The material for final inspection shall be offered by the Manufacturer only under packed condition. The Employer shall select samples at random from the packed lot for carrying out acceptance tests. The lot offered for inspection shall be homogeneous and shall contain insulators manufactured in 3-4 consecutive weeks.

The Manufacturer shall keep the Employer informed in advance of the time of starting and the progress of manufacture of material in their various stages so that arrangements could be made for inspection.

No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested unless the Employer in writing waives off the inspection. In the later case also the material shall be dispatched only after satisfactory testing specified herein has been completed.

The acceptance of any quantity of material shall in no way relieve the Manufacturer of his responsibility for meeting all the requirements of the specification and shall not prevent subsequent rejection, if such material are later found to be defective

10) TEST CERTIFICATE :

The manufacturer shall furnish detailed type test reports of the offered composite Insulators as per clause 8.2 of the Technical Specifications at the NABL approved laboratories to prove that the composite Insulators offered meet the requirements of the specification. These Type Tests should have been carried out within five years prior to the date of opening of this manufacturer.

The Employer reserves right to demand repetition of some or all the Type Test in presence of Employer's representative. For this purpose, the manufacturer shall quote unit rates for carrying out each Type Test. However, such unit rates will not be considered for evaluation of the offer. In case the unit fails in the Type Tests, the complete supply shall be rejected.

11) TESTING FACILITIES :

The manufacturer must clearly indicate what testing facilities are available in the works of the manufacturer and whether facilities are adequate to carry out all Routine & acceptance Tests. These facilities should be available to Employer's Engineers if deputed or carry out or witness the tests in the manufacturer works. The insulators shall be tested in accordance with the procedure detailed in IEC 61109 / 92-93 with latest amendments.

12) DRAWINGS:

(i) The Manufacturer shall furnish full description and illustration of the material offered.

(ii) The Manufacturer shall furnish the outline drawing (3 copies) of each insulator unit including a cross sectional view of the long rod insulator unit. The drawing shall include but not be limited to the following information: Long rod diameter with manufacturing tolerances Minimum Creepage distance with positive tolerance Protected creep age distance eccentricity of the long rod unit Axial run out radial run out Unit mechanical and electrical characteristics Size and weight of ball and socket Weight of composite long rod units Materials Identification mark Manufacturer's catalogue number

(iii) After placement of award the Manufacturer shall submit fully dimensioned insulator crate drawing for different type of insulators for approval of the Employer.

13) RETEST AND REJECTION:

Sample Procedure for testing of insulators shall be as per clause 7.1 to 7.6 of IEC 61109 for Acceptance & Routine Tests.

For the sampling tests, two samples are used, E1 and E2. The sizes of these samples are indicated in the table below.

Lot Size (N)	Sample Size			
300 < N < 2000	4	E1	3	E2
2000< N < 5000	8		4	
5000< N < 10000	12		6	

If more than 10000 insulators are concerned, they shall be divided into an optimum number of lots comprising between 2000 and 10000 insulators. The results of the tests shall be evaluated separately for each lot.

The insulators shall be selected by the Employer's representative from the lot atrandom.

The samples shall be subjected to the applicable sampling tests.
The sampling tests are:

Verification of dimensions - (E1 + E2)
Verification of the locking system - (E2) Verification of tightness of the interface between - (E2)
end fittings & Insulator housing
Verification of the specified mechanical load SML -
(E1)Galvanizing test - (E2)

The indication shall be performed in the following way.

(i) the surface shall be properly pre-cleaned with the cleaner ;
(ii) the penetrant, which shall act during 20 minutes, shall be applied on the cleaned surface; with in 5 minutes after the application of the penetrant, the insulator shall be subjected, at the ambient temperature, to a tensile load of 70 % of the SML, applied between the metal fittings; the tensile load shall be increased rapidly but smoothly from zero up to 70 % of the SML, and then maintained at this value for 1 minute;
(iii) the surface shall be cleaned with the excess penetrant removed, and dried;
(iv) the developer shall be applied if necessary;
(v) the surface shall be inspected.

Some housing materials may be penetrated by the penetrant. In such cases evidence shall be provided to validate the interpretation of the results.

After the 1 min. test at 70 % of the SML, if any cracks occur, the housing and, if necessary, the metal fittings and the core shall be cut, perpendicularly to the crack in the middle of the widest of the indicated cracks, into two halves. The surface of the two halves shall then be investigated for the depth of the cracks.

Verification of the specified mechanical load SML

The insulators of the sample E1 shall be subjected at ambient temperature to a t ensile load, applied between the couplings. The tensile load shall be increased rapidly but smoothly from zero to approximately 75 % of the SML, and then be gradually increased to the SML ina time between 30 sec. to 90 sec.

If 100 % of the SML is reached in less than 90 s, the load (100 % of the SML) shall be maintained for the remainder of the 90 s. (This test is considered to be equivalent to a 1min withstand test at the SML.)

The insulators have passed the test at 13.4 & 13.5 above if:

No failure (breakage or complete pull out of the core, or fracture of the metal fitting) occurs either during the 1 min. 70 % withstand test (a) or during the 1 min.100 % withstand test (b).

No cracks are indicated after the dye penetration method described in 13.4 above.

The investigation of the halves described in 13.4 above shows clearly that the cracks do not reach the core.

Galvanizing test

This test shall be performed according to IS: 2633/IS: 6745 on galvanized parts.

14) MARKINGS :

Each insulator shall be legibly and indelibly marked with the following details as per IEC-61109:

a) Name or trademark of the manufacturer.
b) Voltage & Type
c) Month and year of manufacturing.
d) Min. failing load/guaranteed mechanical strength in kilo Newton followed by the word 'KN' to facilitate easy identification.
e) BGJY 'Employer Name'. Marking

One 10 mm thick ring or 20 mm thick spot of suitable quality of paint shall be marked on the end fitting of each composite long rod of particular strength for easy identification. The paint shall not have any deteriorating effect on the insulator performance.

Following codes shall be used as identification mark: For 45 KN long rod units : Blue
For 90 KN long rod units : Red

15) PACKING :

All insulators shall be packed in strong corrugated box of min. 7 ply duly paletted or wooden crates. The gross weight of the crates along with the material shall not normally exceed 100 Kg to avoid hackling problem. The crates shall be suitable for outdoor storage under wet climate during rainy season.

The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field.

Suitable cushioning, protective padding, or Dunn age or spacers shall be provided to prevent damage or deformation during transit and handling.

All packing cases shall be marked legibly and correctly so as to ensure safe arrival at their destination and to avoid the possibility of goods being lost or wrongly dispatched on account of faulty packing and faulty or illegible markings. Each wooden case /crate/corrugated box shall have all the markings stenciled on it in indelible ink.

The Manufacturer shall provide instructions regarding handling and storage precautions to be taken at site.

16) GUARANTEE

The Manufacturer of insulators shall guarantee overall satisfactory performance of the insulators. The manufacturer shall furnish in the form attached (Schedule 'A') all the guaranteed technical particulars.

GUARANTED TECHNICAL PARTICULARS FOR 11 KV 7 0 K N DISC INSULATOR

	11 KV Disc	
Type of insulator	Polymeric composite Disc Insulator	
Reference Standard	IEC 61109	
Material of FRP Rod	Boron free ECR	

Material of sheds	Silicon Rubber	
Type of metal end fittings	Ball & Socket	
Nominal Ball Pin Diameter	16 mm	
Material of end fittings	SGCI / MCI	
Material of sealing compound	RTV Silicon	
Colour of sheds	Grey	
Rated voltage	11 KV	
Highest voltage	12 KV	
Dry Power Frequency Withstand voltage	60 KV	
Wet Power Frequency Withstand voltage	35 KV	
Dry Power Frequency Flashover Voltage	75 KV	
Visible Discharge Voltage (PF)	9 KV	
Wet Power Frequency Flashover Voltage	45 KV	
Dry Lightning Impulse withstand voltage	Positive : 75 KV Negative :80 KV	
Dry Lightning Impulse Flashover voltage	Positive : 95 KV Negative : 100 KV	
RIV at 1 MHz when energised at 10 KV / 30 KV (rms) under dry condition	< 50 microvolt	
Creepage distance (min)	320 mm	
Min Failing load	70 KN	
Dia of FRP Rod	16 mm	
Length of FRP Rod (min)	200 mm	
Dia of weather sheds	100 mm	
Thickness of housing	3 mm	
Dry arc distance	170 mm	
Method of fixing sheds to housing	Injection moulding	
No of weather sheds (min)	Three	
Type of sheds	Aerodynamic	
Type of packing	Wooden/Corrugatedbox	
No of insulator in each pack	Thirty	
Guarantee	24 months from commissioning or 30 months from the date of last despatch.	

Signature of the Bidder with Seal

TECHNICAL SPECIFICATION OF CABLE AND CONDUCTORLT XLPE AB CABLE

1. SCOPE:

This specification covers the design, manufacturing, testing, supply, delivery and performance requirements of LV overhead **ISI marked 3Ph 5 Wire XLPE insulated Aerial Bunched Cable (ABC)** indicated in our Schedule of Requirements for use in the LV network of TPNODL.

The materials offered should have been successfully type tested at any NABL Accredited Testing Laboratory within a period of five years on the date of bid opening. Compliance shall be demonstrated by submitting with the bid (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

The Aerial Bunched Cable shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or material, which, in his judgment is not in full accordance therewith.

2. STANDARDS:

Except where modified by this specification, the Aerial Bunched Cable shall be designed, manufactured and tested in accordance with the latest editions of the following standards.

IES/ISO	Indian Standard	Material
	IEC: 1089 IS: 398/1994	Round wire concentric lay Overheadelectrical Stranded Conductors.
	IS: 398(Part-4)/1994	All Aluminum Alloy Conductors, Quality
ISO: 9000		Management Systems.
	IS: 8130/1984	Conductors for insulated Electric cables.
	IS: 10810/1984	Method of Tests for cables.
IEC: 502	IS:7098/1998	XLPE Insulated PVC. Sheathed power cables.
	IS:14255/1995	Aerial Bunched Cables for working voltage up to and including1100 volts.

The Bidder may propose alternative standards, provided it is demonstrated that they give adegree of quality and performance equivalent to or better than the referenced standards. The

purchaser shall adjudge whether to accept or reject any standards.

The Bidder shall furnish a copy of the alternative standard proposed along with his bid. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard.

In case of conflict the order of the precedence shall be (1) IEC or ISO standards, (2) Indian Standards, (3) Other alternative standards. This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Contractor or the necessity of providing the goods complying with other relevant standards or recommendation.

3.0 SERVICE CONDITIONS:

The service conditions shall be as follows:

- Maximum altitude above sea level 500 m
- Maximum ambient air temperature 50^0 C
- Maximum daily average ambient air temperature 35^0 C
- Maximum ambient air temperature 5^0C
- Maximum temperature attainable by an object exposed to sun 60^0 C
- Maximum yearly weighted average ambient temperature 32^0 C
- Maximum relative humidity 100 %
- Average number of thunderstorm days per annum 70
- Average number of rainy days per annum 120
- Average annual rainfall 150 cm
- Wind pressure as per IS:5613(Part-I/Sec.I) 1985

Wind Zones IS:5613 Part-I/Sec-I	Light	Medium	Heavy
Terrain Category	100 Kg/m^2	150 Kg/m^2	200 Kg/m^2

Environmentally, the region where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators.

Therefore, outdoor material shall be designed and protected for use in exposed, heavily polluted salty corrosive and humid coastal atmosphere.

4. SYSTEM CONDITIONS:

The materials shall be suitable for installation in supply systems of the following characteristics.

- Frequency 50Hz
- Nominal System Voltage 400/230V
- Maximum System Voltage LV System 440/250 V
- Minimum LV Voltage 370 V
- Power frequency one minute withstand 2KV(set & dry)
- Neutral Earthing arrangement LV System Solidly earthed

5.0 GENERAL/ TECHNICAL

The design of Aerial Bunched Cable offered shall comprise a compacted, standard, hard drawn H2 / H4 grade aluminum phase conductor as applicable under IS-8130 / 84 with cross linked polyethylene (XLPE) insulation 0.65 to 1.1. KV class, having of **carbon black content 2.5% ± 0.5%.**

The sizes and number of cores required are: **3x50mm² + 1x35mm² +1x16 mm²**

The type of Bunched Cables shall be three phase insulated bundled. All Aluminum Conductors combined with a neutral and catenaries (bare) which shall be of heat treated aluminum magnesium silicon alloy wires containing approximately 0.5% each of magnesium and silicon respectively. The catenaries must have an ultimate tensile stress of not less than that specified in the table of technical requirements.

The Bidder shall specify the standard to which this bundle shall be manufactured.

The conductor bundle offered shall be designed to meet the requirements set out in this specification taking note of safety factors pertaining to conductor or catenary tensioning and TPNODL specification: General Technical Requirements for LV overhead lines.

However, a bid of Aerial Bunched Cables shall not be considered, unless it is accompanied by a list of all special tools and equipments necessary to complete the installation.

6.0 CONDUCTORS:

(a) The phase conductors shall be of multi-stranded aluminum of compacted circular cross section. The aluminum shall comply with IS 8130:1984. The messenger conductor shall be of multi-stranded Aluminum Alloy conforming to IS 398 (Part 4) – 1994. In addition to meeting all requirement of relevant ISS the LT XLPE AB Cables supplied shall satisfy following general requirements.

(b) FOR PHASE CONDUCTORS:

Sl.No.	Specified Cross Section Area (mm2)	No. of strands	Min. Dia of each strand inmm	Min. overall dia. of conducting part	Maxm. D.C Resistance at 20 degree centigrade.(Ohm / Km)	Nominal Insulation thickness (mm)
1	16	7	1.75	5.25	As per ISS/GTPAs per ISS/GTP	1.2
	25	7	2.14	6.42		1.2
	35	7	2.54	7.6		1.2
	50	7	3.05	9.15		1.5
	70	19	2.18	10.9		1.5
	95	19	2.54	12.7		1.5

(c) FOR MESSANGER CONDUCTORS

Sl. No.	Phase conductor size of LT AB Cable in mm2	Specified Cross Section Area (mm2) of the Messenger conductor	No. of strands	Nominaldia. of each strand	Min overall dia.Of conducting part of the compacted conductor(mm)	Maxm. D.C Resistance of the messenger at 20 degree centigrade.(Ohm / Km)	Approx. Mass (Kg/Km) for the messenger
1	16	25	7	2.14	5.2	As per ISS/GTP	65
2	50	35	7	2.54	7.6		95
3	70	50	7	3.05	9.15		136
4	95	70	7	3.6	10.8		191.8

6.0 (b) The bidder must take required precaution to ensure that the average diameter of each strand of conductor shall be ascertained through physical measurement of dimensions of finished cables at ambient temperature during pre-dispatch inspection or / and verification at TPNODL Utility Store by consignee and the value so obtained shall have a tolerance limit with reference to the nominal diameter of each strand of conductor as stated in the tables above.

7.0 TOLERANCES:

The measurement of strand diameter of the finished AB Cable shall not be less 0.03mm for strands up to and including 3.00mm diameter. For strands above that size, measurement of stranddiameter shall not be less than 1% of the nominal strand diameter.

For the purpose of checking compliance with the above requirement, the diameter shall be determined by two measurements at right angles taken at the same cross section. The physical measurement of strands shall be conducted after opening the strands of a finished AB Cable offered for inspection.

8.0 SPLICES IN WIRES:

Splices in Wires shall generally comply with requirements of IEC 1089.

The aluminum alloy rods may be spliced by cold pressure but welding before drawing provided the manufacturer can guarantee that the splice can develop 90% of the tensile strength of the unsliced rod. Wires which break during stranding may be sliced by cold pressure butt-weldingprovided that:

No two splices in the completed conductor occur within 15m of each other and no two splices inany individual wire are less than 150m apart.

The splice shall be done with high skilled workmanship. The finished splice shall be smooth andat no point shall the cross sectional area be less than that of the un sliced wire.

Splicing of the alloy wires on the stranding machine in order to utilize lengths of wires on reelsshall not be permitted.

9.0 STRANDING AND CORE LAY:

The conductor cores shall be stranded and the direction of lay must be as defined in IEC: 1089.

10.0 INSULATION:

The Aerial Bunched Cables shall be insulated for a voltage class of 0.65/1.1 KV and shall becapable of operating permanently at 1.2KV.

The insulation wall thickness shall be determined in accordance with Table-4 (Clause-7.2 andClause 7.3) of IS: 14255/1995.

The insulating material shall be black and suitable to resist ultra violet radiation, salt laden sprays, chemical pollution, ageing effects, abrasion and mechanical shocks and mechanical and electrical stress at temperature up to 90˚C in normal operation and 250^0C under short circuit conditions per IEC: 502/1994.

The carbon black content in the XLPE insulation shall be **2.5% ± 0.5%**

11.0 PHASE IDENTIFICATION:

The individual insulated conductors within a bundle shall be identified by means of longitudinal projections.

The three phase conductors shall be marked by one, two or three longitudinal projections,indicating the R,Y,B phases respectively.

The projections shall have the following dimensions.

- The distance between the tips of two adjacent projections, where there is more than one,shall be between 1.0 and 1.5m.

- The width of the projection at the base shall be 1.0mm; and
- The height of the projections shall be 0.5mm.

12.0 INSULATION MARKINGS:

Each individual conductor comprising a bundle shall have the range of non-erasable distinct markings listed below legibly printed on the insulation surface at one meter intervals. The embossing should be very clear & easily visible to naked eye.

- ISI Mark, IS 14255-95, Manufacturer's B.I.S License No. legibly embossed on the insulation.
  - Name of the Purchaser.: TPNODL
  - P.O No. & Date

- Scheme : **BGJY**
  - Manufacturer's trademark identification for example "UCXLPE50"
  - Year of manufacture:
  - Designation of conductor type
  - Size: for example "3x50"
  - Shape of conductor.
  - Rated voltage class: 0.65/1.1KV
  - Back up conductor identification: conductors with one, two and three projections shall bemarked R, Y and B respectively. The conductor with no projection shall be marked N and
  - The height of the printed lettering shall be not less than 20% of the overall diameter ofthe conductor

13.0 TWIST:

The direction of lay of the conductors comprising the bundle shall be left-handed and the lay ration shall comply with IEC: 1089.

With a bare catenaries configuration the insulated phase cables together shall be twisted round the neutral catenaries to form the ABC. This cable bundle is then strung directly onto the distribution poles supported by the catenaries with standard approved hardware.

14.0 CABLE DRUM LENGTH:

The cable shall be supplied in 500m or 1000 m Drum Lengths as the case may be for different sizes of LT XLPE AB Cable.

15.0 TESTS:

15.1 General

Where not specified, all tests and test results shall conform to the requirements of IEC 502/1994or IS 7098 (Part-I) 1998, IS 10810/1984, IS: 398(Part-IV) and IS: 14255/1955.

Unless expressly stated otherwise, the ambient temperature for routine tests as well as voltagetests shall be 20 ± 15^0C and for all other tests be 20 ± 15^0C.

The frequency of the alternating test voltage shall be 49 Hz to 51Hz. The voltage wave form should be sinusoidal.

15.2 Type Tests

The test sample shall be 10m to 15m in length. All cores of the bundles shall be tested.

- □ Insulation resistance at ambient temperature.
- □ Insulation resistance at operating temperature.
- □ AC voltage test.

The insulation resistance test at ambient temperature shall be carried out in a water bath at ambient temperature.

The insulation resistance test at a operating temperature shall be conducted in a water bath at 90^0C.

The longitudinal projections used for phase identification shall be ignored. The results of this test shall be used to calculate the volume receptivity and the results conform to the requirements of IEC: 502/1994 or IS 10810 (Part-43).

The AC voltage test shall be carried out by applying 1.95KV ($3U_0$) for four hours to the sample, which shall be submerged in a water bath at ambient temperature, having been steeped for a period not less than one hour. The test shall only be deemed to have been passed if no breakdown occurs.

Furthermore, the following non-electrical type tests shall also be carried out:

- Insulation wall thickness: the longitudinal projections used for phase 1 identifications shall beignored as per IS 10810 (Part-6);
- Ageing test, consisting of an evaluation of the retention of the mechanical properties of theinsulation after ageing.
- Wrapping test: as per IS 10810 (Part-3);
- Tests for bleeding and blooming of pigment as per IS 10810 (Part-9)Thermal expansion of insulation.
- Measurement of carbon black content as per IS 10810 (Part-32).
- Water absorption by the XLPE insulation, shrinking of the XLPE insulation.
- Tensile test: adhesion between conductor and insulation.

The adhesion test requires a tensile testing machine. A sample of at least 300mm length shall be selected and straightened out. The insulation shall be removed for a length of 150mm. The insulated end shall be held in the upper grip head and the bare conductor on the lower grip head. Tension shall be applied at a speed of 500mm/ min until the conductor first begins to slide within the insulation. The test shall have been passed if the conductor and insulation combination can stand $75N/mm^2$ without slippage occurring.

The neutral conductor/catenaries shall be type tested in accordance with the requirements of IS398 (Part-IV) 1994.

15.3 Routine Tests

The following measurement or tests shall be carried out on all drums and coils of Bunched cable:Conductor resistance

- Voltage test.

The conductor to be tested for conductor resistance shall be stored for at least 12 hours in a room at particular constant temperature. If it cannot be established that the conductors have reached the room temperature, the test should be postponed for a period of further 12 hours. Alternatively, the test can be carried out on short sample after remaining one hour in a

temperature controlled water bath. The test shall be carried out and the conversion factors used to convert the resistance value to a base of 200^0C and one Km. The DC resistance of each conductor shall not exceed the appropriate maximum values specified in IEC:228/IS:6474.

The voltage test shall be conducted by applying to each core 3.5KV AC (2.5 U_0 plus 2 KV) or 8.4 KV DC for 5 minutes with the specimen lying in a water bath at ambient temperature. Theconductor shall pass the test if no electrical breakdown occurs.

15.4 Acceptance Tests

The following sample check, measurements and test shall be carried out in addition to theAcceptance Tests as per IS 14255 – 1955, IS : 398 (Part – IV) 1994, IS 8130 / 1984

- Measurement of insulation wall thickness;
- Measurement of diameter of each strand, overall outside dia & Cross Sectional Area ofthe conducting Part out of the finished product during pre-dispatch inspection.
- Thermal expansion test;
- Check of physical characteristics
- Tensile strength of individual wires of conductor.
- High Voltage Test on drums immersed in water(apply voltage 3.5 KV AC for 5 min)

These tests should be carried out on one length form each production batch of the same sample.

The thickness of the insulation wall shall be measured on a piece removed from each end of the sample length. If either means or minimum values are not met, two further samples shall be removed at 0.5m form the end corresponding to the failed specimen. If these samples do not satisfy the mean and minimum thickness requirements, the test shall be deemed to have been failed.

The longitudinal projections used for phase identifications shall be ignored.The thermal expansion test need only be carried out on one core.

In relation to the tensile test, the tensile strength of the aluminum wires before stranding and thatof the finished conductor shall comply with IEC: 1089.

15.5 Test on the Catenary (messenger) Conductor

Breaking load, elongation and resistance tests shall be completed on the aluminum alloy catenaries conductor in accordance with the requirements of IS:398 (Part-IV)/1994 or IEC:1089.

15.6 Bending Test on a complete cable

This test shall be performed on a sample of completed cable. The sample shall be bent around atest mandrel at room temperature for at least on turn. It shall then be unwound and the processshall be repeated after turning the cable sample around its axis by 180^0. This process shall berepeated twice more. There shall be no signs of breaking or cracking of the cable insulation during this test.

The diameter of the mandrel shall be:

$$10\ (D+d)$$

Where D = Actual diameter of the cable (mm)d = Actual diameter of the conductor (mm)

15.7 Rejection and Retests

Should any one of the test pieces first selected fail to pass the tests, two further samples from the same batch shall be selected for testing, one of which shall be from the length from which the original test sample was taken unless the length has been withdrawn by the supplier.

Should the test pieces from both of these additional samples satisfy the requirements of the tests, the batch represented by these samples shall be deemed to comply with the standard. Should the test pieces from either of the two additional samples fail, the batch represented shall be deemed to have failed.

16.0 COMPLIANCE WITH SPECIFICATION:

The Aerial Bunched Cable shall comply in all respects with the requirements of this specification. However, any minor departure from the provisions of the specification shall be disclosed at the time of bidding in the Non-compliance Schedule of this document.

17.0 COMPLIANCE WITH REGULATIONS:

All the cables shall comply in all respects with the Indian Regulations and Acts in force. The cables and connections shall be designed and arranged to minimize the risk of fire and any damage, which might be caused in the event of fire.

18.0 NON-CONFORMING PRODUCT:

The Purchaser reserves the right for decisions regarding acceptance, modification or rejection of non-conforming items.

19.0 INSPECTION AND TESTING:

The Purchaser or his authorized representative has free entry at all times, while work on the contract is being performed, to all parts of the manufacturer's works which concerns the processing of the cables ordered. The manufacturer shall afford the purchaser or his authorized representatives without charge, all reasonable facilities to ensure that the cable being furnished is in accordance with these specifications.

The cables shall successfully pass all the routine tests & acceptance Tests referred to in the section on tests and those listed in the most recent edition of the standards given in the specification.

The Purchaser reserves the right to reject any of the cables if the test results do not comply with the values specified or with the date given in the Technical data schedule.

Type Test Certificates for the tests conducted earlier shall be submitted with the bid for evaluation. The requirements of additional type tests will be at the discretion of the Purchaser

The Purchaser shall witness routine tests .In order to facilitate this, the contractor shall give the purchaser of 15days notice that the material is ready for inspection & testing. The supplier shall extend all assistance to the representative of the Purchaser during his inspection & testing of samples at his works. The materials shall be dispatched only

after approval of such Test Reports and issue of Dispatch clearance by the Purchaser. **However the Purchaser reserves the right to retest the materials after delivery at any NABL Accredited Testing Laboratory in case of any disputes regarding size & quality of supplied materials at a later date during guarantee period. The cost of such retesting shall be borne by the supplier.**

All costs in connection with the testing, including any necessary retesting shall be borne by the Contractor, who shall provide the Purchaser with all the test shall have the right to select the samples for test and shall also have the right to ensure that the testing apparatus is correct. Measuring apparatus for routine tests shall be calibrated at the expense of the contractor at an approved laboratory and shall be approved by the purchaser before testing.

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

Any cost incurred by the Purchaser in connection with inspection or retesting as a result of failure of the equipment under test or damaged during transport or off loading shall be to the account of the Contractor.

The Third Party Independent Evaluation Agency (TPIEA) if required may be engaged by TPNODL who shall have right to conduct pre & post despatch inspection jointly with TPNODL / independentlyof the equipment / materials procured by the Purchaser.

The Contractor shall submit to the Purchaser three signed copies of the test Certificates, giving the results of the tests as required. No materials shall be dispatched until the Purchaser has received the test certificate and the contractor has been informed that they are acceptable.

The test certificate must show the actual values obtained from the tests, in the units used in this specification, and most merely confirm that the requirements have been met.

In the case of components for which specific type tests or routine tests are not given in this specification, the Contractor shall include a list of the tests normally required for these components. All materials used in the Contract shall withstand and shall be certified to have satisfactorily passed such tests.

No inspection or lack of inspection or passing by the Purchaser's representative of equipment or materials whether supplied by the Contractor or sub- Contractor, shall relieve the contractor from his liability to complete the contract works in accordance with contract or exonerate him from any of his guarantees.

20.0 GUARANTEE:

The contractor shall guarantee the following:

Quality and strength of materials used.

- Satisfactory operation during the guarantee period of **24 months** from the date of commissioning. Performance figures as supplied by the bidder in the technical data sheet.

21.0 PACKING AND SHIPPING:

The cable shall be wound on strong drums or reels capable of withstanding all normal transportation and handing.

Each length of cable shall be durably sealed before shipment to prevent ingress of moisture. The drums reels or coils shall be lagged or covered with suitable material to provide physical protection for the cable during transit or during storage and handling operations.

In the case of steel drums adequate precautions shall be taken to prevent damage being caused by direct contact between the cable sheath and the steel. These precautions hall be subject to the approval of the Purchaser.
If wooden drums are used then the wood shall be treated to prevent deterioration from attack bytermites and fungi.
Each drum or reel shall carry or be marked with following information:

- Individual serial number
- Standard ISI Mark, 14255-95, Manufacturer"s B.I.S License No.
- Name of the Purchaser : TPNODL
- Destination
- Purchase Order No. &
- DateManufacturer's name
- Year of
- manufactureCable
- size and type
- Length of conductor (meters)
- Net and Gross mass of conductor
- (Kg)Scheme : BGJY
- All necessary slinging and stacking instructions
- Destination
- Country of origin

The direction of rolling as indicated by an arrow shall be marked on a flange.

22.0 STORAGE:

The site selected for the storage of cable drums shall be well drained and preferably have a concrete/ firm surface which will prevent the drums sinking into the ground or being subjected to excess water thus causing flange rot.
All drums shall stand on battens, in the upright position and in such a manner to allow sufficient space between them for adequate air circulation. During storage the drums shall be rotated 90^0 every three months. In no instances shall be the drums be stored "flat" on their flanges or one on
top of each other.

23.0 SHIPPING:

The Contractor shall be responsible for the shipping of all cables, drums and reels supplied from abroad to the ports of entry and for the transport of all goods to various specified destinations including customs clearance, off loading, warehousing and insurance.
The Contractor shall inform himself fully as to all relevant transport facilities and requirements and loading gauges and ensure that the equipment as packed for transport shall conform to these limitations. The contractor shall also be responsible for verifying the access facilities specified.
The contractor shall be responsible for transportation of all the loads associated with the contract and shall take all reasonable steps to prevent damage of any highway or bridges by his vehicles by selecting routes, choosing proper vehicles for use and restricting and distributing loads to avoid the
risk of damage. The Contractor shall immediately report to the Purchaser any claims made against the contractor arising out of alleged damage to a highway or bridge.

All items of equipments shall be securely clamped against movement to ensure safe transit from the manufacturer's facilities to the specified destinations.

24.0 HAZARDOUS SUBSTANCES:

The Contractor shall submit safety data sheets for all hazardous substance used with the equipment. The contractor shall give an assurance that there are no other substances classified as hazardous in the equipment supplied. He shall also take responsibility for the disposal of such hazardous substances that may be found for any injuries resulting from those substances.

25.0 SUBMITTALS:

The following shall be required in duplicate along with the bid:

Completed technical data sheets;

- Descriptive literature giving full technical details of equipment offered.
- Outline dimension drawing for each type of conductor, for each bundle showing theconductor strand, composition and the bundle twist;
- Type test certificates, where available, and sample routine test reports;
- Detailed reference list of customers already using equipment offered during the last fiveyears with particular emphasis on units of similar design and rating;
- Performance reports from the customers for the supplied LT XLPE AB Cables.
- Details of manufacturer's quality assurance standards and programme and ISO 9000series or equivalent national certificates;
- Deviations from this specification to be submitted as per Non-Compliance. Only deviations approved in writing before award of contract shall be accepted;
- List of recommended spare parts for five years of operation with prices and spare parts catalogue with price list for future requirements.
- Any other documents to establish qualifying & credibility requirements as specified inthis Tender Document.

26.0 PERMANENT EMBOSSING:

All materials supplied under this tender shall bear distinct mark of 'BGJY Scheme, and Purchase Order No. & Date , Size of cable , length marking , voltage grade, Manufacturer, Trade mark , ISI mark , Phase marking, by way of embossing /enamel painting etc. including other information mentioned in GTP. This should be clearly visible to naked eye.

GUARANTEED TECHNICAL PARTICULARS FOR 3X50+1X35+1X16 MM² LT XLPE AB CABLE.

Sl No	Description	Specified	Bidder's Offer
1	Ref. ISS / IEC followed	IS 14255/95, IS 398 Part IV	
2	Phase Conductor material / Insulation type	H2 / H4 E.C grade aluminium as per IS 8130/84 / XLPE insulation (IS	
3	Material of Neutral Catenary	Aluminum alloy as per IS 398 Pt - IV	
4	Voltage Class	0.65/1.1 KV	
	No. of Strands of Phase Conductor	7	
5	No. of strands/ Average /Minimum Strand Dia. In mm. (Finished Phase conductor.)	7/3.05	

6	Approximate Overall Dia. Of compacted phase conductor after removal of insulation.(in mm.)	9.15	
7	No. Of Strands / Average Strand Dia. In mm.(Neutral Catenary.)	7/2.54	
8	Minimum Overall Dia. of compacted Bare Neutral Caternary .(in mm.)	7.62	
9	No. of Strands / Average strand dia. / Overall dia./Nominal cross sectional area of conducting part In No / mm/mm2. St. Light Conductor)	7 /1.75/5.25 / 16mm2	
10	Minimum average thickness of insulation of phase Cond. (mm)	1.5	
11	Minimum thickness of insulation of Phase Cond. At any point (mm)	1.25	
12	Minimum thickness of insulation at any point in street light conductor (mm)	0.98	
13	Maximum DC resistance of Phase conductor at 20 ^{o}C ohmn/ KM	0.64	
14	Maximum DC resistance of street light conductor	1.91	
15	Maximum DC resistance of neutral cond. Ω / Km	0.986	
16	Ultimate tensile strength of neutral conductor	9.8	
17	Maximum temperature (Continuous)	90°C for phase and 75 °C for neutral	
18	Embossing on insulation at each one meter interval	Distinct Non-erasable ISI Mark, IS 14255-95, Manufacturer"s B.I.S License No., Name of the Purchaser, Name of the manufacturer, Size of cable, voltage Grade along with sequential marking of length..	
19	Cable drum length	500 / 1000m	
20	Volume Resistivity of insulation at 27°C	1X10^{13}Ω - cm min.	
21	Volume Resistivity of insulation at 70°C	1X10^{11}Ω - cm min.	

N.B:

1) In case of discrepancies between values of ISS & GTP, better will prevail.

2) Average diameters of strands of each cable shall be ascertained by physical measurement after opening the strands of each phase of a finished AB Cable offered for inspection.

Signature of the bidder with Seal

Suspension ClampDead End Clamp
Pole Clamp with Eye Hook

1.0 Scope

This specification covers the design, manufacture, assembly, testing and supply ofSuspension Clamp, Dead end Clamp & Eye hook for making connections to Aerial Bunched Cables rated 1100 volts and insulated with cross-linked polyethylene.

2.0 Standard

The design, performance and test requirements shall confirm to this specification andthe following standards. However in case of any conflict, the requirements of this specification shall prevail.

1) REC Specification 32/1984
2) REC Specification 84/2010 (dead end & Suspension clamp)

The devices shall also be compatible with the cables of sizes & dimensions as definedin the cable Specifications for the cables with which they are intended to be used.

3.0 Type Test

For all accessories, the Type Test Report should be submitted from an Independent NABLAccredited Laboratory like CPRI

The Test report shall include the Model Number, Applicable size Range, and GA Drawingshowing the principal parts and dimensions of the connector.

4.0 Acceptance Test

The Acceptance Tests & sampling plan to be conducted as per REC Spec. 83/ 2010 and asper relevant IS Specifications.

4.4 **Drawings & Samples:**

GA drawing and other particulars along with samples are to be submitted along with offer.

ANCHOR (DEAD END) & SUSPENSION CLAMPS

Scope

This specification covers the design, manufacture, assembly, testing and supply of Accessories for anchoring & suspending Aerial Bunched Cables rated 1100 volts and insulated with cross-linked polyethylene and aluminum alloy bare messenger.

	Description	Application
a)	Dead end Clamp (as per REC Construction standard E-35)	For fitting onto a pole for anchoring the end of a length of ABC, or for a major change in direction.
b)	Suspension Clamp (Bolted Type asper REC Construction standard E-34)	For supporting a length of ABC at an intermediate pole in a length, with small angle of deviation.

Cable Data

The standard sizes and characteristics of the phase and street lighting conductors, messengerwires shall be as specified in REC specification 32/1984 or IS: 14255-1995. The strength of the messenger shall be not less than the Value shown in Table 1.

Table-1

Conductor Size *(mm^2.)*	Messenger Rating (as per IS 14255)
35	9.8 KN
70	17.5 KN

Marking / Embossing

Anchoring Clamp, Suspension clamp should bear

- Manufacturers trade mark and logo
- Name of Purchaser, P.O. No. & Date.
- Product Code or Reference
- Traceability Code/Batch Number

Type Test

For Dead End & Suspension clamps, the Type Test Report s should be submitted from anIndependent NABL Accredited Laboratory / CPRI as per REC Spec-84/2010.

Acceptance Tests

The Acceptance Tests & sampling plan to be conducted as per REC Spec. 84/ 2010. & as perrelevant IS Specifications..

Drawings & Samples:

GA drawing and other particulars along with samples are to be submitted along with offer.

EYE HOOKS

a) Eye hooks shall be as per REC construction standard E-35 (Type – A)
b) It should be made of forged hot dip galvanized steel as per IS-1570
c) The clamp corrosion resistance should conform to standards IS 2629 & IS 2633.
d) Minimum breaking Load should be 20 KN.

Type Test

For Eye hooks, the Type Test Report s should be submitted from an Independent NABLAccredited Laboratory / CPRI as REC Spec-32/1984 & 84/2010 and as per relevant IS Specifications.

Acceptance Tests

The Acceptance Tests & sampling plan to be conducted as per REC Spec. 32/ 1984. &84/2010 and as per relevant IS Specifications.

6.2 Drawings & Samples:

GA drawing and other particulars along with samples are to be submitted along with offer.

GUARANTEED TECHNICAL PARTICULARS FOR SUSPENSION CLAMP FOR BARE MESSENGERWIRE

Sl. No	Description	Guaranteed particulars to be submitted bythe Vendors along with offer
1	Name and address of the manufacturer	
2	Applicable standard	
3	Type of clamp	
4	Type of design	
5	Voltage Grade(kV)	
6	Loop anchor attachment(open/close)	
7	Installation (with/without dis-assembly)	
8	Type & grade (metallic/non-metallicmaterial)	
9	Type of hot dip galvanizing & thicknessof Zinc coating	
10	Marking	
11	Colour of non-metallic parts	
12	Dimensions	
13	Approximate weight	
14	Minimum Breaking Load (KN)	
15	Maximum allowable load(KN)	
16	Max. angle of deviation of conductor(degrees)	
17	Method of casting	
18	Are GA drawing & samples enclosed	

Signature of the bidder with Seal

GUARANTEED TECHNICAL PARTICULARS FOR DEAD END CLAMP FOR BARE MESSENGER WIRE
(To be submitted along with offer)

Sl..	Description	Guaranteed particulars to be submitted by the Vendors
1	Name and address of the manufacturer	
2	Applicable standard	
3	Type of clamp	
4	Type of design	
5	Voltage Grade(kV)	
6	Loop anchor attachment(open/close)	
7	Installation (with/without dis-assembly)	
8	Type & grade (metallic/non-metallicmaterial)	
9	Type of hot dip galvanizing & thicknessof Zinc coating	
10	Marking	
11	Colour of non-metallic parts	
12	Dimensions	
13	Approximate weight	
14	Ultimate tensile strength(KN)	
15	Maximum allowable load(KN)	
16	Slip Strength (KN)	
17	Method of casting	
18	Operating temperature (deg.cent) a) Continuous Operation b) Short circuit condition Are GA drawing & samples enclosed	

Signature of the bidder with Seal

Guaranteed Technical Particulars of Eye Hook		
Sl. No.	Description	Guaranteed Technical Particulars submitted by Vendors
1	Name and Address of the Manufacturer	
2	Type of Hooks	
3	Maximum weight span for 4x95's Maximum weight span for 4x50's	
4	Horizontal pull out load	
5	Types of Facades for which it is suitable	
6	Stand off from Facade	
7	Method of fixing to Façade	
8	Installation(with/without disassembly)	
9	Type and grade of Metallic Material	
10	Type of Hot Dip Galvanizing Thickness of ZincCoating	
11	Markings:- As specified in IEC - 947	
12	Dimensions	
13	Net Weight	
14	Ultimate tensile strength	
15	Acceptance tests	

Signature of the bidder with Seal

Barbed Wire

TECHNICAL SPECIFICATION FOR G.I. BARBED WIRE

STANDARDS:

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the G.I.Barbed wire shall conform to the latest revisions available at the time of placement of order of all the relevant standards but not limited to as listed below.

IS:280:1978 Mild steel wire for general engineering purposes (*third revision*)

IS:1340:1977 Code of practice for chromate conversion coating of zinc and cadmiumcoated articles and zinc base alloys (*first revision*)

IS:1521:1972 Method for tensile testing of steel wire (*first revision*)
IS:1755:1983 Method for wrapping test for metallic wire (*first revision*)

IS:2633:1986 Method for testing uniformity of coating of zinc coated articles(*second revision*)
IS:4826:1979 Hot dipped galvanized coating on round steel wires (*first revision*)
IS:12753:1989 Electro galvanized coatings on round steel wire – Specificationr

3. GENERAL TECHNICAL REQUIREMENTS:

GI Barbed wire shall be 2 PLY with a 2.5mm diameter. The barbs shall have a 2mm diameter and be 12.5mm in length. The barbs shall have four points and shall be formed by twisting two point wires, each two turns, tightly around both line wires making altogether four complete turns.

Barbed wire shall be of type IOWA with size and dimensions as under:-Line wire-2.5 mm
Point wire - 2.0 mm

Distance between two bars shall be 75 mm (+ 12 mm).

SPECIFIC TECHNICAL PARTICULARS FOR 2.5 MM X 2.0 MM G.I.BARBED WIRE

Sl.No.	Particulars	Particulars Specified	Bidders Offer
1	Size of wire- mm	Line wire- 2.5 mm + 0.08 mm Point wire- 2.0 mm + 0.08 mm	
2	Type of Barbed Wire	Iowa Type	
3	Tensile strength of line wire	390 to 590 N/mm²	
4	Minimum breaking load of completed Barbed wire	3.7 KN	
5	Mass of complete Barbed wire (minimum)	115 gms / Mtr.	
6	Distance between twoBarbs	(75 + 12) mm	
7	No. of lays between the Barbs (minimum)	4	
8	Method of Galvanising	Hot dipped according to IS:4826 /1979 with medium coating.	
9	Mass of coating (minimum)	Line wire- 110 gms/Mtr² Point wire- 105 gms / Mtr² (testing after barbing)	

10	No. of dips the wire is able to withstand withoutcopper coating	(testing after barbing)	
	A) For Line Wire	2 dip in Min	
	B) For Point Wire	2 dip in Min	

Signature of the bidder with Seal

SUB-STATION FENCING WITH BARBED WIRE:

For Sub-Station fencing with Barbed wire refer attached Drawing

MATERIALS HANDLING AND INSURANCE

The contractor shall deliver all equipment/materials against this contract to his site stores under cover of Transit Insurance to be taken in his name. Cost of such insurance is to be borne by the contractor.

Cost of transportation of all materials from contractor"s store to the site of work as well as department supply items like Conductors, AB cables, Power cables, etc shall be borne by the contractor irrespective of mode of transportation and site condition.The contractor has to bear the cost of premiums on insurance for all materials, tower accessories and total erection cost of the line including cement, rods for foundation.

It will be the responsibility of the contractor to report to the concerned Police Station about all incidents of thefts and lodge, pursue and settle all claims with Insurance Company in case of damage/loss due to theft, pilferage, flood and fire etc. and the employer of the work shall be kept informed promptly in writing about all such incidents. The loss, if any, on this account shall be recoverable from the contractor if the claims are not lodged and properly pursued in time or if the claims are not settled by the insurance company due to lapses on the part of the contractor. The contractor shall have to replenish promptly damaged, stolen tower members and accessories conductors, earth wire, hardware"s etc. and repair/re-erect the damaged lines, free of cost to the employer so as to maintain the programme of work. The employer will not be responsible in any way for such loss of materials.

TECHNICAL SPECIFICATION OF 55 /100 MM² ALL ALUMINIUM ALLOY CONDUCTOR (AAAC)

1. SCOPE

This specification covers design, Engineering, Manufacture, Testing, Inspection before dispatch, forwarding, packing, transportation to sites, Insurance (both during transit & storage), storage, erection, supervision testing & commissioning of all sizes of All Aluminum Alloy Conductors of the aluminum – magnesium- silicon type for use in the distribution overhead power lines of TPNODL of Odisha.

The equipment offered shall have been successfully type testes and the design shall have been satisfactory operation for a period not less than five years on the date of bid opening. Compliance shall be demonstrated by submitting with the bid, (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

The scope of supply includes the provision of type test, Rates of type tests shall be given in the appropriate price schedule of the bidding document and will be considered for evaluation. The Purchaser reserves the right to waive type tests as indicated in the section on Quality Assurance, Inspection and Testing in the specification.

The Aluminum Alloy Conductor shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or materials, which, in his judgment, is not in full accordance therewith.

STANDARDS

Except where modified by the specification, the Aluminum Alloy Conductor shall be designed,manufactured and tested in accordance with latest editions of the following standards.

IEC/ISO/ Other International Standard	IS	Subject
IEC :1089		Round wire concentric lay overhead electrical standard conductors
	IS 398	Aluminum Alloy Stranded Conductors
	IS 9997	Aluminum Alloy redraw rods for electrical purposes
IEC 502 : 1994		Extruded solid dielectric insulated power cables for rated voltages 1.0 KV up to 30 KV
IEC 104		Aluminum Magnesium Silicon alloy wire for overhead
	IS 1778	line conductors Reels and drums of bare conductor.
BS : 6485-1971		PVC covered conductors for overhead power lines.

This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the contractor of the necessity of providing the goods complying with other relevant standards or recommendations.

3. GENERAL

The wires shall be of heat treated aluminum, magnesium silicon alloy containing approximately silcon-0.5 to 0.9 %. magnesium-0.6 % to 0.9%,Fe-0.5% (maximum) , Copper- 0.1% (max), mn- 0.03% , Cr-0.03%, Zn-0.1%, B-0.06%, and having the mechanical and electrical properties specified in the table and be smooth and free from all imperfections, such as, spills, splits and scratches.

Neutral grease shall be applied between the layers of wires. The drop point temperature of thegrease shall not be less than 120^0 C.

Mechanical and Electrical Characteristics of Aluminium Alloy Wires used in theConstruction of Stranded Aluminium Alloy Conductors

Nominal Diameter	Minimum Diameter	Max. Diameter	Cross Sectional Area	Mass	Minimum Breaking Load		Maximum Resistance at 20^0C
					Before stranding	After stranding	
1	2	3	4	5	6	7	8
mm	mm	mm	mm^2	Kg/km	KN	KN	ohms/ km
3.15	3.12	3.18	7.793	21.04	2.37	2.29	4.290
3.81	3.77	3.85	11.40	30.78	3.52	3.34	2.938
4.26	4.22	4.30	14.25	38.48	4.40	4.18	2.345

Maximum resistance values given in column 8 have been calculated from the maximum values of theresistively as specified and the cross sectional area based on the minimum diameter.

The minimum breaking load is calculated on nominal diameter at ultimate tensile strength of 0.309 KN / mm^2 for wire before stranding and 95% of the ultimate tensile strength after stranding.

4. PHYSICAL CONSTANTS FOR ALUMINIUM ALLOY WIRES

Resistively:

For the purpose of this specification, the standard value of resistively of aluminum alloy wire which shall be used for calculation is to be taken as 0.0325 ohm mm^2 /m at 20^0 C. the maximum value of resistively of any single wire shall not , however, exceed 0.0328 ohm. mm^2/m at 20^0 C.

Density :

At a temperature of 20^0 C, the density of aluminum alloy wire is to be taken as 2700 kg/m^3.

Temperature Coefficient of Linear Expansion :

The temperature coefficient of linear expansion of aluminum alloy wire is to be taken as $23x10^{-6}0_C$

Constant – Mass Temperature Coefficient

At a Temperature of 20^0 C, the constant – mass temperature coefficient of resistance of aluminum alloy wires, measured between two potential points rigidly fixed to the wire, is taken as 0.00360/^{0} C

5. STANDARD SIZES

Nominal Sizes of Wires

The aluminum alloy wires for standard constructions covered by this specification shall have the diameters as specified in the table and a tolerance of ±1% shall be permitted on the nominal diameter.

Standard Conductors

The sizes, resistance and masses (excluding the mass of grease) of stranded aluminum alloy conductors shall be as given in table.

Mechanical and Electrical Characteristics of Aluminum Alloy StrandedConductors

Sl.No.	ActualArea	Strandingand WireDia	Approx. Overall Dia	Approx. Mass	Calculated Maximum Resistanceat 20^0 C	Approx Calculated Breaking Load
1	2	3	4	5	6	7
	mm^2	mm	mm	kg/km	ohms/km	KN
1	55	7/3.15	9.45	149.20	0.621	16.044

2	80	7/3.81	11.43	218.26	0.425	23.41
3	100	7/4.26	12.78	272.86	0.339	29.344
4	232	19/3.94	19.70	636.67	0.1471	68.05

Increase in Length due to Stranding

When straightened out, each wire in any particular layer of a stranded conductor, except the central wire, is longer than the stranded conductor by an amount depending on the lay ratio of that layer.

Resistance and Mass of Conductor

The resistance of any length of stranded conductor is the resistance of the same length of any one wire multiplied by a constant as set out in the table below.

The mass of each wire in any particular layer of the stranded conductor, except the central wire, will be greater than that of an equal length of straight wire by an amount depending on the lay ratio of that layer. The total mass of any length of an aluminum stranded conductor is, therefore, obtained by multiplying the mass of an equal length of straight wire by an appropriate constant as mentioned below. In calculating the stranding constants as mentioned in the table below, the mean lay ratio, that is the arithmetic mean of the relevant minimum and maximum values in table for lay ratio has been assumed for each layer.

Calculated Breaking Load of Conductor

For a conductor containing not more than 37 wires, 95% of the sum of strength of the individual wires calculated from the values of the minimum breaking load given in this specification.

For a conductor containing more than 37 wires, 90% of the sum of the strengths of the individual wire calculated from the values of the minimum breaking load given in this specification.

Calculated Area and Maximum Resistance of Conductor

The actual area of a stranded conductor has been taken as the sum of the cross- sectional areas of the individual wires of nominal diameter.

Maximum resistance values of stranded conductor have been calculated on the basis of maximum resistivity and the cross-sectional area based on the minimum diameter of wires.

Stranding Constants

Number of Wires in Conductor	**Stranding Constants**	
	Mass	Electrical Resistance
(1)	(2)	(3)
7	7.091	0.1447
19	19.34	0.05357

6. JOINTS IN WIRES

Conductor containing seven wires

There shall be no joint in any wire of a stranded conductor containing seven wires, except those made in the base rod or wire before final drawing.

Conductors containing more than seven wires

In stranded conductors containing more than seven wires, joints in individual wires are permitted in any layer except the outermost layer (in addit ion to those made in the base rod or wire before final drawing) but no two such joints shall be less than 15 m apart in the complete stranded conductor. Such joints shall be made by cold pressure butt welding. They are not required to fulfill the mechanical requirements for unjointed wires.

6.2 Conductors containing more than seven wires

In stranded conductors containing more than seven wires, joints in individual wires are permitted in any layer except the outermost layer (in addition to those made in the base rod or wire before final drawing) but no two such joints shall be less than 15 m apart in the complete stranded conductor. Such joints shall be made by cold pressure butt welding. They are not required to fulfill the mechanical requirements for un-jointed wires.

7. STRANDING

The wire used in the construction of a stranded conductor shall, before and after stranding, satisfyall the relevant requirements of this standard.

The lay ratio of the different layers shall be within the limits given in the table for lay ratio.

In all constructions, the successive layers shall have opposite directions of lay, the outermost layer being righ-handed. The wires in each layer shall be evenly and closely stranded.

Unless otherwise agreed between the Employer and the Contractor, stranded aluminum alloy conductors shall be supplied in the manufacturer's usual production lengths to be indicated in the bid Schedule. The Employer reserves the right to specify particular lengths of conductor such that certain drum lengths will be shorter than others. There will in both cases be a permitted variation of –0 + 5% in the length of any one conductor length.

8. LENGTHS AND VARIATIONS IN LENGTHS : Unless otherwise agreed

9. TESTS

Type Tests

The following tests shall be carried out as per relevant ISS once on samples of completed line conductor during each production run of up to 500 kms of the conductor from each manufacturing facility.

Ultimate Tensile Strength Test

This test is intended to confirm not only the breaking strength of the finished conductor but also that the conductor has been uniformly stranded.

A conductor sample of minimum 5 m length fitted with compression dead end clamps at either end shall be mounted in a suitable tensile test machine. Circles perpendicular to the axis of the conductor shall be marked at two places on its surface. Tension on the conductor sample shall be increased at a steady rate upto 50% of the minimum UTS specified and held for one minute. The circles drawn shall not be distorted due to relative movement of the individual strands. Thereafter the load shall be increased at a steady rate to the specified minimum UTS and held at that load for one minute. The conductor sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

D.C Resistance Test On a conductor sample of minimum 5 m length two contact clamps shall be fitted with a pre-determined bolt torque. The resistance between the clamps shall be measured using a

Kelvin double bridge by initially placing the clamps at zero separation andsubsequently one meter apart. The test shall be repeated at least five times and the average

value recorded. The value obtained shall be corrected to the value at 20^0 C, which shall conform to the requirements of this specification.

Routine Tests

Measurement of Physical Dimensions:

The samples should meet the desired dimensional requirements before conducting following Routine Tests as per relevantISS.

Selection of Test Samples

Samples for the tests specified in this specification shall be taken by the manufacturer before stranding, from not less than 10% of the individual lengths of aluminium alloy wire included in any one final heat-treatment batch and which will be included in any one consignment of the stranded conductors to be supplied.

Alternatively, if desired by TPNODL at the time of placing an order, that the tests be made of wire shall be taken from length of stranded conductor.

Samples shall then be obtained by cutting 1.2 meters from the outer end of the finished conductor from not more than 10% of the finished reels or drums.

Tests for electrical and mechanical properties of aluminum alloy wire shall ordinarily be made before stranding since wires unlaid from conductors may have different physical properties from those of the wire prior to stranding because of the deformation brought about by stranding and by straightening for test.

Spools offered for inspection shall be divided into equal lots, the number of lots being equal to the number of samples to be selected, a fraction of a lot being counted as s complete lot. One sample spool shall be selected at random from each lot.

The following test shall be carried out once on samples of completed line conductor during each production run of up to 500 kms of the conductor from each manufacturing facility.

Breaking Load Test

The breaking load of one specimen, cut from each of the samples taken shall be determined by means of a suitable tensile testing machine. The load shall be applied gradually and the rate of separation of the jaws of the testing machine shall be not less than 25 mm / min and not greater than 100mm /min.

Elongation Test

The elongation of one specimen cut from each of the samples taken shall be determined as follows:

The specimen shall be straightened by hand and an original gauge length of 200 mm shall be marked on the wire. A tensile load shall be applied as described above and the elongation shall be measured after the fractured ends have been fitted together. If the fracture occurs outside the gauge marks, or within 25 mm of either mark, and the required elongation is not obtained, the test shall be disregarded and another test should be made.

When tested before and after stranding, the elongation shall not be less than 4% on a gauge length of 200 mm.

D.C Resistance Test

The electrical resistance test of one specimen cut from each of the samples taken shall be measured at ambient temperature. The measured resistance shall be corrected to the value at 20^0 C by means of the formula :

$$R_{20} = R_T \; \frac{1}{1 + \alpha (T-20)}$$

where , R_{20} = resistance corrected at 20^0 C R_T
= resistance measured T^0C
α = constant – mass temperature coefficient of resistance, 0.0036,
and T = ambient temperature during measurement.

The resistance corrected at 20^0 C shall not be more than the maximum values specified.

Chemical Analysis of Aluminum Alloy

Samples taken from the alloy coils / strands shall be chemically / spectrographically analyzed. The results shall conform to the requirements stated in this specification. The contractor shall make available material analyses, control documents and certificates from each batch as and when required by the **Purchaser**.

Test should be conducted at the independent test house by the purchaser in the case of absence Of facility at manufacturer. However the cost of such testing shall be borne by the manufacturer.

Dimensional and Lay Length Check

The individual strands of the conductors shall be dimensionally checked and the lay lengths checked to ensure that they conform to the requirements of this specification.

Ten percent drums from each lot shall be rewound in the presence of the Purchaser or his representative to allow visual checking of the conductor for joints, scratches or other surface imperfections and to ensure that the conductor generally conforms to the requirements this specification. The length of conductor wound on the drum shall be re-measured by means of an approved counter / meter during the rewinding process.

Visual and dimensional Checks on the Conductor Drums.

The drums shall be visually and dimensionally checked to ensure that they conform to the requirements of this specification and of IS 1778: Specification for reels and drums of bare conductors. For wooden drums, a suitable barrel batten strength test procedure is required. The Bidder shall state in his bid the tests to be carried out on the drums and shall include those tests in the Quality Assurance Programme.

Acceptance Tests :

All tests required to confirm enclosed Guaranteed Technical Particulars (GTP) requirements of this specification needs to be conducted as Acceptance Tests.

9 . 3 Test Reports.

a) Copies of type test reports shall be furnished in at least six copies along with one original. One

copy will be returned duly certified by the Owner only after which the commercial production of the material shall start.

b) Record of routine test reports shall be maintained by the Supplier at his works for periodic inspection by the Owner's representative.

c) Test certificate of tests during manufacture shall be maintained by the Contractor. These shall be produced for verification as and when desired by the Owner.

10. Packing.

a) The conductor shall be supplied in returnable, strong, wooden drums provided with lagging of adequate strength, constructed to protect the conductor against any damage and displacement during transit, storage and subsequent handling and stringing operations in the field. The Contractor shall be responsible for any loss or damage during transportation handling and storage due to improper packing. The drums shall generally conform to IS: 1778-1980, except as otherwise specified hereinafter.

b) The drums shall be suitable for wheel mounting and for letting off the conductor under a minimum controlled tension of the order of 5 KN.

c) The Contractor should submit their proposed drum drawings along with the bid.

d) The Contractor may offer more than one length of the conductor in a single drum.

e) All wooden components shall be manufactured out of seasoned soft wood free from defects that may materially weaken the component parts of the drums. Preservative treatment shall be applied to the entire drum with preservatives of a quality, which is not harmful to the conductor.

f) The flanges shall be of two ply construction with a total thickness of 64 mm with each ply at right angles to the adjacent ply and nailed together. The nails shall be driven from the inside face flange, punched and then clenched on the outer face. Flange boards shall not be less than the nominal thickness by more than 2mm. There shall not be less than 2 nails per board in each circle. Where a slot is cut in the flange to receive the inner end of the conductor the entrance shall be in line with the periphery of the barrel.

g) The wooden battens used for making the barrel of the conductor shall be of segmental type. These shall be nailed to the barrel supports with at least two nails. Thebatten shall be closely butted and shall provide a round barrel with smooth externalsurface. The edges of the battens shall be rounded or chamfered to avoid damage to the

onstruction of drums. The flanges shall be holed and the barrel supports slotted to receive them. The barrel studs shall be treaded over a length on either end, sufficient to accommodate washers, spindle plates and nuts for fixing flanges at the required spacing.

i) Normally, the nuts on the studs shall stand protruded of the flanges. All the nails used on the inner surface of the flanges and the drum barrel shall be counter sunk. The ends of barrel shall generally be flushed with the top of the nuts.

j) The inner cheek of the flanges and drum barrel surface shall be painted with bitumen based paint.

k) Before reeling, card board or double corrugated or thick bituminous water proof bamboo paper shall be secured to the drum barrel and inside of flanges of the drum by means of a suitable commercial adhesive material. The paper should be dried before use. After reeling the conductor, the exposed surface of the outer layer of conductor shall be wrapped with water proof thick bituminous bamboo paper to preserve the conductor from dirt, grit and damage during transport and handling.

l) A minimum space of 75 mm for conductor shall be provided between the inner surface of the external protective lagging and outer layer of the conductor. Outside the protective lagging, there shall be minimum of two binders consisting of hoop iron/galvanized steel wire. Each protective lagging shall have tow recesses to accommodate the binders.

m) Each batten shall be securely nailed across grains as far as possible to the flange, edges with at least 2 nails per end. The length of the nails shall not be less than twice the thickness of the battens. The nails shall not protrude above the general surface and shall not have exposes sharp, edges or allow the battens to be released due to corrosion.

n) The nuts on the barrel studs shall be tack welded on the one side in order to fully secure them. On the second end, a spring washer shall be used.

o) A steel collar shall be sued to secure all barrel studs. This collar shall be located between the washers and the steal drum and secured to the central steel plate by welding.

p) Outside the protective lagging, there shall be minimum of two binders consisting of hoop iron/ galvanized steel wire. Each protective lagging shall have two recesses to accommodate the binders.

q) The conductor ends shall be property sealed and secured with the help of U-nail on the side of one of the flanges to avoid loosening of the conductor layers during transit and handling.

r) As an alternative to wooden drum Contractor may also supply the conductors in non- returnable painted steel drums. After preparation of steel surface according to IS: 9954, synthetic enamel paint shall be applied after application of one coat of primer. Wooden/Steel drum will be treated at par for evaluation purpose and accordingly the Contractor should quote in the package.

Marking.

Each drum shall have the following information stenciled on it in indelible ink along with otheressential data:

(a) Contract/Award letter number
(b) Name and address of consignee.
(c) Manufacture's name and address.
(d) Drum and lot number
(e) Size and type of conductor
(f) Length of conductor in meters
(g) Arrow marking for unwinding
(h) Position of conductor ends
(i) Number of turns in the outer most layer.
(j) Gross weight of the drum after putting lagging.
(k) Average weight of the drum without lagging.
(l) Net weight of the conductor in the drum
(m) Month and year of manufacture of conductor

The above should be indicated in the packing list also.

12.0 Verification Conductor Length

The Owner reserves the right to verify the length of conductor after unreeling at least five (5) percent of the drums in a lot offered for inspection. For the balance drums, length verification shall be done by the owner based on report/certification from Manufacturer/ Contractor.

REJECTION AND RETESTS

Type Tests should the conductor fail any of the type tests specified above, the Purchaser will not accept any conductor manufactured from the material, nor conductor made by the manufacturing methods used for the conductor which failed the test.The manufacturer shall propose suitable modifications to his materials and techniques in order that he can produce conductor which will satisfactorily pass the type test requirements.

Routine Tests

Should any one of the test pieces first selected fail the requirements of the tests, two further samples from the same batch shall be selected for testings, one of which shall be from the length from which the original test sample was taken unless that length has been withdrawn by the manufacturer.

Should the test pieces from both these additional samples satisfy the requirements of the tests, the batch represented by these samples shall be deemed to comply with the standard. Should the test pieces from either of the two additional samples fail, the batch represented shall be deemed not to comply with the standard.

If checks on individual strand diameters, conductor lay lengths and conductor surface condition indicate non-compliance with the requirements of the specification, the particular drum will be rejected. Inspection will then be carried out on two further drums within the same batch. If the conductor on either of the drums is non-complaint, the complete batch will be rejected.

GURANTEED TECHNICAL PARTICULARS FOR 55 MM² ALL ALUMINIUM ALLOYCONDUCTOR

Sl. No.	Particulars		Specified Requirement	Details furnished by the bidder
1	Nominal Aluminium Alloy area ofconductor in Sq.mm	:	**55**	
2	No. of stands	:	7	
3	Wire dia. in mm			
	i. Nominal	:	3.15	
	ii. Minimum	:	3.12	
	iii. Maximum	:	3.18	
4	Approximate Over all diameter of conductor in mm	:	9.45	
5	Cross sectional area in Sq.mm			
	i. Individual wire	:	7.793	
	ii. Standard Conductor	:	55	
6	Minimum breaking load in KN			
	i. Individual wire	:	2.37	
	ii. Standard Conductor (U.T.S)	:	16.044	
7	Approximate mass in Kg. Per Km of Aluminium Alloy conductor			
	i. Individual wire	:	21.04	
	ii. Standard Conductor	:	149.2	
8	Calculated maximum DC resistance at 20^0C in Ohm/Km			
	i. Individual wire	:	4.29	
	ii. Standard Conductor	:	0.621	
13	Modulus of Elasticity of Aluminium Alloy conductor Kg/Sq.mm	:	To be specified by bidder	
14	Co-efficient of linear expansion perdegree centigrade for		$23X10^6$	
	i. Individual /^{0}C	:		

	ii. Standard conductor/^{0}C			
15	Standard length (Mtr.)	:	2000 ±5%	
16	Lay ratio for 7 wire conductor	:	Min Max To be specified by bidder	
17	Direction of Lay	:	Right hand	
18	Standard according to which the conductor will be manufactured and tested	:	IS : 398 (Part-4) – 1994	
19	Size of the drum in mm (as per IS-1778/80 with Amendment I /1989	:	To be offered by the Bidder	
20	Length of conductor in each drum inKm	:	To be offered by the Bidder	

Bidders Signature with Seal

GURANTEED TECHNICAL PARTICULARS

FOR 100 MM² ALL ALUMINIUM ALLOY CONDUCTOR

Sl. No.	Particulars		Specified Requirement	Details furnished by the bidder
1.	Nominal Aluminium Alloy area of conductor in Sq.mm	:	**100**	
2.	No. of stands	:	7	
3.	Wire dia. in mm			
	a) Nominal	:	4.26	
	b) Minimum	:	4.22	
	c) Maximum	:	4.30	
4.	Approximate Over all diameter of conductor in mm	:	12.78	
5.	Cross sectional area in Sq.mm			
	i) Individual wire	:	14.25	
	ii) Standard Conductor	:	100	
6.	Minimum breaking load in KN			
	i) Individual wire	:	4.40	
	ii) Standard Conductor (U.T.S)	:	29.344	
7.	Approximate mass in Kg. Per KM of Aluminium Alloy conductor			
	i) Individual wire	:	38.48	
	ii) Standard Conductor	:	272.86	
8.	Calculated maximum DC resistance at			
	20^{0}C in Ohm/Km			
	i) Individual wire	:	4.18	
	ii) Standard Conductor	:	0.339	
13.	Modulus of Elasticity of Aluminium Alloy conductor Kg/Sq.mm	:		

16.	Co-efficient of linear expansion per degree centigrade for a) Individual /^{0}C b) Standard conductor/^{0}C	: :	$23X10^6$	
17.	Standard length (Mtr.)	:	2000 $\pm$5%	
18.	Lay ratio for 7 wire conductor	:	Min Max To be specified by bidder	
19.	Direction of Lay	:	Right hand	
20.	Standard according to which the conductor will be manufactured and tested	:	IS : 398 (Part-4) – 1994	
21.	Size of the drum in mm (as per IS-1778/80 with Amendment I /1989	:	To be offered by the Bidder	
22.	Length of conductor in each drum in Km	:	To be offered by the Bidder	

Bidders Signature with Seal

GUARANTEED TECHNICAL PARTICULARS OF INSULATING PIERCING CONNECTOR

Sl. No.	Particulars	Specified Requirement	Details furnished by the bidder
1	Name of Manufacturer		
2	Place of manufacture		
3	Is manufacturer of accessories as ISO 9001-2000 company		
	a) copies Certificate enclosed		
	b) Are GA drawing enclosed		
4	Product designation	MV 240-95	
5	Applicable standard	As per NFC 33 020-1998	
6	Range of cable sizes: Main & Tap	Main : 95-240 (99) mm^2	
		Branch: 35-70-(99) mm^2	
7	Materials Composition		
	a) Body- Nylon		
	b) Contact plates- Tinned copper		
	c) Bolt-Steel		
	d) Seals & end caps - Elastomer		
8	Is any metallic part carrying potential in operation exposed during installation		
9	Are end caps of branch cable		
	a) Slide on type		
	b) Rigid		
10	Are torque limiting shear heads provided to tightening bolts		
11	Marking		
	a) Make		
	b) Main range		
	c) Tap range		
12	Rated current	600 A	
13	Voltage withstand under water emersion in	15 KV for 1 min	
14	Rated Tightening torque in	19 to 25 Nm	
15	Dimensions		

Signature of the bidder with Seal

GURANTEED TECHNICAL PARTICULARS OF LT STAY SETS

Sl No.	Item Description	Specified Parameters		Material	Bidder's offer
		Section Tolerances	Fabrication Tolerances		
	Manufacture's Name & Address		To be specified by the bidders		
1.	Anchor Plate	6mm thick +2.5%-5%	200x200mm+1%	GS Plate 6 mm thick	
2.	Anchor Rod	16mm dia +5%- 3%	Length 1800mm + 0.5%	GS Round 16mm dia	
			Rounded Eye 40 mm inside dia +3% Threading 40mm+ 11%-5%	GS Round 16mm dia	
3.	Turn Buckle Bow	16mm dia +5%-3%	995mm+1%	GS Round 16mm dia.	
			Length180mm +1%	GS Angle 50x50x6 mm	
4.	Eye Bolt Rod	16mm dia +5%-3%	Length 450mm + 1%	GS Round 16 mm dia	
			Threading 300mm +1% Round Eye 40mm inside dia+3%		
5	Galvanisation thickness	All galvanization shall be carried out in accordance with IS: 2629 . The weight of Zinc deposited shall be in accordance withIS: 2629 and shall not less than 0.61 kg/m² with a minimum thickness of 86 microns for items of thickness more than 5 mm,0.46kg/m²(64 microns) for items of thickness between 2 mm & 5 mm& 0.33kg/m²(47 microns) for items less than 2 mm thickness.			
a	Anchor Plate				
b	Anchor Rod				
c	TurnBuckle Bow				
d	Eye Bolt Rod				
6	Thimble	2 nos. to be made of 1.5 mm thick G.S Sheet into a size 75x22x40 mm & shape as per standard.			
7	Hexagonal Nut	One G.S Hexagonal Nut confirming to IS:1363 & 1367 withone square washer of size 50x50x6 mm (G.S) along with Anchor Rod.			
8		Two G.S Hexagonal Nuts of suitable size along with Eye Bolt Rod.			

Name & Signature of Agency with seal

GURANTEED TECHNICAL PARTICULARS OF 11KV HT STAY SETS

Sl No.	Item Description	Specified Parameters		Material	Bidder's offer
		Section Tolerances	Fabrication Tolerances		
	Manufacture's Name & Address		To be specified by the bidder		
1	Anchor Plate	8 mm thick +2.5%-5%	300x300mm+1%	GS Plate 8 mm thick	
2	Anchor Rod	18 mm dia +5%- 3%	Length 1800mm + 0.5%	GS Round 18mm dia	
			Rounded Eye 40 mm inside dia +3% Threading 40mm+ 11%-5%	GS Round 18mm dia	
3.	Turn Buckle Bow	18mm dia +5%-3%	995mm+1%	GS Round 18mm dia.	
			Length200mm +1%	GS Channel 100x50x4.7mm	
4.	Eye Bolt Rod	18 mm dia +5%-3%	Length 450mm + 1%	GS Round 18 mm dia	
			Threading 300mm +1% Round Eye 40mm inside dia+3%		
5	Galvanisation thickness	All galvanization shall be carried out in accordance with IS: 2629 . The weight of Zinc deposited shall be in accordance with IS: 2629 and shall not less than 0.61 kg/m² with a minimum thickness of 86 microns for items of thickness morethan 5 mm, 0.46kg/m²(64 microns) for items of thickness between 2 mm & 5 mm& 0.33kg/m²(47 microns) for items less than 2 mm thickness.			
a	Anchor Plate				
b	Anchor Rod				
c	TurnBuckle Bow				
d	Eye Bolt Rod				
6	Thimble	2 nos. to be made of 1.5 mm thick G.S Sheet into a size 75x22x40 mm & shape as per standard.			
7	Hexagonal Nut	One G.S Hexagonal Nut confirming to IS:1363 & 1367 withone square washer of size 50x50x6 mm (G.S) along with Anchor Rod.			
8		Two G.S Hexagonal Nuts of suitable size along with Eye Bolt Rod.			

Name & Signature of Agency with seal

GURANTEED TECHNICAL PARTICULARS STAY WIRE (7/8 SWG)

Sl. No.	Description	Specified	Bidder's offer
1.	Manufacturer's name & address	To be specified by the Bidder	
2	Nominal diameter of wire in mm	4.0	
3	Tolerance in diameter in mm	± 2.5%	
4	Minimum breaking load in Kg	5960.26	
5	Tensile strength Kgf/mm²	71.40	
6	Overall diameter of stranded wire in mm	12.0	
7	Sectional Area (in mm².)	113.14	
8	Coating Test		
a	Type of zinc coating whether heavy or light	Heavy	
b	Weight of coating in g/m²	476	
9 a	Length of wire in each coil in mtr.	117	
b	Tolerance	± 5%	
10	No. of dips the coating is able to withstand as 18 ± 20ºC	3 dip in min.	
11	Adhesion Test (Wrap Test at 1 turn per second coiling while stress not exceeding % nominal tensile strength)		
a	Min. complete turn of wrap	To be specified by bidder	
b	Dia of mandrel on which wrapped	- do -	
12	Bend Test		
a	Angle	- do -	
b	Dia round a format to be bent	- do -	
13	Freedom from defect	- do -	
14	Chemical composition the MS Wire used shall not exceed		
a	Sulphur 0.060%	- do -	
b	Phosphorous 0.065%	- do -	
15 a	Weight of each coil in Kg	70 to 100	
b	Tolerance	± 5%	
16 a	Weight of wire in Kg/Km	750	
b	Tolerance	± 5%	
17	Standard according to which the solid wire is manufacturedand tested	ISS: 2141/1992 & ISS: 4826/1979	

Name & Signature of Agency with seal

GURANTEED TECHNICAL PARTICULARS STAY WIRE (7/12 SWG)

Sl. No.	Description	Specified	Bidder's offer
1.	Manufacturer's name & address	To be specified by the Bidder	
2	Nominal diameter of wire in mm	2.50	
3	Tolerance in diameter in mm	± 2.5%	
4	Minimum breaking load in Kg	2331.07	
5	Tensile strength Kgf/mm²	71.40	
6	Overall diameter of stranded wire in mm	7.50	
7	Sectional Area (in mm².)	44.19	
8	Coating Test		
a	Type of zinc coating whether heavy or light	Heavy	
b	Weight of coating in g/m²	476	
9 a	Length of wire in each coil in mtr.	298	
b	Tolerance	± 5%	
10	No. of dips the coating is able to withstand as 18 ± 20ºC	3 dip in min.	
11	Adhesion Test (Wrap Test at 1 turn per second coiling while stress not exceeding % nominal tensile strength)		
a	Min. complete turn of wrap	To be specified by bidder	
b	Dia of mandrel on which wrapped	- do -	
12	Bend Test		
a	Angle	- do -	
b	Dia round a format to be bent	- do -	
13	Freedom from defect	- do -	
14	Chemical composition the MS Wire used shall not exceed		
a	Sulphur 0.060%	- do -	
b	Phosphorous 0.065%	- do -	
15 a	Weight of each coil in Kg	70 to 100	
b	Tolerance	± 5%	
16 a	Weight of wire in Kg/Km	310	
b	Tolerance	± 5%	
17	Standard according to which the solid wire is manufactured and tested	ISS: 2141/1992 & ISS: 4826/1979	

Name & Signature of Agency with seal

100X50 MM MS CHANNEL

50X50X6 MM MS ANGLE

01.00 **Scope:**

This specification covers the manufacturing, testing before dispatch and delivery at destination at site stores of **Bhadrak** Circle area under TPNODL.

100X50 MM MS CHANNEL
75X40 MM MS CHANNEL
50X50X6 MM MS ANGLE

As per I.S :2062 and its later amendments for grade A

02.00 **Standards:**

The steel materials shall comply with the requirements of latest issue of IS – 2062 Gr – A except where specified otherwise.

03.00 **Climatic Conditions:**

The climatic conditions at site under which the store shall operate satisfactory, are as follows:

Maximum temperature of air in shade	45 c
Maximum temperature of air in shade	0 c
Maximum temperature of air in shade	50 c
Maximum rain fall per annum	2000mm
Maximum temperature of air in shade	45 c
Maximum ambient temperature	45 c
Maximum humidity	100%
Av. No. of thunder storm days per annum	70%
Av. No. of dust storm per annum	20
Av. Rain fall per annum	150mm

04.00 **'V' CROSSARMS**

The cross-arm shall normally be constructed of steel and it will be the contractor's responsibility to ensure that the conductor spacing at the cross arms is adequate to prevent phase clash while supporting the loads generated, as per the Contractor's line design, by conductor weight, by wind, and by conductor tension for maximum wind span and worst design conditions, for all pole duties and for all permitted line deviations.

Cross-arms shall be fixed to the pole in a manner which prevents rotations in any plane even if the bolts are not fully tightened.

The cross-arm dimensions and characteristics given in this specification are intended to describe typical distribution structures and to maintain the general look of the existing network and take advantage of the familiarity of the Employer's staff with these kind of arrangements.

04.01 **Cross-arm Design Calculations**

The contractor shall design the cross-arm length and section configuration. He shall provide calculations to satisfy the Collector & District Magistrate, Bhadrak that the choice of length

complies with the requirements of 11KV lines in respect of conductor phase spacing and to avoid conductor clashing for the span lengths and tension limitations specified or designed.

The cross-arm sections shall be determined by taking cognisance of the design wind and weight spans, cross-arm length, as well as calculated conductor tension limits under worst design conditions and wind pressure.

04.02 **Fabrication**

Cross-arms for 33KV & 11KV construction at intermediate and light angle poles shall be fabricated from grade 43A mild steel of channel section and for heavy angle poles, end poles and section poles fabricated from grade 43 A mild steel of angle section. The grades of structural steel shall conform to ISO/R/630/1967 or IS – 226: 1975. they shall be hot dip galvanized as per specification.

The cross-arm shall be drilled to accommodate pole bolts and any insulator fittings included in the Contractor's design.

Except where otherwise indicated all dimensions are subject to the following tolerances:

- Dimensions up to and including 50mm : + 1 mm ; and
- Dimensions greater than 50 mm : + 2%

All steel members and other parts of fabricated material, as delivered, shall be free of warps, local deformations, unauthorized splices, or unauthorized bends. Bending of flat strap shall be carried out cold. Straightening shall be carried out by pressure and not by hammering. Straightness is of particular importance if the alignment of bolt holes along a member is referred to its edges.

Holes and other provisions for field assembly shall be properly marked and cross referenced. Where required, either by notations on the drawings or by the necessity of proper identification and fitting for field assembly, the connections shall be match marked.

A tolerance of not more than 1 mm shall be permitted in the distance between the center lines of bolt holes. The holes may be either drilled or punched and, unless otherwise stated, shall be not more than 2 mm greater in diameter than the bolts. When assembling the components, force may be used to bring the bolt holes together (provided neither members nor holes are thereby distorted) but all force must be removed before the bolt is inserted. Otherwise strain shall be deemed to be present and the structure may be rejected even though it may be, in all other respects, in conformity with the specification.

The backs of the inner angle irons of lap joints shall be chamfered and the ends of the members cut where necessary and such other measures taken as will ensure that all members can be bolted together without strain or distortion. In particular, steps shall be taken to relieve stress in cold worked steel so as to prevent the onset of embitterment during galvanizing.

Similar parts shall be interchangeable.
Shapes and plates shall be fabricated and assembled in the shop to the greatest extent practicable. Shearing, flame cutting, and chipping shall be done carefully, neatly, and accurately. Holes shall be cut, drilled, or punched at right angles to the surface and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges, and burrs resulting from drilling or reaming operations shall be removed with the proper tool.

Shapes and plates shall be fabricated to tolerances that will permit field erection within tolerances, except as otherwise specified. All fabrication shall be carried out in a neat and

workmanlike manner so as to facilitate cleaning, painting, galvanizing and inspection and to avoid areas in which water and other matter can lodge.

Contact surfaces at all connections shall be free of loose scale, dirt, burrs, oil and other foreign materials that might prevent solid seating of the parts.

04.03 **Cross-arm Replacement**

Where rehabilitation of existing networks requires the replacement of a 'V' or horizontal cross-arm or replacement of a pole with a 'V' or horizontal cross-arm then the replacement unit shall be matched to the original so as not to change the general look of the line.

Only in instances, where large sections of the line may require replacement or the original design is no longer available or desirable, shall be contractor, with the permission the, replace the original cross-arm configuration with a new design.

The replacement cross-arm shall conform to the requirements of the fabrication section of this specification.

04.04 **Other Associated Steelwork**

Other steelwork may be required for mounting line equipment such as AB Switch, surge arresters and Insulators.

The contractor is expected to design the steelwork and to accompany the bid with the relevant drawing and substantiating design calculations.

The steel work shall be fabricated from grade 43 A mild steel as per ISO/R/630/1967 or IS-226:1975 and it shall be hot dip galvanized as per the Surface Treatment section of this specification.

All required fixing nuts, bolts and washers shall be supplied alongwith cross arms.

05.00 **BOLTS AND NUTS**

All bolts and nuts shall comply with ISO 272, 885, 888, 4759/1 and the washer shall conform with ISO/R/887. All hardware shall be galvanized as per the Surface Treatment.

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

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

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

The dimensions and characteristics given are intended to describe typical ISO metric bolts, nuts and washers, such as are commonly used in the construction of distribution lines and other distribution plant and equipment. However , the bidder is free to propose alternative hardware.

Furthermore, it shall be the Bidder's responsibility to ensure that the bolts, screws, nuts, washers, clips, fasteners of any description and any other hardware, are capable of supporting the loads action on them, as per the bidder's design, by wind, vibration and short circuit forces for all permitted line and plant duties.

The ISO metric galvanized black hexagon bolts list in the table of Bolt Threaded Depth in this specification shall be used either as pole bolts, namely, where the bolt is required to pass through the center of the pole, or as assembly bolts. The bolts shall comply with ISO 272, 885,888, 4759/1 and shall also conform with the dimensions given in the table of Bolt Threaded Depth Nuts shall be in accordance with ISO 272, 885,888,4759/1.

Unless otherwise specified, each bolt shall be supplied with one full nut and one washer. Individual nuts may also be used for special purposes, such as lock nuts. These nuts shall also conform with ISO 272, 885,888,4759/1.

Bolt threaded length

Diameter	**Length (mm)**	**Threaded Length (mm)**
M12	80	30
	140	70
	200	70
	220	70
	230	70
	260	80
M16	40	Fully Threaded
	45	Fully Threaded
	110	38
	200	70
	220	70
	230	70
	260	80
	280	80
M20	40	Fully Threaded
	220	70
	280	80
M22	40	Fully Threaded

Screw threads shall be parallel throughout their length. They shall be so formed that, after galvanizing, the nut can be easily screw by hand over the whole threaded length, without excessive play. Before dispatch from the work s one washer shall be fitted to each bolt and a nut shall be screwed on the whole threaded length and left in this position.

05.01 **Permissible Loads**

The safe working shear stress of bolts is 118N/mm^2, with the area of the bolt measured at the root of the thread. The following table referenced Bolts Safe Working Loads shows the ultimate tensile strength and the tensile stress areas, as per ISO 272, 885, 888, 4759/1 and

the safe working tensile and safe working shear loads for the bolts covered by this specification. The ultimate shear strength has been assumed to be 75% of the ultimate tensile load and a factor of 2.5 has been applied:

Bolts safe working loads

Bolt Size	Ultimate Tensile Stress (N/mm^2)	Tensile Stress Area (mm^2)	Ultimate Tensile Strength (kN)	Safe Working Tensile Load (kN)	Safe Working Shear Load (kN)
M12	392	84.3	33.05	13.22	9.91
M16	392	157.0	61.54	24.62	18.46
M20	392	245.0	96.04	38.42	28.81

05.02 **Eye Bolts and Nuts**

M20 eye bolts shall preferably be of drop forged manufacture and shall be supplied complete with one full nut.

Eyebolts shall be manufactured from steel to ISO 272, 885, 888, 4759/1 and shall meet the requirements for mechanical properties detailed in ISO 272, 885, 888, 4759/1.

Where a welding process is used in the manufacture, each eye bolt shall be individually proof tested by the manufacturer in accordance with ISO 272, 885, 888, 4759/1 to 125% of its safe working tensile load that is to 48 kN. The safe working tensile load shall be the ultimate axial tensile strength divided by the factor of safety of 2.5.

The eye shall be permanently and legibly stamped with the letter METRIC in letters not less than 3 mm high.

The safe working load of any eye bolt is that load which may be safely carried in an axial direction. If loaded in any other direction the safe working load is reduced and reference shall be made to the following table for safe working loads of M20 eye bolts and eye nuts.

Safe working loads of M20 eye bolts and eye nuts

Angle between Direction of Load and Axis of Bolt	**Safe Working Load (KN)**
0	38.42
5	30.55
10	25.52
15	22.05
20	19.54
25	17.67
30	16.24
35	15.13

40	14.26
45	13.58
50	13.06
55	12.68
60	12.40
65	12.23
70	12.15
75	12.17
80	12.28
85	12.49
90	12.81

05.03 **Tie Rods**

Tie rods shall be supplied with four full nuts. The material of the rods shall be steel to ISO 272, 885, 888, 4759/1 and shall meet the requirements for mechanical properties detailed in ISO 272, 885,888, 4759/1. Associated nuts shall comply with ISO 272, 885, 888, 4759/1.

05.04 **Washers**

Washers shall be of the following different types :

- Round, flat, mild steel washers and having the dimensions shown in the following table: Round flat washer dimensions.
- Tapered, squared (curved) malleable iron washers.
- Square (curved) mild steel washers;
- Square, flat, mild steel washers, in accordance with ISO/R/887 or IS –2016 : 1967.
- Tapered, D shaped, malleable iron washers, in accordance with ISO/R/887 or IS-2016:1967.

Round flat washer dimensions

Type	Internal Diameter (mm)	External Diameter(mm)	Thickness mm)
M12	14	28	2.5
M16	18	34	3.0
M20	22	39	3.0
M22	24	44	3.0

These washers shall comply with ISO/R/887

05.05 **Screws**

Screws may be:

- Coach screws of galvanized mild steel, gimlet pointed, in accordance with BS 1494. the screws shall be 10mm in diameter and supplied in lengths of 38mm, 76mm and 152mm; or

- Roundhead drive screws of galvanized mild steel, 63 mm long and with 6.3 mm diameter and in accordance with BS 1494-1.

07.00 POST INSULATOR FOR PRIMARY SUBSTATIONS

07.01 Post Insulator (clamp top type)

Bidders may offer substation designs using post insulators of the clamp top type. The insulators shall be suitable for use in TPNODL primary substations with conditions as shown in the sections on Service Conditions and System Conditions.

They shall conform to IEC 273 or IS 2544 and shall meet the following performance criteria:

Normal Voltage	33KV	11KV
Visible discharge voltage	27 KV rms.	9 KV rms.
Wet and dry power frequency one minute withstands voltage.	75 KV rms.	35 KV rms.
Power frequency puncture withstand voltage	1.3 times the actual dry flashover voltage.	1.3 times the actual dry flashover voltage.
Impulse withstand voltage peak	170 KV peak	75 KV peak
Minimum creep age distance	840 mm	380 mm
Minimum protected creep age distance	420 mm	-
Minimum failing load (bending)	12.5 KN	12.5 KN
Minimum failing load (torsion)	2000 Nm*	1200 Nm*

* While these are the minimum failing loads acceptable to the employer, it shall be the bidder's responsibility to ensure that the mechanical strength of the offered insulators shall be capable of insulators, by conductor tensions for maximum wind span and worst design conditions and for all insulator duties and permitted line deviations.

The Bidder shall quote the make, type of insulation material, metal fittings along with cantilever, torsion, tension and compression strengths.

The porcelain shall be sound, free form defects thoroughly vitrified and smoothly glazed to give a brown colored finish. The glaze shall cover all exposed parts of the insulator and shall have a good luster, smooth surface and good performance under the extreme weather conditions of a tropical climate. It shall not be cracked or chipped by ageing under the specified service conditions. The glaze shall have the same coefficient of expansion as of the porcelain body throughout the working temperature range. The cement used shall not give rise to chemical reaction with metal fittings.

07.02 **Tests**

Type, acceptance and routine tests shall be carried out and results given alongwith certification as appropriate in the Technical Data Schedule and Test Certificates Schedule of this specification.

07.03 **Type Tests**

The following type tests are required :

- Visible discharge test;
- Impulse voltage withstand test;
- Dry power frequency voltage withstand test
- Wet power frequency voltage withstand test
- Mechanical strength test for post insulators as per IEC 168 / IS 2544;

07.04 **Acceptance tests**

The test samples having withstood the routine tests shall be subjected to the following tests according to the sampling procedure of IEC 383 clause 23;

- Verification of dimensions
- Temperature cycle test
- Mechanical strength test for post insulators as per IEC 168/ IS 2544;
- Porosity test on post insulators;
- Puncture test

Test for galvanization of ferrous parts

07.05 **Routine Tests**

The following routine tests shall be conducted on each set and results are to be furnished for consideration :

- Visual examination
- Power frequency voltage dry test;
- Tests to prove mechanical strength.

08.00 **STAY INSULATORS (11 KV)**

The insulators shall be suitable for use on the **TPNODL** distribution system with conditions as shown in the sections on Service Conditions and System Conditions 11 KV Stay insulators shall be used on L.V stays.

08.01 **Performance Characteristic shall be strictly as per relevant IS.**

08.02 Materials

The insulators shall be brown glazed porcelain.

08.03 **Design**

The bidder shall guarantee than the dimensions and tolerance of the insulators offered are in accordance with the drawing which shall accompany the bid documents**.**

The insulators shall be used with 7/8 SWG (7/4.00 mm) steel stay wire, having an overall diameter of 12.2 mm and tensile strength of 70 kgf/sq. mm. The insulators shall be suitable for use having a minimum stay wire hole diameter of 22 mm and be such that a straight stay wire can be passed through it.

08.04 **Markings**

All insulators shall be clearly marked with the name or trademark of the manufacturer

and the year of manufacture. These markings shall be legible and indelible. The markings may be printed or impressed, provided such impressions do not impair the performance of the insulator. Marking shall be applied before firing.

08.05 **Tests**

The insulators shall be subjected to the following type, acceptance and routine tests in accordance with IS –5300 : 1969.

08.06 **Type Tests**

The following type tests are required:

- Dry power frequency voltage withstand test;
- Wet power frequency voltage withstand test;
- Mechanical strength test;

08.07 **Acceptance tests**

The test samples having withstood the routine tests shall be subjected to the following tests according to the sampling procedure of IEC 383 clause 23;

Verification of dimensions

- Mechanical or Electro – Mechanical failing load test;
  Mechanical load shall be applied under conditions reproducing service conditions as closely as possible.
- Porosity test;

Power frequency puncture test.

08.08 Routine Tests

The following routine tests shall be conducted on each insulator:

- Visual examination
- Mechanical load test

TECHNICAL SPECIFICATION FOR 11 KV LINE FITTINGS

01.00 **SCOPE**

This Specification covers Design, Engineering, Manufacture, testing, inspection before dispatch, forwarding, packing, transportation to site, Insurance (both during transit & storage), Storage, Erection, Supervision, testing and commissioning of 11KV Line Fittings for use in the networks of TPNODL, Odisha.

The equipment offered shall have been successfully type tested and the design shall have been in satisfactory operation for a period not less than two years on the date of bid opening. Fittings which are components of insulator assemblies shall have been in satisfactory operation for a period not less than five years. Examples of such fittings are spindles for pin insulators, and hooks, conductor clamps, armour rods, and yoke plates for strain and suspension disc insulators. Compliance shall be demonstrated by submitting with the bid (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

The scope of supply includes the provision of type tests. Rates for type tests shall be given in the appropriate price schedule of the bidding document and will be considered for evaluation.

The line fittings shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards

at the time of offer

02.00 **STANDARDS**

Except where modified by the specification, the fittings shall be designed, manufactured and tested in accordance with the latest editions of the following standards.

IEC / ISO / or other International Standard	**IS**	**Title**
	IS-2486	Metal fittings of insulators
ISO/R/630/1967	IS-2062:1992	Steel for general structural purposes
ISO 2092 –1/2	IS-5082 :1981	Wrought aluminum and aluminum alloys
DIN 6796		Conical washers
IEC 1284	IS-2121	Overhead power line fittings
BS 3288		Insulator and Conductor fittings performance
IEC 1089	IS –398	Aluminum conductors
IEC 502		Insulated power cables 1 –33 KV
ASTM D1000 IEC 454		Test methods of pressure sensitive, adhesive coated taps for electrical and electronic applications
BS 183		General purpose Galvanised Steel Wire
BS 4429		Turnbuckles for general engineering purposes
BS EN 10218-1 : 1994		Mechanical tests on steel wire
ISO 9000		Quality Management Systems
ISO 8501-1		Shot blasting
	IS –6005	Phosphating of iron and steel
ISO 1460	IS –2629	Hot dip galvanizing
	IS- 2633	Galvanised steel tests

BS 1924		Tests on materials before stabilization
ISO 68, 261, 262, 724, 965/1, 965/3, BS- 3643		Metric screw threads
BS 1387		Screwed and Socketed steel tubes
	IS –2141	Hot dip galvanized stay strand

This list is not be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Contractor of the necessity of providing the goods complying with other relevant standards or recommendations.

GENERAL

03.00 This specification covers the design, manufacture, testing, supply, delivery and performance requirements of insulator fittings / hardware, conductor splices, terminating connectors, binding and stay wire materials as required by the lines.

The dimensions and characteristics given in this specification are intended to described typical distribution overhead line fittings and hardware which will maintain the general look of the existing network and will take advantage of the availability of tools and the familiarity of the employers staff with these kind of arrangements.

However, the bidder is free to propose alternative fittings and hardware provided the bid respects the general requirements of this specification.

Furthermore, it will be the bidder's responsibility to ensure that all the fittings, hardware and accessories are capable of supporting the mechanical and electrical loads imposed on them by climatic conditions, conductor tensions and structure loads under worst design conditions as stated in the specification.

The bidder is referred to the associated TPNODL Technical Specifications for additional information.

INSULATOR FITTINGS AND HARDWARE

04.00

Insulator fittings and hardware for use in line terminations or anchor points shall be capable of withstanding a tension force at least equal to the breaking loads of the insulators which are as follows:

04.01 **Conductors nominal breaking load**

Conductor	**Actual AAAC cross sectional area (mm^2)**	**Nominal Breaking Load(KN) of Conductor**	**Nominal Breaking Load (KN)of Insulator**
Rabbit Equivalent	55 AAAC	16.03	70 KN
Racoon Equivalent	80 AAAC	23.41	90 KN
Dog Equivalent	100 AAAC	29.26	90 KN
XLPE Cable	55 mm^2		

04.02 **Disc Insulator Fittings**

The insulators shall be cap and pin type with ball and socket couplings. The hardware for insulator strings, whether suspension or strain insulators, together with ball and socket fittings shall be of standard design. This hardwares shall be interchangeable and suitable for use with disc insulators of any make conforming to relevant Indian and International Standards.

Fully dimensioned drawing of the complete insulator string hardware and their components parts should show clearly the following arrangements.

1. Attachment of hanger or strain plate
2. Suspension assembly.
3. Dead end assembly
4. Yoke plates.
5. Hardware fittings of ball and socket type for interconnecting units to the yoke plate.
6. Anchor links for connection of tension strings to crossarms with suitable fittings.

6.2.1 (a) Ball and socket designation

The designation should be in accordance with the standard dimensions stated in IS: 2486 (part–II)/ IEC : 120. The dimensions shall be checked by appropriate gauge after galvanizing .

04.03 **Ball Ended Hooks**

Ball ended hooks , together with section straps, shall be used to attach the ball and socket chain of insulators to the angle, section and end pole crossarm.

Ball ended hooks shall be manufactured to comply with ISO/R/630/1967 or IS – 2026:1992 and shall be hot dip galvanized to conform with the section on Surface

Treatment in this specification .The dimensions of the ball ended hook shall be compatible with those of the section strap.

04.04 **U Bolt Shackles**

Where the requirements of the line design requires a double set of tension insulators, then a U bolt shackle, together with a ball ended eye link and a socket clevis, may be used to attach a combination of dual yoke plates, double chain of tension insulators and conductor clamp to the cross-arm of the pole.

U bolt shackles shall be made to comply with ISO/R/630/1967 or IS – 2062 :1992 and shall be hot dip galvanized to conform with the section on Surface Treatment.

The dimensions of the U bolt shackle shall be compatible with those of the ball ended eye link and the crossarm, specified in the TPNODL specification.

04.05 **Ball Ended Eye Links**

Where the requirements of the line design requires a double set of tension insulators, a ball ended eye link, together with an U bolt shackle and a socket clevis, shall be used to attach a combination of dual yoke plates, double chain of tension insulators and conductor clamp to the cross-arm of the intermediate H pole. In general, ball ended eye links shall be used to attach ball and socket combinations to other associated hardware.
Ball ended eye links shall be made to comply with ISO/R/630/1967 or IS-2062:1992 and shall be hot dip galvanized to conform with the section on Surface Treatment.

The dimensions of the ball ended eye link shall be compatible with those of the insulators and those of the U bolt and socket clevis.

04.06 **Socket Clevises**

Socket clevises may be used at 33 KV and 11 KV termination points to attach the compressed termination to the closest insulator in the chain. They shall also be used where lines require a duplicate chain of tension or suspension insulators. In this case a socket clevis may be required to attach the bottom insulator to the bottom dual yoke plate and the ball ended hook or eye link to the top dual yoke plate.

Socket clevises shall be made to comply with ISO/R/630/1967 or IS –2062:1992 and all ferrous parts shall be hot dip galvanized in conformity with the section on surface treatment. The socket clevises shall be delivered complete with phosphor bronze security clip, mild steel pin and washer and stainless steel split pin.
The dimensions of the socket clevis shall be compatible with the ball end in strain insulator pins and in other hardware and with the dimensions of the dual yoke plate.

Dual Yoke Plates

04.07

Dual yoke plates may be used where 33 KV line require a duplicate chain of tension or suspension insulators. The dual yokes may be required to attach the insulators to the cross-arm on the one hand and to the conductor termination or suspension

clamp on the other.
Dual yoke plates shall be made to comply with ISO/R/630/1967 or IS-2062:1992 and all ferrous part shall be hot dip galvanized in conformity with the section on surface treatment.
The dimensions of the dual yoke plate shall be compatible with those of the ball elevis and of the socket clevis, respectively.

04.08 **Ball Clevises**

Ball clevises may be used where lines require a duplicate chain of tension of suspension insulators. The ball clevises may be required to attach the first insulator in the chain to the first dual yoke plate.

Ball clevises shall be made to comply with ISO/R/630/1967 or IS-2062:1992 and all ferrous parts shall be hot dip galvanized in conformity with the section on surface treatment. The ball clevises shall be delivered complete with mild steel pin and washer and stainless steel split pin.
The dimensions of the ball clevis shall be compatible with those of the dual yoke plate.

04.09 **Socket Tongues**

Socket tongues may be sued where lines require a duplicate chain of suspension insulators. The socket tongue may be required to attach the suspension clamp to the lower dual yoke plate by means of a ball ended eye link. Alternatively, the suspension clamp may be attached directly to the dual yoke plate.

Socket tongues shall be made to comply with ISO/R/630/1967 or IS-2062:1992 and all ferrous parts shall be hot dip galvanized in conformity with the section on surface treatment. The socket tongues shall be delivered complete with phosphor bronze security clip.
The dimensions of the socket tongue shall be compatible with those of the suspension clamp.

04.10 **Pin Insulator Fittings**

05.00 **Insulator Pin**

Pin insulator pins shall be made from grade 43A steel complying with ISO/R/630/1967 or IS – 2062:1992 and shall be hot dip galvanized to conform with the section on Surface Treatment. The pins shall also comply with the requirements of IS – 2486 (parts 1 & 2)

The collar which is required in straight pins shall not be welded to the stalk. The complete pin shall be forged out of a single piece of material. The lower surface of the collar must be perpendicular to the axis of the stalk.
Each straight pin shall be fitted with one hexagonal ISO metric nut and washer comply with the section reference Bolts, Nuts and Washers in the TPNODL specification.

The threads shall cover the whole of the stalk to ensure that the same pin insulator can be used both on channel and angle cross-arms. They shall be ISO metric complying with ISO 68, 261, 262,724, 965/1, 965/3 coarse threaded series, and shall be formed before galvanizing to such a depth that , in the finished state, the nut can be easily screwed by hand over the whole threaded length of the pin without excessive play. The bid shall state by what process the threads are formed.

05.01 **11 KV Pin insulator**

The 11 KV pin insulator assembly complete is for use with the requisite cross-arm and structure in an intermediate or light angle pole position. The galvanized steel pin when used with the 11 KV pin insulator described in the TPNODL specification of 33 KV, 11 KV Insulators, the combination shall meet the following requirements:

- Conductor clearance to cross-arm shall be a minimum of 220 mm;
- The minimum creepage distance shall be not less than 320 mm;
- The insulator pin shall fit the steel channel or angle cross-arms outlined in the specification.
- When fitted to the steel channel or angle cross-arms shall have a mechanical failing load (MFL) of at least , 10 KN.
- The deflection of the top of the pin at the specified failing load shall be less than 1.5 mm.

However, the strength of the proposed insulator assembly shall be capable of supporting the loads generated as per the Bidder's line design, by wind acting on the conductor and insulators, by conductor tensions for maximum wind span and worst design conditions and for all insulator duties and permitted line deviations. Design calculations shall determine the strength of the insulator assembly offered.

06.00 **TERMINATIONS AND CONNECTORS**

All splice or termination connectors shall be capable of being used with AAAC conductors complying with the TPNODL Technical Specification for all Alluminium Alloy Conductors, the sizes stipulated in this specification.

The barrel of each fitting shall be packed with an abrasive, neutral, high melting point, soft grease and shall be delivered with the ends sealed. The quantity of grease shall be approximately half the volume of the bore.

The bore shall be tapered at each end for a distance of 5 mm. Tension splices shall be chamfered off leaving a minimum wall thickness at the ends of 2 mm.

All straight through tension and non tension connectors shall be provided with a conductor stop at the center of the tube.

In the lug terminals, the palm faces shall be flat and the barrel length shall correspond to half the appropriate non tension connector.

If lugs have to be used with PVC covered conductors, an additional barrel length of 20 mm shall be provided and the lugs counter bored to accommodate the PVC covering.
The palm faces of the lug connections shall be protected with an oil impregnated strippable plastic or other suitable coating.

The maximum tolerance in connector tubes shall be + 0.15 mm in internal and external diameters and +0.35 mm in concentricity.

The connectors offered shall be suitable for application by compression.

All terminations and splices shall be capable of being made with hand operated compression tool. The dies shall be removable from and interchangeable with the respective tools. For all AAAC conductors up to a cross section of 100 MM^2 die-less compression tools can be used.

A one piece tension connector shall be used and it shall be possible to compress the alluminium conductor without a requirement for destranding.

All connectors shall perform without distress under normal, cyclic loading and fault conditions and shall not limit the rating of the conductor on which they are used.

Conductor connectors shall be able to accommodate typical variations in dimensions of conductors supplied by different manufacturers and shall be of a material which will not react chemically with the conductors to which they are attached.

Tension connectors for use in line terminations of anchor points shall be capable of withstanding a tension force of at least 90% of the breaking loads of the conductors as given in the section referenced Conductors nominal breaking loads in this specification.

06.01 **Tension or Dead End Terminations**

These terminations shall be manufactured from aluminium and be of the compression type, factory filled with a special grease compound to give optimum electrical and mechanical performance. They shall be used to terminate the main conductor under full tension at heavy angle, section and end pole position.

Conductor	All Aluminium Alloy conductor Cross Section (mm^2	Overall Diameter (mm)
Rabbit Equivalent	55 AAAC	9.45
Racoon Equivalent	80 AAAC	11.43
Dog Equivalent	100 AAAC	12.78

The dead end assembly shall be compression type with jumper connection terminal at one end. The jumper terminal shall be set such that the jumper will leave the clamp at an angle of 60 degrees to the axis of the main conductor. The area of bearing surface on all the connections shall be sufficient to ensure positive electrical and mechanical contact and avoid local heating due to I^2R losses. The resistance to the clamp when compressed on conductor shall not be more than 75% of the resistance of equivalent length of conductor.

Die compression areas shall be clearly marked on each dead-end assembly designed for continuous die compressions and shall bear the words 'COMPRESS FIRST' suitably inscribed near the point on each assembly where the compression begins. If the dead end assembly is designed for intermittent die compressions it shall bear identification marks 'COMPRESSION ZONE' AND 'NON-COMPRESSION ZONE' distinctly with arrow marks showing the direction of compressions and knurling marks showing the end of the zones. The letters, number and other markings on the finished clamp shall be distinct and legible.

The assembly shall not permit slipping of damage to or failure of the complete conductor or any part thereof at a load less than 90% of the ultimate tensile strength of the respective conductors.

06.02 **Non Tension Terminations**

These fittings shall consist of palm type lug terminals and shall be used to terminate line jumpers and other non tension conductors on to equipment terminals, such as pole mounted transformers. Lugs shall be of two types: aluminium and bimetal. In the bimetal lugs the bimetal junction within the palm shall be of such design as to afford adequate protection against electrolytic corrosion.

All bolts, nuts and washers used to connect aluminium lugs shall be made of galvanized steel. Lugs with an aluminium palm shall be supplied with conical washers. The conical washer shall conform to DIN 6796 or equivalent.

The lugs shall be suitable for conductors having overall diameters as shown in the above table.

Lugs shall be suitable for fitting to 10 mm , 13 mm and 17 mm studs and the lug palm shall be of adequate dimension to accommodate the current rating of the conductor.

06.03 **Tension Connectors**

Tension connectors shall be used for making conductor splices under full tension and shall consist of an aluminium sleeve, factory filled with a special grease compound to give optimum electrical and mechanical performance.

These connectors shall be capable of being used to make splices in midspan and shall therefore be capable of supporting tension loads at least equal to the maximum conductor breaking load, as listed in table reference Conductor nominal breaking load in this specification.

The fullest possible use shall be made of maximum conductor lengths and therefore tension joints shall be minimized but where they are not avoidable they shall preferably of the compression type and in accordance with the requirement of IEC-1284, IS –2121 and IS –2486.

06.04 **Non Tension Connectors**

Non tension connectors comprise tap off connectors and straight through non tension connectors.

The tap off connectors shall be used for branching off a main line and shall consist of a "C" shaped barrel which can be compressed on to the main conductor and in electrical contact with another closed barrel, holding the branch conductor forming a tee configuration. Both the closed and "C" shaped barrels shall be factory filled with a special grease compound to give optimum electrical and mechanical performance.

The straight through non tension connectors shall be used to splice jumpers and other non tension conductors and shall consist of an aluminium sleeve, factory filled with a special grease compound to give optimum electrical and mechanical performance. They shall preferably be of the compression type.

The range of connectors shall be of the AAAC listed in the section on Tension Terminations in this specification.

06.05 **Compression Tooling**

The range of connectors offered for conductors up to and including 232 mm^2 AAAC shall be capable of being compressed by a hand operated tool. The employer is already committed to the use of die-less hand operated mechanical compression tools on overhead line work. Use of this method of jointing will be preferred. However where the bidder offers other types of compression jointing and connecting systems, details of the tools, dies and methods shall be submitted with the bid.

Full details of jointing methods and quality control system shall be included in the Quality Assurance Plan.

06.06 **Materials**

The alluminium portion in all connectors shall be 99.5% pure alluminium, conforming with IS – 5082: 1981: Wrought alluminium and alloy bars.

Compounds and greases for improving contact between connectors and conductor strands shall used. They shall however, be chemically neutral to the connector and conductor materials and must be present in position in the delivered connectors.

The quantity of grease shall be approximately half the volume of the bore. As a rule of thumb to check that sufficient quantity is present, grease should be squeezed out of the conductor barrel entry point as the conductor is fully inserted. The grease in the connectors shall be protected from accumulating dust and other debris by means of plastic plugs, or equivalent.

06.07 **Markings**

The manufacturer's name or trademark shall be clearly stamped on every fitting.

In addition, the following information shall be provided on connectors:

- Metric conductor size for which the connector is suitable;

- The die number suitable for compressing the connector;
- The points on the connector surface to be compressed;
- The sequence of die action i.e the order in which different parts of the connector shall be compressed;
- The insertion length for the conductor with the location of any blocked off portions in the connector center.

All markings shall be legible and indelible.

06.08 **Tests**

06.09 **Type tests**

The mechanical type test shall comply with BS 3288 part 1, whereas the electrical type test shall conform with IEC 1284/IS – 2486

06.10 **Tensile type tests on tension connectors.**

For these tests a connector shall be compressed onto the Employer's conductor in accordance with the manufacturer's installation instructions. The assembly shall be mounted in a tensile test rig and anchored in a manner approximating, as nearly as possible, the arrangement to be used in service, precautions being taken to avoid conductor bird caging. The length of conductor between the connector and any other joint or clamp in the test assembly shall be not less than 100 times the overall diameter of the conductor.
A tensile load of 50% of the breaking load of the conductor shall be applied and the conductor marked in such a way that movement relative to the connector can easily be detected. The tensile load shall be steadily increased to 95% of the break load of the conductor and then reduced to 90% and maintained at that level for one minute. During this period there shall be no movement of the conductor relative to the connector and no connector failure.

The load shall then be steadily increased until failure occurs. The load reading at which the failure occurs shall be recorded as a percentage of the nominal breaking load of the conductor.
This test shall be repeated successfully on three identical connectors.

06.11 **Tensile type tests on non tension connectors.**

This test shall be similar to the tensile test on tension connectors, except that the one minute test will take place at 10% of the nominal breaking load of the conductor.

For tap off connectors the tension shall be applied between the main and the tap off conductor and failure shall be recorded as a percentage of the nominal breaking load of the tap off rather than the main conductor.

06.12 **Electrical type tests**

These tests shall be in accordance with the full electrical requirements of the latest

edition of IEC 1284/IS-2486

06.13 **Acceptance Tests**

Sample tests are intended to verify the quality of the materials and workmanship. They are made on connectors taken at random from batches about to be delivered. If required the sample test shall be carried out on a sample of 0.4 percent of the quantity in the consignment subject to a minimum of three units.

In the event of a sample not meeting the test requirements, twice the original number of samples shall be tested. If all these samples meet the test requirements the consignment will be acceptable, but if any fail to do so, the consignment in total will be deemed to be unacceptable and shall be rejected.

Sample inspection however will be carried out, during which the following requirements shall be checked out on the chosen connector samples:

- That the connector dimensions correspond with those shown on the manufacture's drawing. The maximum tolerance allowable shall be +2%;
- That the ends of the connectors are suitably chamfered or coned to facilitate insertion of the conductors without damage;
- That the connectors are smooth, seamless and free from any defects likely to cause them to be unsatisfactory in service;
- That all identification marks are clearly legible;
- That galvanized parts are in accordance with the section on Surface Treatment;
- That adequate quantities of grease are present in the connectors.

The number of samples to be checked shall be determined by the following algorithm:

$s = 4$ for $100<n<500$

$s = 4+1.5n/1000$ for $500<n<20,000$

$= 19 + 0.75n/1,000$ for $n>20,000$

Where s = number of samples selected; and n= number of connectors in the consignment

Tests shall be carried out on all units. Mechanical routine testing shall comply with BS 3288 part 1, whereas electrical routine testing shall conform with IEC 1284/IS-2486.

The bid shall be accompanied by test certificates giving successful results of the type tests carried out on connectors identical in all details and representative of the range offered.

The test certificate must contain the following details :

- Type of connector;
- Manufacturer;
- Textual and photographic description of test arrangements;
- Description of conductors used;
- Details of tools and dies used;
- Details of grease or compound used;
- Test results;
- Level and duration of load current; and
- Level and duration of short circuit current.

07.00 **BOLTS AND NUTS**

Bolts, nuts and washers shall conform to the section on Bolts and Nuts in the specification.

08.00 **LINE BINDING ACCESSORIES**

Line binding accessories consisting of soft aluminum binding wire, aluminum binding stirrups, semi conducting tape and anticorrosive tape are required for the line.

The aluminum binding wire & stirrups are for use to bind bare aluminum conductor to the insulators in the construction of new lines and Reconductoring of line.

Semi conducting tape shall be used under the bind with 11 KV PVC covered conductors.

Anticorrosive tape shall be used as a barrier against ingress of moisture wherever copper and aluminum are spliced together, such as at the interface between aluminium conductors and the copper or brass terminals of equipment connected to the line. It may also be used to seal the ends of PVC covered conductor.

08.01 **Aluminium Binding Wire**

08.02 **Physical Characteristics**

The binding wire shall be EC grade hard-drawn aluminium rods of 3.53 mm diameter complying with IEC 1089/IS-398. The material comprising the wire shall

have the following chemical composition :

Aluminium 99.5% minimum

- Copper, silicon and iron 0.5% maximum

The surface of the wire shall be smooth and free from all irregularities and imperfections. Its cross section shall closely approximate that of a true circle.

08.03 **Characteristics of Aluminium Binding Wire**

Diameter of wire (mm)			Cross sectional area of nominal dia. wires (mm)	Weight of wire kg/km	Breaking Load (KN)
Minimum	Nominal	Maximum			
3.51	3.53	3.55	9.787	26.45	1.57

08.04 **Inspection and Tests**

The following routine checks and tests shall be carried out on 10% of the coil of aluminium binding wire. If any one sample fails to pass any one of the tests nominated for that wire, then samples shall be taken from every coil in the consignment and any coil from which a sample proves defective shall be rejected. On no account shall any rejected material be presented for test again.

Physical properties

The surface of the finished wire shall be checked to ensure that it is smooth, free from all irregularities, imperfections and inclusions and that its cross section approximates closely that of a true circle.

The wire shall be checked to ensure that its diameter and weight are within the values given in the table above : Characteristics of aluminium binding wire.

Ultimate tensile strength

When tested on a standard tensile testing machine, the value obtained for the ultimate tensile stress shall not be less than 1.57 KN.

Wrapping test

The wire shall withstand one cycle of a wrapping test as follows :

The wire shall be closely wrapped round a wire of its own diameter to form a close helix of eight turns. Six turns shall then be unwrapped and again closely

rewrapped in the same direction as the first wrapping. The wire shall not break or crack when subjected to this test.

08.05 **Delivery**

The aluminium binding wire shall be delivered in 30 m coils, with a permitted tolerance of +5%. Randdom or non standard lengths shall not be permitted.

Each coil shall be adequately guarded against damage due to transportation and handling and shall have an outer layer of tightly wound polythene tape or be contained in a suitable, transparent plastic bag.

The internal diameter of the wound coil shall not be such as to result in a permanent set in the conductor.

08.06 **Aluminium Binding Stirrups**

08.07 **Physical Characteristics**

The following types shall be required :

Intermediate pole binding stirrups for 33 KV and 11 KV; and

Light angle pole binding stirrups for 33 KV and 11 KV.

It shall be the responsibility of the bidder to ensure that the stirrups match the insulators.

Each aluminium stirrup shall be made of a 7 mm diameter aluminium rod complying with ISO 209-1/2.

The tensile strength of the stirrups shall be between 135N/mm^2 and 170 N/mm^2

08.08 **Fabrication**

Stirrups shall be cold formed on a suitable mandrel such that the bends are smooth and the surfaces free from indentations.

The stirrups for intermediate positions shall be formed through the following steps:

The U shape shall be formed first around a mandrel of the appropriate diameter;

The 90^0 bend in one plane and 45^0 bend in the other plane shall then be formed simultaneously with the ends of the rod free. This is to ensure that torsion stresses are not induced in the material during this forming operation; and

The legs shall then be formed through 45^0 and finally the ends of the stirrup shall be bent through 90^0.

08.09 **Inspections and Tests**

The binding stirrups shall be inspected for surface indentations and irregularities. All bends shall be smooth and even.

08.10 **Semiconducting Tape**

08.11 **Physical and Other Characteristics**

The semiconduting tape shall be used to relieve 11 KV PVC covered conductor from electrical stress at insulator positions.

This tape shall be a soft, semiconducting, ethylene propylene rubber based, high voltage tape, used for binding 11 KV PVC covered conductor.

The semiconducting tape shall be non vulcanizing stable at temperatures upto 130^0 C, highly resistant to cracking, moisture and ultra violet radiation, unaffected by vibration and compatible with hydrocarbon and chlorinated solvents.

In addition, it shall be a semiconducting, self amalgamating tape, highly conformable to irregular shapes and compatible with solid dielectric cable insulation.

Specifically, the type offered shall be suitable for use with the 11 KV PVC covered conductors : AAA conductors and it shall comply with IEC 502 or equivalent.

The tape shall be indelibly and legibly marked along its length with a suitable legend, such as, "caution: semiconducting". The tape shall be suitable for outdoor locations exposed to severe climatic conditions including ultraviolet rays, rain and wind. The tape shall have the characteristics shown in the following table.

Characteristics	**Characteristic Value**
Physical	
Thickness	0.75 mm
Tensile strength	1.00 kg/cm^2
Elongation	800 %

Normal conditions temperature	90^0 C
Emergency conditions temperature	130^0 C
Electrical	
Ac resistivity	750 ohm-cm
Dc resistivity	750 ohm –cm
Maximum capacity	5 mA

In addition, all these tapes shall be ozone resistant (even when stretched 500%), they shall be resistant to ultraviolet radiation and they shall be compatible with ketones and hydrocarbon and chlorinated solvents.

09.00 **Inspection and Tests**

The semiconducting tapes shall be tested in accordance with ASTM D 1000: Test methods for pressure sensitive, adhesive coated tapes used for electrical and electronic applications, or equivalent.

09.01 **Anticorrosive Tape**

This tape shall be used to protect bimetal connections from the ingress of moisture and to seal the ends of PVC covered conductor. Therefore, the anticorrosive tape offered shall retain its composition and plasticity over a wise temperature range

The anticorrosive tape shall be non cracking and non hardening and shall not be affected by vibration. The tape shall be highly impermeable to water and highly resistant to mineral acids, alkalis and salts.

In general, the anticorrosive tape offered shall comply with IEC 454 or equivalent.

09.02 **Markings**

The tape cores shall be marked with :i) the manufacturer's name or trademark ; and ii) the product reference.

10.00 **STAY ASSEMBLIES**

The stay assemblies are required for 33 KV, 11KV & L.V Line.

It will be the bidder's responsibility to ensure that the stay assembly and each of the components offered in this bid are capable of supporting the loads generated, as per the bidder's line design, by wind acting on the pole and by conductor tension for maximum wind span and worst design conditions, for all pole duties and for all permitted line deviations and stay angles.

The designs should be such that the number of stays used on any structure shall be kept to a minimum and in any event shall not be more than three for all structures except double end structures and section structures.

10.01 **Stay wire**

10.02 **Design**

The stay wire must be so designed and manufactured that it will withstand satisfactorily the thermal, mechanical and environmental stress to which it will be subjected during installation and throughout its lifetime in service on the employer's electrical networks. They stay wire covered by this specification is required for use on stays from concrete and steel poles on the Employer's overhead distribution networks. It may be used in localities close to the sea and where service corrosion conditions

apply. Stay wires shall comply with the requirements of IS:2141 for Grade 4 steel wire. The minimum failure load shall be no less than the values shown in the following tables.

10.03 **Minimum Breaking Load**

Type of wire	Number of wires and construction	Nominal Wire diameter (mm)	Minimum breaking load of single wire before stranding KN	Minimum breaking load of the stranded wire KN
Grade 4	7 (6/1)	4.00	8.79	58.45

10.04 **Manufacture**

The stay wire in this specification shall be drawn from steel which shall conform to BS 183 or IS-2141:1992. Galvanising shall comply with the requirements of IS 4826 for Heavy Coating or IEC 888 Class 2. The coating shall not be less than 490 g/m^2.

The wire shall be stranded galvanized steel wire, comprising seven wires, each having a nominal diameter of 4.0 mm.

Each wire shall be circular in section and shall contain no weld, joint or splice whatever. It shall be free from any scale, inequalities, spills, splits or any other defects.

Each wire shall be completely and smoothly galvanized before stranding . The stranding shall be carried out in such a way that if an evenly distributed pull is applied at the ends of the completed strand, each wire shall take an equal share of the pull.

The lay of the wires shall be right handed. The length of lay, which shall be defined as the axial length of one complete turn of the helix, shall be 12 to 18 times the strand diameter.

10.05 **Stay wire Coils**

Normally, the stay wire shall be smoothly and uniformly coiled in standard 100 m coils with a tolerance of + 5%.

The coils shall have a minimum diameter of 520 mm. To prevent damage during transportation, handling or storage, the coils shall be lagged with paper and hessian or with hessian laminated paper, or in other alternative manner suggested by the contractor at the time of bidding and demonstrably safe.

10.06 **Labeling**

Each coil shall be clearly labeled with a metallic tag securely attached to the inner part of the coil and marked with the following information :

- Manufacture's name;
- Size of wire;
- Length of wire in meters ; and
- Weight of wire in kilograms.

11.00 **Pole Brackets**

The pole bracket shall be made of mild steel to grade 43A conforming to ISO/R/ 630/1967 or IS –2062:1992 and galvanized in accordance with the section on Surface Treatment in this specification. Pole brackets shall be suitable for use on steel or concrete poles. The minimum strength of the bracket shall be equal to the design breaking load of the stay wire.

All bolts, nuts and washers shall be supplied with the stay assemblies, and shall conform to the requirements. Bolts shall have a metric thread and a 20 mm diameter.

11.01 **Stay thimbles**

Stay thimbles shall be made of mild steel, crescent shaped, steel bar conforming to ISO/R/630/1967 or IS-2062:1992 and galvanized in accordance with specification. The minimum strength of the thimble shall be equal to the design breaking load of the stay wire.

Thimbles shall have no sharp points and will normally supplied closed, in position with the fittings to which they are associated.

11.02 **Stay rods**

Stay rods shall be made of a steel bar of grade 43A, complying with ISO/R/630/1967 or IS –2062:1992 and galvanized in accordance with the specification.

The stay rod shall be adjustable by means of a turnbuckle complying with BS 4429 and shall be supplied complete with one lock nut and two thimbles. The tube portion of the turnbuckle shall be manufactured from heavy gauge steel tube, complying with BS 1387. The threads shall be cut to BS 3643, coarse pitch.

Alternatively a fixed length stay rod with eye end may be supplied, in which case a separate turn buckle shall be supplied. The turn buckle shall be of the type shown in Sketch in this specification.

The stay rod shall come with a steel plate for bearing on the stay block. The steel plate shall be made to ISO/R/630/1967 or IS – 2062: 1992 and galvanized in accordance with the specification.

The minimum strength of the say rod shall be equal to the design braking load of the

stay wire. The stay rod shall be at least 1800 mm long.

12.00 **Bolts and Nuts**

All bolts, nuts and washers shall conform to the section on Bolts and Nuts in the specification.

12.01 **Tests**

12.02 **Stay wire**

Sampling of stay wire shall be in accordance with IS – 2141

The wires shall be subjected to the following tests before manufacture and in accordance with BS 443, BS 4545 and IS –2141 : 1992

- Ductility test
- Tolerance on wire diameter
- The completed strand shall be tested as follows and in accordance with BS 443, BS 4545 and IS – 2141: 1992, IS 4826
- Tensile and elongation test
- Chemical analysis
- Galvanising test

The results of the tests shall conform to the values given in the following table

12.03 **Measurements and Tests for Stay Wire**

Description	**Required Value (Grade 4)**
Nominal size of stay wire:	7/4.00 mm
Nominal Diameter of Individual Wires :	4.00 mm
Minimum Diameter of Individual Wires :	3.90 mm
Maximum Diameter of Individual Wires:	4.10 mm
Minimum ultimate tensile strength of individual wires	700 N
Minimum percent elongation at rupture before stranding	5%
Minimum percent elongation at rupture after stranding	4.25%
Wrapping test for ductility : Turns on and off its own diameter	8
Lay ratio of finished strand	19 to 21
Minimum weight of zinc coating before stranding	490 g / mm^2
Minimum weight of zinc coating after stranding	475 g/ mm^2
Chemical test : Sulphur and phosphorus content	Less than or equal to 0.060 % each

TECHNICAL SPCIFICATION FOR 11 KV 400 AMPS 3 POLE AB SWITCH.

01.00 **SCOPE:-** This specification covers manufacturing testing and supply of 11 KV 400 AMPS 50 Hz Air Break switches for out door installation in horizontal configuration. The switches are suitable for operation under off load conditions only and are intended for use on Distribution Sub- stations and tapping sectionalizing points of 11 KV lines.

02.00 **DESCRIPTION OF THE MATERIALS:-**

The 11 KV A.B. Switch sets shall confirm to the following parameters:-

i) Number of poles	3
ii) Number of Post insulator per pole	2 nos. 12 KV post insulator
iii) Nominal system voltage	11 KV
iv)Highest System Voltage	12 KV
v) Rated frequency	50 Hz
vi) System earthling	effectively earthed.
vii) Rated nominal current	400 amps
viii) Altitude of installation.	Not exceeding 1000 M

The post insulators used in the A.B. Switches shall have the following ratings

i) Power frequency withstand voltage (dry).	35 KV (RMS)
ii) Power frequency withstand voltage(wet)	35 KV(RMS)
iii) Impilse withstand voltage (dry)	75 KV peak
iv) Power frequency puncture withstand voltage.	1.3 times the actual dry Flashover voltage of the unit

03.00 **STANDARDS:-** The AB Switch Set shall conform to the following standards:-

a) IS-9920 (Part-I to V.)
b) IS-2544/1973 (for porcelain post insulators)
c) IS-2633, (for galvanisation of ferrous parts.) or its latest amendments if any.

04.0 **INSULATOR MAKE:-**

1. 12 KV post Insulators complete with post and cap duly cemented to be used in the AB Switch Set conforming to IS-2544/1973

The tenderer shall furnish the type test certificate of the post insulators from their manufacturer for reference and scrutiny.
The tenderers shall mention make, type of insulation materials, metal fittings, Creepage distance, protected Creepage distance, tensile strength, compression strength, torsion strength and cantilever strength.

05.00 **CLIMATIC CONDITIONS:-** The A.B. Switch set shall be suitable for operation under the following climatic conditions.

1.	Maximum ambient air temperature.	45 ^{0} C
2.	Maximum daily average air temperature	35 ^{0} C
3.	Maximum yearly average ambient air temperature	30 ^{0} C
4.	Maximum temperature attainable by a body Exposed to the sun.	50 ^{0} C
5.	Minimum ambient air temperature	o ^{0} C
6.	Maximum relative humidity.	100%
7.	Minimum number of rainy days per annum	70
8.	Average number of rainy days per annum	120
9.	Average annual rain fall.	150 cm.
10.	Number of months of tropical monsoon conditions	4
11.	Maximum wind pressure.	260 Kg./ mm^2
12.	Degree of exposure to atmospheric pollution.	Normally polluted atmosphere.

06.0 **TECHNICAL DETAILS:-**

6.1 General:- The 11 KV A.B. Switch Set shall be the gang operated rotating single air break type having 2 post insulator per phase.. The operating mechanism shall be suitable for manual operation from the ground level and shall be so designed that all the three phases shall open or close simultaneously. The Switches shall be robust in construction, easy in operation and shall be protected against over travel or straining that might adversely effect any of its parts. The required base M.S. Channel (hot dip galvanised) phase coupling rod, operating rod with intermediate guide braided with flexible electrolytic copper, tail piece of required current carrying capacity and operating mechanism with 'ON' & 'OFF' positions shall be provided. The operating rod shall be medium gage of 32mm diameter nominal bore G.I. pipe single length 6 meters. The phase coupling rod for gang operation shall be of medium gauge 25mm dia nominal bore G.I. Pipe. The Rotating post insulators shall be provided with suitable bearing mounted on a base channel with 8 mm dia thrust coller and 6mm split pin made out of stainless steel. The operating down rod shall be coupled to the spindle (minimum dia - 32mm) for gang operation through another suitable bearing by two numbers 10mm dia stainless steel bolts with double nuts. All the bearings shall be provided with grease nipples. All metal (ferrous) parts shall be galvanised and polished.

The pipe shall be galvanised in accordance with IS-4736/1968. The post insulators should be fixed with the base channel using Galvanised Nuts and Bolts.

06.01 Mounting:- The A.B. Switches shall be suitable for horizontal mounting in double pole sub-station structures.

06.02 Switching Blades:- It shall be made out of electrolytic copper with silver plated. The approximate size shall be 220mm x 50 x 8mm.The switch shall have such a spring mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation.

06.03 Fixed Contracts:- The fixed jaw type female contracts shall be made of electrolytic copper (minimum 95 % copper composition) duly electroplated controlled by Phospher bronze high pressure spring housed in roubust G.I. Cover.

06.04 It is essential that provision shall be made in fixed female contracts to take the shock arising from the closing of moving contract blade without the same being transmitted to the post insulator. The arrangement made in this regard shall be specifically shown in the drawing.

06.05 Arcing Horn:- As the switches are generally meant for isolating transmission line and distribution transformers, suitable arcing horns shall be provided for breaking the charging current horn shall be made of 10 mm dia G.I. Rod with spring assisted operation.

06.06 Terminal Connectors:- Terminal connectors shall be robust in design. The size of fixed connector shall be (80 x 50 x8 mm) and size of movable connector shall be of (80 x 50) x (80 x 50) x 8 mm of copper casting with uniform machine finishing duly silver plated made out of minimum 95 % copper composition with 2 nos. 12 mm dia holes provided with suitable brass bolts and double nuts, flat washers & 2 nos. biometallic solderless sockets suitable upto 80 mm^2 conductor.

06.07 Spacing:- The minimum clearance between phase to the switch shall be 760 mm. The operating down rod shall be at a transverse distance of 300 mm from the outer limb of the switch. The centre spacing between two post insulators of the same phase shall be 380 mm. In the open position of the A.B. Switches the moving blade shall rotate through 90^0. This shall be exhibited in the drawing.

06.08 Sample, Drawing & Literatures:- Samples of each item 11 KV 400 amps. A.B. Switch shall be furnished and three copies of drawings item similar to the sample shall be furnished alongwith the tender.

The details of construction and materials of different parts of the A.B. Switch shall clearly be indicated in the tender and illustrative pamphlet/ literature for the same shall be submitted along with the tender.

07.00 **TESTS & TEST CERTIFICATE:-**

Type Test:- Certificates for the following type tests conducted within five years proceeding to the date of opening of tender) on a prototype set of A.B Switch in a Govt. Approved Testing Laboratory preferably at CPRI Bangalore shall have to be submitted for reference.

Dielectric Test(impulse and one minute wet power frequency withstand voltage test.)

- Temperature rise test (for contracts and terminals)
- Short Time current and peak withstand current test.
- Mainly active load breaking capacity test.
- Transformer off-load breaking capacity test
- Line charging breaking capacity test
- Cable charging breaking test
- Operation and mechanical endurance test
- Mechanical strength test for post insulator, as per Is-2544/1973 shall be furnished.
- Test for galvanisation of metal (ferrous) parts.

Routine Tests:- The following routine tests shall have to be conducted on each sets and results are to be furnished for consideration of deputing inspecting officer for inspection and conducting testing of the materials.

1. Power frequency voltage dry test.
2. Measurement of resistance of main circuit
3. Tests to prove satisfactory operation.
4. Dimension check
5. Galvanisation test.

08.0 **GUARANTEED TECHNICAL PARTICULARS:-**

The tenderer shall furnish the guaranteed technical particulars duly filled in the proforma along with the tender.

09.00 **COMPLETENESS OF EQUIPMENT:-**

All fittings, accessories or apparatus which may not have been specifically mentioned in this specification but which are usual or necessary in equipment of similar plant shall be deemed to be included in the specification and shall be supplied by the Tender without extra charge. All plant and equipment shall be completed in all details whether such details are mentioned in the specification or not.

10.00 **INSPECTION:-**

Routine tests shall be conducted at the place of manufacturer. The tenderers are requested to furnish details of equipment which will be used for testing alongwith tender. The tenderers of those manufacturers who do not have adequate testing facilities for conducting routine and acceptance test are liable for cancellation. The successful bidder has to furnish routine test certificate and guaranteed certificate for approval prior to offer of materials for inspection for each consignment of offer.

TECHNICAL SPECIFICATION FOR 11 KV 200 AMP THREE POLE

H.G. FUSE SETS.

01.00 SCOPE: - This specification covers the manufacture, testing and supply of 11 KV, 200 Amps 3 pole, H.G. Fuse Sets.

02.00 (a) The 11 KV H.G. Fuses shall be suitable for out door operation in horizontal configuration under the climatic conditions specified. It shall be of the following ratings:-

1.	Number of Poles	3
2.	No. of insulator per pole	2 nos. 12 KV post insulators
3.	Nominal system voltage	11 KV
4.	Highest system voltage	12KV
5.	Rated frequency	50 Hz
6.	System Earthing	Effectively earthed
7.	Rated normal current	200 Amps
8.	Altitude of installation	Not exceeding 1000 M.

The post insulator used in the H.G. Fuse set shall have the following ratings:-

1.	Power frequency withstand voltage (dry)	35KV (RMS)
2.	Power frequency withstand voltage (wet)	35 KV (RMS)
3.	Impulse withstand voltage (dry)	75 KV (Peak)
4.	Power frequency punctures Withstand voltage	1.3 times the actual dry flashover voltage of the unit.

03.00 **STANDARDS:-**

The H.G. Fuse set shall conform to the following standards.

IS-9385-1980 (for high voltage expulsion fuses and similar fuses)

IS-2544-1973 (for porcelain post insulators or its latest amendments if any

IS-2633-1979 (for Galvanization of ferrous parts)

04.00 **INSULATOR MAKE:**-12 KV post insulator complete with pedestal cap duly cemented to be used in 11 KV H.G. Fuse sets confirming to IS-2544/1973

05.00 **TECHNICAL DETAILS:-** The H.G. Fuses shall have adjustable arcing horns made of solid copper rod having 7.62 mm dia. The horns shall be fitted with screwing devices with flynuts for fixing and tightening the fuse wire. It shall have robust terminal connector 5s of size 80mm x50 mm x 6 mm made of copper casting (95% minimum copper composition) duly silver plated with two numbers of 12mm dia brass bolts and double nuts with flat brass washers. The connector should be capable of connecting crimpable conductor up to 80 Sq.mm. size (ACSR/Alloy) with bimetallic solder less sockets .The H.G. Fuse Set shall suitable for horizontal mounting on sub-station structures. The minimum clearance between the adjacent phases of the fuse set shall be 760 mm and the center to center (distance between two post insulators of the same phase) shall be 410 mm. All metal (ferrous) parts shall be galvanized and polished. Only 12 KV post insulator (original cemented and not pin insulators shall be used for the H.G. Fuse Set.

06.00 **CLIMATIC CONDITIONS: -** The H.G. Fuse Set shall be suitable for operation under the following climatic conditions:-

1	Maximum ambient air temperature.	45 ^{0} C
2	Maximum daily average air temperature	35 ^{0} C
3	Maximum yearly average ambient air temperature	30 ^{0} C
4	Maximum temperature attainable by a body Exposed to the sun.``	50 ^{0} C
5	Minimum ambient air temperature	0 ^{0} C
6.	Maximum relative humidity.	100%
7.	Average number of thunderstorm days per annum	70 days
8.	Average number of rainy days per annum	120
9.	Average annual rain fall.	150 cm.
10.	Number of months of tropical monsoon conditions	4
11.	Maximum wind pressure.	260 Kg./ mm^2
12.	Degree of exposure to atmospheric pollution.	Normally polluted atmosphere.

07.00 **TESTS & TEST CERTIFICATE:-** Certificate for the following type test conducted (within 5 years preceding to the date of opening of Tender) on a prototype set of H.G. Fuse set in a Govt. approved Testing Laboratory preferably at CPRI, Bangalore shall have to be submitted for reference and Scrutiny.

1. Dielectric test (impulse & one minute wet power frequency withstand voltage test.)
2. Temperature rise test (for terminals).
3. Mechanical strength test for the post insulator as per IS-2544/1973.
4. Test for galvanization of metal (ferrous) parts.

08.00 **ROUTINE TESTS: -** The following routine tests shall have to be conducted on each test and results are to be furnished for consideration for acceptance of deputing inspecting Officer for inspection & conducting testing of the materials.

1. Power frequency voltage dry test.
2. Dimension check
3. Galvanization test.

d) GUARANTEED TECHNICAL PARTICULARS: - The tenderers are required to furnish the guaranteed technical particulars duly filled in the proforma along with the tender.

e) COMPLETENESS OF EQUIPMENT: - Any fittings accessories or apparatus which may not have been specifically mentioned in this specification but which are usually necessary in equipment of similar plant shall be deemed to be included in the specification and shall be supplied by the Tenderer without extra charge. All plant and equipment shall be complete in all details whether such details are mentioned in the specification or not.

f) INSPECTION:- Routine and acceptance test shall be conducted at the place of manufacturer. The tenderers are requested to furnish details of equipment which will be used for testing along with tender. The tenders of these manufacturers who do not have adequate testing facilities for conducting routine and acceptance test are liable for cancellation. The successful bidder has to furnish routine test certificate and guarantee certificate for each consignment of materials to be inspected at the time of offer of materials for inspection.

g) NATURE OF PRICE:- The nature of price shall be " FIRM " .

TECHNICAL SPECIFICATION FOR 11 KV SURGE ARRESTOR (L.A)

01.00 **SCOPE**

This Specification covers Design, Engineering, Manufacture, testing, inspection before dispatch, forwarding, packing, transportation to site, Insurance (both during transit & storage), Storage, Erection, Supervision, testing and commissioning of 11 KV Surge Arrestor (L.A) for use in the networks of TPNODL, Odisha.

The equipment offered shall have been successfully type tested and the design shall have been satisfactory operation for a period not less than two years on the date of bid opening. Compliance shall be demonstrated by submitting with the bid, (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

The scope of supply includes the provision of type test, Rates of type tests shall be given in the appropriate price schedule of the bidding document and will be considered for evaluation.

The Surge Arresters shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer.

02.00 **STANDARDS**

Except where modified by the specification, the Surge Arresters shall be designed, manufactured and tested in accordance with the latest editions of the following standards.

IEC/ISO/BS	IS	Subject
IEC 99 – Part-1	IS 3070- Part 1	Non linear resistor gapped surge arresters for a.c. systems.
IEC 99- Part 4	IS 3070- Part 3	Metal-oxide surge arresters without gaps for a.c systems.
	IS 5621	Hollow insulators for use in electrical equipment.
IEC 233		Tests on hollow insulators for use in electrical equipment.
IEC 270		Partial discharge measurement
IEC 455		Guide for solvent less polymerisable resinous compounds used for electrical insulator.
IEC 815	IS 13134	Guide for selection of insulators in respect of polluted conditions.
BS 729 ISO 1460,	IS 2629, IS 4736 IS 2633	Hot dip galvanizing. Method of testing uniformity of zinc coated articles.

This list is not be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Contractor of the necessity of providing the goods complying with other relevant standards or recommendations.

03.00 **TECHNICAL**

The Station Class Surge Arrestor shall be heavy duty, metal oxide, gapless type generally for installation on the 11 KV sides of 11 KV Primary substations and 11/0.4 KV Distribution Substation.

The performance requirements are as follows:

Performance Characteristics of Surge Arresters

Nominal System Voltage	**11 KV**	**33 KV**
Class	**Station Class**	**Station Class**
• Arrestor voltage rating	12 KV	30 KV
• Rated frequency	50 Hz	50 Hz
• Continuous operating voltage, rms	9.6 KV	24 KV
• Leakage current through arrestor at operating voltage	Less than 1 mA	Less than 1mA
• Long duration discharge class	Class 2	Class 2
• Nominal 8/20μs discharge current – peak	10 kA	10 kA
• Maximum Lightning impulse residual voltage with 8/20μs discharge current peak	32KV(31KV*)	85KV (78 KV*)
• Maximum switching impusse residual voltage peak	28 KV (24 KV*)	70 KV (60 KV*)
• Maximum residual voltage with steep current peak	38 KV (34 KV*)	93 KV (85 KV*)
• High current impulse test value (4/10μs wave)	100 KA	100 KA
• Insulator housing impulse withstand voltage, 1.250μs wave-peak	41.6 KV	110.5 KV
• Insulator housing power frequency voltage withstand capability for one minute (wet) – peak	29.68 KV	74.2 KV
• Minimum creepage distance of insulator	380 mm	900 mm
• Minimum protected creepage distance	Not Applicable	450 mm

* Figures shown in bracket are preferred ratings. Insulation withstand voltage of arrester housing shall be related to the residual voltages in accordance with clause 5.1 of IEC : 99.4

04.00 **GENERAL CONSTRUCTIONAL FEATURES**

The surge arresters shall be single phase gapless units suitable for outdoor installation. They shall consist of non- linear blocks of metal oxide assembled in series in hollow porcelain or polymer insulator housings. Bidder shall offer either porcelain or polymeric insulators with the equipment.

04.01 **Springs**

In order to arrest the longitudinal vibrations, sturdy spring assemblies are to be provided on either end of the metal oxide stacks inside the arresters.

04.02 **Galvanizing**

All ferrous parts excluding the springs shall be of steel casting and hot dip galvanized with heavy coating as set out in the section on Surface Treatment.

04.03 **Base and mounting**

The station class surge arresters shall be complete with fittings suitable for mounting in a vertical position on mild steel channels.

The drawing showing the mounting arrangement shall be submitted with the bid and the arrangement shall be subject to approval of the S.E,Electrical Circle,Bhadrak

04.04 **Other features**

- Live parts shall be designed to avoid sharp point edges and other corona producing surfaces as far as possible.
- Hermetic sealing shall be provided to prevent ingress of moisture. The sealing shall not be affected during the maximum line discharge current over the life of the arrester which shall be 25 years minimum.
- **Disconnections are not required with the arresters.**

05.00 **INSULATOR HOUSING**

The housing of the arrester packs which are under continuous electrical stress shall be brown glazed hollow porcelain or polymeric insulator. The creepage and flashover distances of the insulators shall be dimensioned and the type and profile designed in accordance with IEC :815; IS:13134 and shall be suitable for the worst environmental conditions. The creepage distance to earth shall suit the outdoor service conditions mentioned in the relevant standards for heavily polluted atmosphere and shall not be less than 900 mm in case of 33 KV and 380 mm in case of 11 KV surge arresters. The projected creepage distance of the insulators of 33 KV arresters shall be minimum 450 mm. The internal surfaces of hollow porcelain insulators shall also be glazed.

All porcelain used on the surge arresters shall have the following properties: high strength, homogeneity, uniform glaze, free from cavities and other flaws and high quality uniform finish. Porcelain components shall withstand the maximum expected static and dynamic loads to which the surge arresters may be subjected during their service life. Porcelain insulators shall conform to IS 5621 and shall be subjected to and successfully pass the tests listed in this standard and in IEC 233.

If polymeric insulators are offered, they shall conform to the requirements of the relevant parts of IEC : 455.

06.00 **TERMINATION**

The surge arresters shall be supplied with electrical connection terminals on the top of size and rating appropriate for all the duties, including overload duty specified for the equipment. The terminals shall be of the bi-metallic type, suitable for connection of all aluminum alloy conductor (AAAC) or aluminum conductor steel reinforced (ACSR). The 33 KV and 11 KV station class arresters shall have terminals suitable for 55 MM^2 to 232 MM^2 or Panther ACSR. In general connections using palm type solder less sockets shall be preferred. Where the terminals are of the clamp type, they shall be suitable for taking a range of conductors.

All nuts , bolts, washers and spring washers required to complete the connection shall be supplied with the equipment.

The proposed method of connection shall be stated in the offer.

06.01 **Earthing terminal**

An earthling terminal adequate for the full rated discharge current having clamping bolts complete with nuts, washers and spring washers shall be provided on the base of the arrester.

The earthling terminals shall be identified by means of appropriate symbol marked in a legible and indelible manner adjacent to the terminals.

07.00 **PRESSURE RELIEF DEVICE**

The 33 KV station class surge arresters with porcelain housings shall be fitted with pressure relief device class 20(B) as defined in IEC : 99- Part 1, to relieve excessive internal pressure in the event of arrester's failure to prevent explosive shattering of porcelain causing damage to the nearby equipment and operating personnel. In the even of such an explosion and the shattering of the porcelain housing, the parts shall fall within the radius stipulated in IEC : 99 – Part 1.

The 11 KV arresters shall be fitted with pressure relief devices as under:

Station Class - 10 (C)

08.00 **PARTIAL DISCHARGE**

The intensity of partial discharge of the surge arresters shall not exceed 50 pico coulomb (PC) at 1.05 times the continuous operating voltage;

09.00 **RATING PLATE**

Each surge arrester shall be provided with a non ferrous nameplate, fixed in a suitable location on the arrester and bearing the following information, in a legible and indelible manner:

- Manufacturer's name and Trade mark

- Employer's name

- Type and identification of arrester;
- Year of manufacturer;
- Rated Voltage;
- Continuous operating voltage;
- Nominal discharge current;
- Pressure relief class;
- Long duration discharge class or duty type;

10.00 **TESTS**

10.01 **Type Tests**

The type tests are required in conformity with IEC: 99-4; IS:3070-3 and other relevant standards. The tests shall include the followings

- Insulation withstand tests, including lightning impulse voltage withstand test and power frequency voltage withstand test;

- Residual voltage tests, including steep current impulse residual voltage test, lightning impulse residual voltage test and switching impulse residual voltage test (for 10 KA station class only) :

- Long duration current impulse withstand test;

- Operating duty tests, including accelerated ageing test, heat dissipation behaviour test, high current impulse operating duty test, switching surge operating duty test (for 10 KA station class only) and tests to evaluate thermal stability;

- Pressure relief tests, including high current pressure relief test and low current pressure relief test as per IEC: 99-1;

- Seal leakage test. The bid shall describe the sensitive checking method adopted by the manufacturer.

- Partial discharge tests;

- Temperature cycle test on porcelain housing;

- Porosity test on porcelain housing;

- Hot dip galvanizing test;

- Mechanical strength test of porcelain housing;

10.02 **Acceptance tests**

Acceptance tests shall be carried out, in conformity with IEC 99-4, on the nearest lower whole number to the cube root of the number of surge arresters to be supplied. The tests shall include the following :

- Measurement of power frequency voltage on the complete arrester at the reference current measured at the bottom of the arrester;

- Lightning impulse residual voltage on the complete arrester at nominal discharge current or at a suitable lightning impulse value, depending on the manufacturer's choice of routine test procedure;
- Partial discharge test;
- Temperature cycle test on porcelain housing;
- Porosity test on porcelain housing;
- Mechanical strength test on porcelain housing;
- Hot dip galvanizing test.

10.03 **Routine Tests**

The minimum requirement for routine tests shall be :

- Visual examination
- Measurement of reference voltage
- Residual voltage test for lightning impulse current in the range between 0.01 and 2 times the nominal discharge current;
- Check for satisfactory absence from partial discharges and contract noise, in conformity with IEC 270;
- Leakage current tests;
- Leakage check on the housing seals;

Standard Technical Specification for 1-Ph meters

A) Single Phase meter (5-30 Amps) & (10-80Amps) for BPL Consumer & DT meter respectively .

1. SPECIFICATION OF SINGLE PHASE STATIC ENERGY METERS

Sr. No.	Function /Feature	Technical Requirements
1.1	Voltage	240 volt (P-N), +20% to -40% Vref, however the meter should withstand the maximum system voltage i.e. 440 volts continuously.
1.2	Display	a) LCD (Six digits) b) Height: 10 mm X 6 mm min. c) Pin Type d) Viewing angle min. 160 degrees
1.3	Power factor range	Zero lag –unity- zero lead
1.4	Display parameters	a) Display parameters : LCD test, KWH, MD in KW, Date & Time (Cumulative KWH will be indicated continuously by default & other parameters through push-button)

Sr. No.	Function /Feature	Technical Requirements
		b) Display order shall be as per Annexure-1
1.5	Power Consumption	Less than 1 Watt & 4VA in Voltage circuit and 2 VA for Current circuit
1.6	Starting current	0.2 % of Ib
1.7	Frequency	50 Hz with + / - 5% variation
1.8	Test Output Device	Flashing LED visible from the front
1.9	Billing data	a) Meter serial number, Date and time, KWH, MD in KW, History of KWH, & MD for last 6 months. b) All the above parameters (namely KWH, MD in KW) are meter readings. c) All these data shall be accessible for reading, recording and spot billing by downloading through **IR porT** on universal MRI or Laptop computers at site.
1.10	MD Registration (KW)	a) Meter shall store MD in every 15 min. period along with date & time. At the end of every 15 min, new MD shall be previous MD and store whichever is higher and the same shall be displayed.
1.11	Auto Reset of MD	Auto reset date for MD shall be indicated at the time of finalizing GTP and provision shall be made to change MD reset date through MRI even after installation of meter on site. Default resetting date is 00:00 hrs, 1st of every month.
1.12	TOD metering	Not applicable.
1.13	Security feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, communication write etc
1.14	Memory	Non volatile memory independent of battery backup, memory should be retained up to 10 year in case of power failure
1.15	Software & communication compatibility	a) IR port to transfer the data locally through CMRI or lap top. b) The Supplier shall supply Software required for CMRI. The supplier shall also provide training for the use of software. The software should be compatible to Microsoft Windows systems (Windows 98 system). c) The Supplier shall provide meter reading protocols. Vendor to jointly work with BSES IT team to develop PDS/CMRI software for meter downloading and further uploading on computer. **The vendor has to give an undertaking in this regards.**

Sr. No.	Function /Feature	Technical Requirements
1.16	Climatic conditions	a) Refer IS: 13779 for climatic conditions. b) The meter should function satisfactorily in India with high end temperature as 60ºC and humidity up to 96%.

2.CONSTRUCTIONAL SPECIFICATIONS

Sr. No.	Parameters	Technical Requirements
2.1	Body of Meter	a) Top transparent and base opaque material polycarbonate UV stabilized. b) Front cover & base should be ultrasonically welded. Top cover should be designed so as the internal components should not be visible.
2.2	Terminal Block	Made of polycarbonate Grade 500R or equivalent bakelite, brass or copper current terminals with flat-head brass screws.
2.3	Terminal cover	Transparent terminal cover with provision of sealing through sealing screw.
2.4	Diagram of connections	Diagram of external connections to be shown on terminal cover
2.5	Marking on name plates	Meter should have clearly visible, indelible and distinctly name plate marked in accordance with IS & DISCOM specifications. Prior approval of name plate design to be taken before product supply.
2.6	Meter Sealing	Supplier shall affix one Buyer seal on side of Meter body as advised and record should be forwarded to Buyer. Sealing shall be as per IS 13779 amendment and CEA guidelines.
2.7	Guarantee / Warranty	5 Years.
2.8	Insulation	A meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
2.9	Resistance of	The terminal block and Meter case shall have safety against the spread of fire. They shall not be ignited by

Sr. No.	Parameters	Technical Requirements
	heat and fire	thermal overload of live parts in contact with them as per the relevant IS 13779.

TAMPER & ANTI-FRAUD DETECTION/EVIDENCE FEATURES

3.1 Tamper Conditions:

The meter shall not get affected by any remote control device & shall continue recording energy under any one or combinations of the following conditions:

Sr. No.	Tamper condition	Meter behavior
3.1.1	I/C & O/G Interchanged	Meter should record forward energy
3.1.2	Phase & Neutral Interchanged	Meter should record forward energy
3.1.3	I/C Neutral Disconnected, O/G Neutral & Load Connected To Earth.	Meter should record forward energy
3.1.4	I/C Neutral Disconnected, O/G Neutral Connected To Earth Through Resistor & Load Connected To Earth.	Meter should record forward energy
3.1.5	I/C Neutral connected, O/G Neutral Connected To Earth Through Resistor & Load Connected To Earth.	Meter should record forward energy
3.1.6	I/C (Phase & Neutral) Interchanged, Load Connected To Earth.	Meter should record forward energy
3.1.7	I/C & O/G (Phase or Neutral) Disconnected, Load Connected To Earth.	Meter should record forward energy

During neutral missing mode starting test will be done at 2A and accuracy shall be within 5% at Ib and above.

3.2 Influence Parameters

The meter shall work satisfactorily with guaranteed accuracy limit under the presence of the following influence quantities as per IEC: 1036 and CBIP Technical Report No: 88 with latest amendment:

External magnetic field *

a) Electromagnetic field induction,
b) Radio frequency interference,
c) Vibration etc,
d) Waveform 10% of 3rd harmonics,
e) Voltage variation,
f) Electro magnetic H.F. Field,
g) D.C. immunity test,

External magnetic field * test will be done as IS for AC abnormal field and at 0.5Tesla for

DC magnetic field.

4.0 COMPONENT SPECIFICATIONS

Ser No	Component Function	Requirement	Makes and Origin
4.1	Current Transformers/ Shunt	The Meters should be with the current transformers/ Shunt as measuring elements. The current transformer should withstand for the clauses under 5.2.h	The current transformer/ Shunt should withstand for the clauses under 5.2.h
4.2	Measurement or computing chips	The Measurement or computing chips used in the Meter should be with the Surface mount type along with the ASICs.	USA: Analog Devices, Cyrus Logic, Atmel, Phillips,TDK,TI South Africa: SAMES Japan: NEC
4.3	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	USA: Atmel, National Semiconductors, Texas Instruments, Phillips, ST, Japan: Hitachi or Oki
4.4	Display modules	a) The display modules should be well protected from the external UV radiations. b) The display visibility should be sufficient to read the Meter mounted at	Hong Kong: Genda Singapore: Bonafied Technologies Korea: Advantek

Ser No	Component Function	Requirement	Makes and Origin
		height of 0.5 meter as well as at the height of 2 meters (refer 3.2.d for Viewing angle). c) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type). d) It should be trans-reflective HTN or STN type industrial grade with extended temperature range.	China: Success,China dispaly Japan: Hitachi, Sony
4.5	Communication modules	Communication modules	USA: National Semiconductors, HP, Optonica Holland / Korea: Phillips Japan: Hitachi Taiwan: Ligitek
4.6	IR Port	The mechanical construction of the port should be such to facilitate the data transfer easily.	USA: National Semiconductors ,HP Holland / Korea: Phillips Japan: Hitachi, Taiwan: Ligitek
4.7	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	It should take care of clause 3.1 and 3.5 **NO capacitive supply**
4.8	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	USA: National Semiconductors, Atmel, Phillips, Texas Instruments, Japan: Hitachi, Oki, AVX or

Ser No	Component Function	Requirement	Makes and Origin
			Ricoh Korea: Samsung Taiwan; Yageo; samxon
4.9	Mechanical parts	a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
4.10	Battery	Lithium with guaranteed life of 10 years	Varta, Tedirun, Sanyo or Panasonic, maxwell
4.11	RTC & Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Philips, Dallas Atmel, Motorola, Microchip Japan: NEC or Oki
4.12	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	(BBT test is must)

Note: The components used by manufacturer shall have “Minimum Life” more than the product “Guarantee life” as mentioned in cl 4.7 This hold true even for name plate printing, mechanical component plating, glue of stickers etc. Incase vendor want to use other make components; same shall be approved by Collector & Dist.Magistrate,Bhadrak before use. In general the component life shall be twice the “Guarantee life”.

5.0 GENERAL REQUIREMENTS

5.1 On the meter name-plate:

a) meter serial number should be of 7/8 digits
b) Size of the digit of the meter serial number should be minimum 5mm X 3mm.
c) bar code should be printed next to / below / above the meter serial number
d) BIS registration mark (ISI mark)

5.2 Meter Sr. Nos. to be printed in black on the name plate, instead of embossing.

5.3 Buyer's Serial Number sticker should be fixed on window glass from inside or on Meter front cover of minimum digit size 5 mm X 3 mm.

5.4 Supplier shall supply software suitable for energy measurement & energy spot billing through CMRI.

5.5 The supplier should seal the meter cover. The Buyer shall approve the method of sealing.

5.6 The internal potential links should be in closed position or link less Meters will be preferred and there shall not be any external link.

5.7 Terminal cover should be fixed on Meter before dispatch.

5.8 Box number, Meter serial number, type, rating should be mentioned on cases / cartons.

5.9 Meters shall be suitably packed with environmental friendly material in order to avoid damage or disturbance during transit or handling and to prevent in grace of moisture and dust.

6.0 ANNEXURE 1: DISPLAY SEQUENCE FOR THE PARAMETERS

6.1 Default Display:

1. Cumulative KWH (cumulative KWH to be displayed continuously without decimal)

6.2 On-demand Display:

After using pushbutton the following parameters should be displayed.

1. LCD test
2. Date
3. Real Time
4. Current MD in KW
5. Last month billing Date
6. Last month billing KWH reading
7. Last month billing Maximum Demand in KW
8. Last month billing Maximum Demand in KW occurrence Date
9. Last month billing Maximum Demand in KW occurrence Time
10 Serial No of meter.

Note: The meter display should return to Default Display mode (mentioned above) if the 'push button' is not operated for more than 6 seconds.

History : Last six month cumulative active energy (KWH) .

Last six months maximum demand in KW with occurance date and time

B) Three Phase (20-100 Amps).

1.0 TECHNICAL SPECIFICATION

Sr. No.	Parameters	Technical Requirements
1.1	Voltage	240 volt (P-N), 415 volt (P-P) +20% to -40% Vref.
1.2	Display	a) LCD (Seven digits) b) Height: 10 mm X 5 mm min. c) Pin Type d) Viewing angle min. 120 degrees
1.3	Display parameters	a) Display parameters: LCD test, date & time, cumulative KWH, cumulative KVAH & RKVAH, MD in KW & KVA, PF, V, I (cumulative KWH continuous and other parameter with pushbutton. All the energies are without decimal.) b) Display order shall be as per Annexure-1
1.4	Power factor range	Zero lag –unity- zero lead
1.5	Power Consumption	Less than 1 Watt & 4VA per phase in voltage circuit, 2 VA in current circuit
1.6	Starting current	0.2 % of I_b
1.7	Current range	Higher current range i.e. Imax is acceptable.
1.8	Test Output Device	Flashing LED visible from the front
1.9	Billing data	a) Meter serial number, Date and time, KWH, KVAH, RKVAH, MD in KW and KVA, No. of tamper counts, tamper occurrence with date & time, tamper restoration date & time with snap shots. History of KWH, KVAH, RKVAH & MD for last 6 months along with TOD readings. b) All the above parameters (namely KWH, KVAH, RKVAH, MD in KW

Sr. No.	Parameters	Technical Requirements
		and KVA) are meter readings. c) All these data shall be accessible for reading, recording and spot billing by downloading through optical port on MRI or Laptop computers at site.
1.10	MD Registration	a) Meter shall store MD in every 30 min. period along with date & time. b) It should be possible to reset MD automatically at the defined date (or period)
1.11	Auto Reset of MD	Auto reset date for MD shall be indicated at the time of finalizing GTP and provision shall be made to change MD reset date through MRI even after installation of meter on site.
1.12	TOD metering	Meter shall be capable of doing TOD metering for KWH, KVARH, KVAH and MD in KW and KVA with 6 time zones (programmable on site through CMRI)
1.13	Load survey	30 min integration period, load profile of average voltage and current, KWand KVA for min. 36 days
1.14	Time required for data reading from meter and downloading on desktop PC	Meter data consisting of all parameters and 36 days load survey for 4 parameters shall be read by CMRI and downloaded on desktop PC in minimum possible time and it shall be indicated at the time of finalizing GTP.
1.15	Diagnostic feature	Self diagnostic for time, calendar, RTC battery all display segments and NVM.
1.16	Security feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, communication write etc
1.17	Software & communication compatibility	a) Optical port with RS 232 compatible to transfer the data locally through CMRI & remote through PSTN / Optical fiber / GSM / CDMA / RF / any other technology to the main computer.

Sr. No.	Parameters	Technical Requirements
		b) The Supplier shall supply Software required for CMRI & for the connectivity to AMR modules. The supplier shall also provide training for the use of software. The software should be compatible to Microsoft Windows systems (Windows 98 system). The software should have polling feature with optional selection of parameters to be downloaded for AMR application. c) Necessary provision shall be made in the software for converting all the parameters available for new and old meters if supplied earlier. Copy of operation manual shall be supplied. d) The meter should have capability to store the tamper status in the memory in the form of status word. Any change in the status word (selectable basis) the meter should generate the interrupt to initiate the communication with the AMR module through RS232 port if module connected.
1.18	Memory	Non volatile memory independent of battery backup, memory should be retained up-to 10 year in case of power failure
1.19	Climatic conditions	a) The meter should function satisfactorily in India with temperature ranging from 0 - 60ºC and humidity upto 96%. b) Also refer IS: 13779 for climatic conditions.
1.20	Calibration	Meters shall be software calibrated at factory and modification in calibration shall not be possible at site by any means.

2.0 CONSTRUCTIONAL FEATURES

Sr. No.	Parameters	Technical Requirements
2.1	Body of Meter	a) Top transparent and base opaque material polycarbonate of LEXAN 143A/943AA or equivalent grade. b) Front cover & base should be ultrasonically welded and should be provided with the brass sealing screws. c) Top cover should be designed so as the internal components should not be visible.
2.2	Terminal Block	Made of polycarbonate of grade 500 R or equivalent grade and shall form Integral part of the meter base, brass or copper current terminals with flat-head brass screws.
2.3	Terminal cover	Transparent terminal cover with provision of sealing through sealing screw.
2.4	Diagram of connections	Diagram of external connections to be shown on terminal cover
2.5	Marking on name plates	Meter should have clearly visible, indelible and distinctly name plate marked in accordance with IS & Reliance Energy Ltd specifications.
2.6	Meter Sealing	Supplier shall affix one Buyer seal on side of Meter body as advised and record should be forwarded to Buyer.
2.7	Guarantee / Warranty	5 Years.
2.8	Insulation	A meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
2.9	Resistance of heat and fire	The terminal block and Meter case shall have safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them as per the relevant IS 13779.

3.0 TAMPER & ANTI-FRAUD DETECTION/EVIDENCE FEATURES

The meter shall log minimum 225 tamper events, compartment wise division of each event and their persistence time shall be indicated in GTP.

The Meter shall not be affected by any remote control device & shall continue recording energy under any one or combinations of the following conditions:

3.1. **Phase sequence reversal:** The meters shall work accurately irrespective of the phase sequence of the supply.

3.2. **Detection of missing potential:** In case someone intentionally takes out a potential lead, the date and time of such occurrence shall be recorded by the Meter. The restoration of normal supply shall also be similarly recorded. The threshold for the voltages should be programmable.

3.3. **Reversal of C.C. (Current Coil) Polarity:** Meter shall record the reversal of C.C. polarity with time and date, and also the time of restoration. Meter shall however

3.4. register the energy consumed correctly with any one, two or all three phase c.c. reversal.

3.5. **C.C. Shorting:** Meter shall record C.C. Terminal shorting with time and date and time of restoration. The threshold of the current should be programmable.

3.6. **Power On / Off:** Meter shall detect power OFF (minimum power off period 5 minutes) if any of phase voltages are not present. This event shall be recorded at the time of each power OFF. At the same time power ' ON ' event shall be recorded. This logging shall be available in Tamper details along with cumulative time of failure.

3.7. **Recording of Neutral disturbance: -** Meter shall log all events when AC/DC current or voltage is injected in neutral circuit without disturbing the recording of energy.

3.8. **Snap-on parameters:** Meter shall log all three phase voltage, current, power factor etc. at the time of tamper attempt for all such occurrence.

3.9. **External Magnetic tampers:** Meter should log on the events of attempt of tampering by external magnetic field as mentioned in the CBIP Technical report no. 88 with latest amendments.

The Meter shall record energy at maximum current (Imax) under the influence of abnormal external magnetic field irrespective of actual load, energy recorded in such case shall also be available in separate register. The Meter shall record as per actual load once the external abnormal magnetic field is removed. In such conditions the Meter shall log the event for presence of abnormal external magnetic field and its restoration.

3.10. **Influence Quantities:** The Meter shall work satisfactorily with guaranteed accuracy limit under the presence of the following influence quantities as per IS 13779, IEC-1036, and CBIP Technical Report No.88 with latest amendment.

The influence quantities are:

3.10.1. External Magnetic field – 0.2 tesla (with log on feature)
3.10.2. Electromagnetic field induction,
3.10.3. Radio frequency interference,
3.10.4. Unbalanced load,
3.10.5. Vibration etc,
3.10.6. Wave form 10% of 3rd harmonics,
3.10.7. Phase sequence,
3.10.8. Voltage unbalance,
3.10.9. Electro Magnetic H.F. Field, and
3.10.10. D.C. Immunity test.

4.0 COMPONENT SPECIFICATIONS

Ser No	Component Function	Requirement	Makes and Origin
4.1	Current Transformers	The Meters should be with the current transformers as measuring elements. The current transformer should withstand for the clauses under 5.9.j	The current transformer should withstand for the clauses under 5.9.j
4.2	Measurement or computing chips	The Measurement or computing chips used in the Meter should be with the Surface mount type along with the ASICs.	USA: Anolog Devices, Cyrus Logic, Atmel, Phillips, Texas Instruments. South Africa: SAMES Japan: NEC
4.3	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	USA: Atmel, National Semiconductors, Texas Instruments, Phillips, ST,Microchip Japan: Hitachi or Oki
4.4	Display modules	a) The display modules should be well protected from the external UV radiations. b) The display visibility should be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters	Hongkong: Genda Singapore: Bonafied Technologies Korea: Advantek China: Sucess Japan: Hitachi, Sony Holland / Korea: Phillips

Ser No	Component Function	Requirement	Makes and Origin
		(refer 3.2.d for Viewing angle). c) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type). d) It should be trans-reflective HTN or STN type industrial grade with extended temperature range.	
4.5	Communication modules	Communication modules should be compatible for the two RS 232 ports (one for optical port for communication with Meter reading instruments & the other - for the hardwired RS 232 port to communicate with various modems for AMR)	USA: National Semiconductors, HP, Optonica,ST, Holland / Korea: Phillips Japan: Hitachi Taiwan: Ligitek Germany: Siemens
4.6	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	USA: National Semiconductors ,HP Holland / Korea: Phillips Japan: Hitachi, Taiwan: Ligitek
4.7	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	SMPS Type (It should take care of clause 3.1 and 3.5)
4.8	Electronic	The active & passive components	USA: National Semiconductors,

Ser No	Component Function	Requirement	Makes and Origin
	components	should be of the surface mount type & are to be handled & soldered by the state of art assembly processes. The PTH components should be positioned such a way that the leads of components should not be under stress and not touching the internal wires.	Atmel, Phillips, Texas Instruments,ST,Onsemi Japan: Hitachi, Oki, AVX or Ricoh Korea: Samsung
4.9	Mechanical parts	**a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc.** b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
4.10	Battery	Lithium with guaranteed life of 10 years	Varta, Tedirun, Sanyo or National
4.11	RTC & Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Philips, Dallas Atmel, Motorola, Microchip Japan: NEC or Oki
4.12	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	

5.0 GENERAL REQUIREMENTS

5.1 On the meter name-plate:

5.2 meter serial number should be of 7/8 digits

5.3 size of the digit of the meter serial number should be minimum 5mm X 3mm.

5.4 bar code should be printed next to / below / above the meter serial number

5.5 BIS registration mark (ISI mark)

5.6 Supplier shall supply software suitable for energy measurement & energy spot billing

through CMRI.

5.7 Buyer's Serial Number sticker should be fixed on window glass from inside or on Meter front cover of minimum digit size 6 mm X 3 mm.
5.8 The supplier should seal meters on both sides. The Buyer shall approve the method of sealing.
5.9 The internal potential links should be in closed position or link less Meters will be preferred and there shall not be any external link.
5.10 Terminal cover should be fixed on Meter before dispatch.
5.11 Meter Sr. Nos. to be printed in black on the name plate, instead of embossing.
5.12 Box number, Meter serial number, type, rating should be mentioned on cases / cartons.
5.13 Meters shall be suitably packed with environmental friendly material in order to avoid damage or disturbance during transit or handling and to prevent in grace of moisture and dust.

6.0 ANNEXURE 1: DISPLAY SEQUENCE FOR THE PARAMETERS

6.1 Default Display:

1. Cumulative KWH (cumulative KWH to be displayed continuously without decimal)

6.2 On-demand Display:

After using pushbutton the following parameters should be displayed.

1.LCD test

2 Date
3 Real Time
4 Cumulative RKVAH
5 Cumulative KVAH
6 Current MD in KW
7 Current MD in KVA
8 Instantaneous Power factor
9 Instantaneous voltage R phase
10 Instantaneous voltage Y phase
11 Instantaneous voltage B phase
12 Instantaneous current R phase
13 Instantaneous current Y phase
14 Instantaneous current B phase
15 Last month billing Date
16 Last month billing KWH reading
17 Last month billing RKVAH reading
18 Last month billing KVAH reading
19 Last month billing Maximum Demand in KW
20 Last month billing Maximum Demand in KW occurrence Date
21 Last month billing Maximum Demand in KW occurrence Time
22 Last month billing Maximum Demand in KVA
23 Last month billing Maximum Demand in KVA occurrence Date
24 Last month billing Maximum Demand in KVA occurrence Time

Note: The meter display should return to Default Display mode (mentioned above) if the 'push button' is not operated for more than 6 seconds.

TECHNICAL SPECIFICATION FOR ENGINEERING PLASTIC METER BOX

1. Scope

This specification covers manufacture, testing at works and supply of Three Phase LT Meter Boxes made of insulating material intended to contain meters to be installed on wall or similar flat surface structure.

2. Applicable Standard

The Meter Boxes shall comply with IS : 5133 (Part-II)

3. Service Conditions

Equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Maximum Ambient Temperature (Degree C)	60
Maximum temperature in shade (Degree C)	45
Minimum Temperature of Air in Shade (Degree C)	0° C
Relative Humidity (Percent)	10 to 100
Maximum annual rain fall (mm)	1450
Maximum Wind pressure (Kg/Sq. M.)	150
Maximum altitude above mean sea level (Metre)	1000
Isoceranic level (days per year)	50
Seismic level (Horizontal Acceleration) Moderately hot and humid tropical climate conducive to rust and fungus growth	0.3 g

4.0 Material and Construction

4.1 The Meter box shall be made of **Injection Moulded reinforced Fire Retardant Polypropylene/ Polycarbonate**, with wall thickness as specified by GTP capable of withstanding temperatures up to 125 °C (As per Ball pressure tests clause 9.14.2 IS – 8828/96).

4.2 (i) The over all dimensions (in mm) of the box shall ensure following inner air gap.

Both left ,right and top hinge side ……. 15mm.

Meter body top surface …….. 15mm

Meter body bottom (wire entry) ……..100 mm.

(All above above clearance are minimum dimension).

(ii) The thickness of the Box & window shall be 2.5 mm ± 0.15 mm.

(iii) (iii) The box shall have ample space to fit GSM / CDMA MODEM and their accessories including antenna etc.

4.3 The Cover of meter box is made of polycarbonate transparent. The meter shall have suitable cable terminated on top cover with D-Port . The other end of cable shall be suitable to be connected with wired port of meter.
4.4 Meter box shall have 2 Nos. of Knock out type holes of diameter at the bottom for entry of service connection wires fixed with one glands .
4.5 For Meter reading , Push button is provided .

4.6 The box cover shall be fixed on two hinges. A total no of 2 hinges in one meter box.

4.7 For holding and locking the cover, U-shaped latches with one hole for riveting on the base and the other for sealing the meter box shall be provided. This clamp will also hold the cover with base. The total number of Clamps for each box will be 2 Nos.

4.8 Meter base supports shall be raised by about 10 mm in the box for easy of wiring.

4.9 Soft rubber gasket for protection on all around cover will be provided.
4.10 The box will be provided with 4 fixing holes of 8mm dia , In addition sealing holes of 3 to 3.5 mm dia will be provided in U clamps.
4.11 The box should have earthling provision.
4.12 Box with CRCA frame for box and meter mounting will be preferred.

GUARANTEED TECHNICAL PARTICULARS OF 11 KV 400 AMPS A.B. SWITCHES

Sl.No	particulars	33 KV 400 Amps A.B. Switches (desired value)	particulars as offered by the tender.
1	2	3	4
1.	Maker's name and country or origin.	To be specified by the By the tenderer.	-
2.	Type of Switch	Rotating type only	-
3.	Suitable for mounting	Horizontal only	-
4.	Number of supporting post insulator per phase	2 nos.12 KV Post Insulator per phase as per ISS-2544/1973.	-
5.	Post Insulator.		
(a)	Maker's name & country of origin	To be specified By the tenderer	-
(b)	Type of cemeting cemented only.	To be quoted original	
(c)	One minute power fre-	35 KV RMS.	-

	Quency withstand voltage Dry		
(d)	One minute power fre- Quency withstand voltage Wet.	35 KV RMS.	-
(e)	Visible discharge voltage	9 KV RMS.	-
(f)	Dry Flashover Voltage by the tenderer	To be specified -	
(g)	Power frequency puncture withstand voltage	1.3 times of actual dry flash over voltage.	
(h)	Creepage distance (actual creepage distance for which type test have been conducted is to be specified by the tenderer.	230 mm minimum.	
6.	Impulse withstand voltage for positive and negative polarity (1.2/50) mircro second wave).	-	-
a)	Across the isolating distance	85 KV (peak)	-
b)	To earth & between poles	75 KV (peak)	-
7.	One minute power frequency withstand voltage		
(a)	Across the isolating distance	32 KV (RMS)	-
(b)	To earth and between poles	28 KV (RMS)	-
8.	Rated normal current and rated frequency.	400 amps. 50 Hz	
9.	Rated short circuit making capacity.	25 KA (peak)	
10.	Rated short time current.	16 KA (RMS)	
11	Rated peak withstand current	40 KA (RMS)	
12	Rated mainly active load		

breaking capacity 10 A

13 Rated Transformer off load breaking capacity 6.3 A(rms)

14. Rated line charging breaking capacity 2.5 A (RMS)

15. Rated cable charging breaking capacity 10 A (rms)

16. Minimum clearance between adjacent phases

(a) Switch Closed. (centre to centre) 760 mm

(b) Switch opened. (centre/edge of blade) 380 mm

17. Temperature rise:

(a) Temperature rise should not exceed to maximum limit as specified below at an ambient temperature not exceeding in 40 ^{0} C 65 ^{0} C

Copper contacts silver faced Terminal of switch intended to be connected to external conductor by bolts or screw at an ambient temperature at 40 ^{0} C should not exceed . 50 ^{0} C

18. Vertical Clearance from top of insulator cap to mounting channel 254 mm (minimum)

19. Type of contact a) Self aligned, high pressure jaw type fixed contacts of electrolytic copper of size 80 x 50 x 8 mm duly silver plated. Each contact should be reverted with three nos. Copper rivets with a bunch (minimum 3 mm thick) consisting of copper foils, each may vary from 0.15 mm to 0.25 mm. These total thickness of copper foils per jaw should be 6 mm. Jaw assembling are to be bolted through stainless steel bolts and nuts with stainless steel flat and spring washer.

b) Solid rectangular blade type moving contact of electrolytic copper size 220 mm x 50 mm x 8 mm duly silver plated.

c) Pressure spring to be used in jaw contacts shall be phosphorous bronze having 8 nos of turn x 28 mm height x 14.4 mm diameter with 14 SWG wire (minimum six nos springs shall be used.)

20. Connectors. Terminal connectors for both movable and

fixed should be of copper casting (minimum 95 % copper composition. The fixed connector shall of size 80 x 50 x 8 mm and the size of movable connector shall be size 80 x 50 x 8 mm with machine finishing duly silver plated with 2 nos. 12 mm dia holes provided with suitable brass bolts and double nuts with brass flat washers and 2 nos solder less bimetallic sockets for each connector suitable up to 80 Sq.mm conductor.

21. Moving Contact Movable contact is to be supported by

galvanized angle of 50 x 50 x 5 mm in each

phase and the moving contact are to be bolted through 2 nos stainless steel bolts and nuts with stainless steel flat and spring washers, suitable.

22. Galvanization a) Iron parts shall be not deep galvanized as per IS-2633/1972.

b) The pipe shall be galvanized as per IS-4736/1968.

23. Details of phase :-

(a) Coupling Rod 25 mm nominal bore G.I. pipe

medium gauge.

(b) Operating Rod 32 mm nominal bore G.I. pipe medium

gauge single length 6 mtrs. The detailed dimension of the G. I. pipe as per IS-1239 (Pt.I) are mentioned below :-

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Nominal Base	Outside diameter		Diameter thickness
	Max.	Min.	
25 mm	34.2 mm	33.3 mm	3.25 mm
32 mm	42.9 mm	42 mm	3.25 mm

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c) Arcing Horn 10 mm dia G.I. Rod with spring assisted operation.

d) Force of fixed contact springTo be specified by the tenderer

e) Copper braided flexible 320 mm length of flexible electrolytic

topes copper tape or braided chord (with tin coated) having minimum weight 450 gms. Per meter and both ends shall be crimped with copper sockets through brass bolts and nuts with brass flat washers. two nos of suitable copper sockets shall be used at both ends. The minimum no. of flexible wires should be 1536 of 36 SWG for each flexible chord.

f) Quick break device: Lever mechanism

g) Bearings 4 nos. self lubricant bearing to be provided with grease nipple including 4 the bearing being a thrust bearing.

h) Locking arrangement:-Pad Locker & Key arrangement at both 'ON' & 'OFF' position.

i) Earth Terminal :- To be provided at base channels.

24. Supporting Channels 75 mm x 40 mm M.S. Channel hot deep galvanized.

25. Weight of each pole To be specified by the tender

complete:-

N.B. i) Ferrous parts shall be duly galvanized as per IS-2633/1972 & Non-ferrous parts shall be silver plated.

ii) Certificate from a Govt.Approved Laboratory regarding composition of copper in electrolytic copper casting of materials should be submitted during inspection of materials at the cost of tenderer.

GUARANTEED TECHNICAL PARTICULARS FOR H.G. FUSE SET

11 KV 200 AMPS, 3 POLE

Sl.No	particulars	(Desired Value)	Values offered By the tender.
1	2	3	4
1.	Name of the manufacturer and	To be specified by the	-

---

	country of origin.	By the tenderer.	
2.	Operating voltage	11 KV	-
3.	Number of insulators per phase	2 nos.12 KV Post Insulator per phase	-
4.	Rated normal current and normal frequency.	200 Amps.50 Hz	
5.	Vertical clearance from top of insulator cap to mounting Channel	254 mm (minimum)	
6.	Height of the riser for carrying the horns.	150 mm from the cap (top) of insulator.	
5.	Post Insulator.		
(a)	Name of the manufacturer & country of origin	To be specified By the tenderer	-
(b)	Type of cemeting	To be quoted original cemented only.	
(c)	One minute power fre- Quency withstand voltage Dry	35 KV RMS.	-
(d)	One minute power fre- Quency withstand voltage Wet.	35 KV RMS.	-
(e)	Visible discharge voltage	9 KV (RMS)	
(f)	Dry Flashover Voltage	To be specified by the tenderer	-
(g)	Power frequency puncture	1.3 times of actual dry	

withstand voltage flash over voltage.

(h) Creepage distance 230 mm minimum.

(actual creepage distancefor which type test have been conducted is to be specified by the tenderer)

8 Impulse withstand voltage

(1.2/50 micro second wave positive & negative polarity.

(a) Across the isolating distance. 85 KV (peak)

(b) To earth & between poles 75 KV (peak)

9. One minute power frequency withstand voltage

(a) Across the isolating distance 32 KV (RMS) -

(b) To earth and between poles 28 KV (RMS) -

11. Details of Arcing Horns Solid Copper rod having 7.62 mm dia silver plated provided with screwing arrangement on the fuse carrier made of copper casting for fixing fuse wire. (Total length 63 5mm). All the bolts, nuts and washers should be made out of brass.

12. Riser Unit (150 mm total height). a) Riser cum connector made out of copper Casting (with minimum 95% copper composition) having riser size 50 mm height x 30mm width x 8 mm thickness and connector size 80x 50x 6 mm duly silver plated and machine finishing

provided with 2 nos.12 mm dia brass bolts

& brass double nuts with flat brass washer

and 2 nos. solder less bimetallic sockets per

each connector suitable up to 80 mm sq.

Conductor.

b) 100 mm height G.I. riser made of 19 mm

nominal bore medium gauge G.I. pipe welded

with 2 nos G.I. Flat of 30 x 5 mm at both ends fixed with 10 mm dia stainless steel, bolts and

nuts with flat stainless steel spring washers.

13. Supporting Channels 75 x 40 x 6 mm M.S. Channel (galvanized)

14. Galvanization All ferrous parts should be galvanized as per

IS-2633/1972 & all non-ferrous parts should be duly electroplated with silver.

15. Weight of each pole To be specified by the tenderer.

Complete).

N.B.:- Certificate from a Govt. Approved Laboratory regarding composition of copper in electrolytic copper casting and galvanization as per ISS may be furnished during inspection of materials at the cost of tender.

TECHNICAL SPECIFICATION

25KVA,63KVA & 100 KVA 11/0.433 KV ALUMINIUM WOUND *DISTRIBUTION TRANSFORMER* (BIS ENERGY LEVEL-II , NONSLEALED TYPE)

GENERAL SCOPE:

1.1 The specification covers the design, engineering, manufacture, stage inspection, testing, pre-delivery inspection, supply, delivery, loading, unloading and performance of requirements11/0.433 KV non-sealed type aluminum wound **BIS Energy Level-II** Distribution Transformers for outdoor use in the networks of TPNODL .The Transformers shall be double wound, three phase, CRGO M3 Grade (0.23mm)

or better, oil immersed with ONAN cooling with Oil filled up to maximum permissible level. The ratings required under this specification **are 25KVA, 63KVA & 100 KVA with Aluminum windings.** as per IS 1180(Part-I),2014 (Latest revision).

The equipment offered should have been successfully type tested within five years from date of tender and the designs should have been in satisfactory operation for a period not less than three years as on the date of bid opening. Compliance shall be demonstrated by submitting with the bid, (i) authenticated copies of the type test reports and (ii) performance certificates from the users, specifically from Central Govt./ State Govt. or their undertakings.

The scope of supply should also include the provision of type test **Purchaser reserves the right to waive type tests as indicated in the section 1.2 on Quality Assurance, Inspection and Testing in this specification.**

The transformer shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchasr shall have the power to reject any work or material, which, in his judgment, is not in full accordance therewith.

CODES & STANDARDS

Except where modified by this specification, the Transformers shall be designed, manufactured and tested in accordance with the latest editions of the following standards. The Bidder may propose alternative standards, provided it is demonstrated that they give a degree of quality and performance equivalent to or better than the referenced standards. Whether to accept or reject any alternative standard shall be adjudged by the Purchaser. The Bidder shall furnish a copy of the alternative standard proposed along with the bid. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard. In the case of conflict the order of precedence shall be 1) IEC or ISO Standards, 2) Indian Standards, 3) other alternative standards.

IEC/ISO	Indian Standard	Subject
IEC 71		Insulation Coordination
IEC 76	IS 2026	Power transformer
	IS 1180	Outdoor Three Phase Distribution Transformers up to 100KVA, 11/ 0.4 KV, Non- Sealed Type.
IEC 137	IS 2099	Bushing for Alternating Voltages above 1000Volt.
IEC 156		Method of determining Electric Strength of Insulating Oils.
IEC 296	IS 335	Specification for Mineral Insulating Oils for Tranformer and Switchgear.
	IS 6792	Method of determination of electric strength of insulatingoils.
IEC 354	IS 6600	Loading Guide for oil immersed Transformers
	IS 4257	Dimensions for clamping arrangement for bushingsSpecification for Low Voltage bushings
	IS 7421	Specification for Outdoor bushings
	IS 3347	
IEC 554	IS 9335	Specification for Insulating craft Papers
	IS 567	Specification for Insulating Press BoardPaper covered aluminium conductor
	IS 162	
	IS 561	Electrical Power Connector
	IS 6103	Testing of specific resistance of electrical insulatingliquids
	IS 6262	Method of test for power factor and dielectric constant of electrical insulating liquids
	IS 0028	Installation and maintenance of transformers

This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Supplier of the necessity of providing the goods complying with other relevant standards or recommendations.

3. SERVICE CONDITIONS

The service conditions shall be as follows:

maximum altitude above sea level	1,000m
maximum ambient air temperature	50° C
maximum daily average ambient air temperature	40° C
minimum ambient air temperature	-5° C
maximum temperature attainable by an object exposed to the sun	60 ° C
maximum yearly weighted average ambient temperature	32° C
maximum relative humidity	100%
average number of thunderstorm days per annum (isokeraunic level)	70
average number of rainy days per annum	120
average annual rainfall	1500 mm
maximum wind pressure	260Kg / m^2

Environmentally, the region where the equipment will be installed includescoastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, thecombination of salt and condensation may create pollution conditions for outdoor insulators.

Therefore, outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive, tropical and humid coastal atmosphere.

4. SYSTEM CONDITIONS:

The equipment shall be for installation in supply systems of the suitablefollowing Characteristics**.**

• Frequency	50Hz ± 5%	
• Nominal System Voltage	11KV System LV System	11KV 433/250V
• Maximum System Voltage	11KV System LV System	12 KV 476 V

◆ Minimum LV voltage	(NEC)	392 V
◆ Nominal short circuit apparent power of the system	11 KV System	500 MVA (IS: 2026)
◆ Insulation levels :		
1.2 /50 µ sec impulse withstand	11 KV System	95 KV peak (As Per BEE, Clause No.10)
◆ Power frequency one minute withstand (wet and dry)	11 KV System	28 KV (rms)
	LV System	3 KV (rms)
◆ Neutral earthing arrangements :	LV System	Solidly earthed

5. TECHNICAL SPECIFIC TECHNICAL REQUIREMENTS

1	Rated KVA (ONAN rating)	25KVA,63KVA &100KVA
		11/0.433 KV
2	No. of phases	3
3	Type of installation	Outdoor
4	Frequency	50 Hz (± 5%)
5	Cooling medium	Insulating Oil
6	Type of mounting	(ONAN)On Channels.
7	Rated voltage	
a)	High voltage winding	
b)	Low voltage winding	
8	Highest continuous system voltage	11 KV
a)	Maximum system voltage ratio (HV / LV)	0.433 KV
b)	Rated voltage ratio (HV / LV)	
9	No. of windings	Two winding Transformers **(BIS Energy Level-II)**
10	Type of cooling	ONAN (Oil natural / Air natural)100%
11	KVA Rating corresponding to ONAN cooling system	Delta
12	Method of connection:	Star
	HV:	Dyn
	LV:	11
13	Connection symbol	Neutral of LV side to be solidly earthed.
14	System earthing	**<u>% Impedance</u> + <u>Tolerance %</u>**
15	Percentage impedance voltage on normal tap and KVA base at 75^0 C corresponding to	4.5 + 10%
	HV/ LV rating and applicable tolerances :	**(No negative tolerance will be allowed)**

16		Intended regular cyclic overloading of windings	As per IEC –76-1, Clause 4.2
17	a) b)	Anticipated unbalanced loadingAnticipated continuous loading of windings(HV / LV) Around 10% 110 % of rated current	
19		Neutral terminal to be brought out	On LV side only
20		Over Voltage operating capability and duration	112.5 % of rated voltage (continuous)
21		Maximum Flux Density in any part of the core and yoke at rated KVA, rated voltage i.e 11 KV / 0.433 KV and system frequencyof 50 HZ	1.5 Tesla

22	Insulation levels for windings :-	
	a) 1.2 / 50 microsecond wave shape Impulse withstand (KVP)	HV: 95 LV: N.A.
	b) Power frequency voltage withstand (KV-rms)	HV: 28 LV: 03
23	Type of winding insulation	
	a) HV winding	Uniform
	b) LV winding	Uniform
24	Withstand time for three phase short circuit	2 Seconds
25	Noise level at rated voltage and frequency	As per NEMA Publication No. TR-1.
26	Permissible Temperature Rise over ambient temperature of 50^0C	
	a) Of top oil measured by thermometer.	35^0C
	b) Of winding measured by resistance.	40^0 C
27	Minimum HV clearances in air (mm) :-	
	a) Phase to Phase Phase	
	b) to ground Bushings &	
28	Terminals	
	a) HV winding line end	0.4 KV porcelain type of bushing (Antifogtype)
	b) LV winding	
29	Insulation level of bushing	
	a) Lightning Impulse withstand (KVP)	HV: 95 LV: Not applicable
	b) 1 Minute Power Frequency withstand voltage (KV –rms)	HV: 28 LV: 3
	c) Creepage distance (mm) (minimum)	
30	Material of HV & LV Conductor	
		25 mm/ KV
		EC grade Aluminum
31	Maximum current density for HV and LV winding for rated current	
32	Polarisation index i.e. ratio of megger values at 600 sec. to 60 sec for HV to earth, L.V to earth and HV to LV.	

33	Core Assembly	1.6 Amp/ mm^2.
34		

Shall be greater than or equal to 1.5, butless than or equal to '5'.

Boltless type

Transformer rating	Max. Losses at 50% load(Watts)	Max Losses at 100% load (Watts)
25 KVA	190	635
63KVA	340	1140
100 KVA	475	1650

6. TYPE OF TRANSFORMER

6.1 The Transformers (BIS Energy Lable-II) shall be of core type construction, double wound, three phase, oil immersed, 11/0.433KV, 50 Hz with oil natural and air cooling (ONAN) to be used as step down Transformers(BIS Level-II) for out door use. The design of the tank, fittings, bushings, etc shall be such that it will not be necessary to keep the transformer energised to prevent deterioration as the Transformers may be held in reserve, outdoors, for many years.

7. PERFORMANCE, CAPACITY AND SHORT CIRCUIT RATINGS

7.1 The following ratings are covered under this specification

- 25KVA, 11/0.433 KV, Aluminum wound
- 63KVA, 11/0.433 KV, Aluminum wound
- 100KVA, 11/0.433 KV, Aluminum wound

7.2 The transformer shall be capable of supplying a continuous load equal to its KVA rating, under the following conditions :

- Continuous steady load;
- design at maximum ambient air temperature of 50^0C;
- 40^0 C average winding temperature rise and 35^0C top oil temperature rise for conventional breathing Transformers

8. RATING AND CONNECTION PLATE

Each transformer shall be provided with a rating plate of weatherproof material showingthe following items indelibly marked :

- Type of transformer
- Standard to which it is manufactured (preferably IEC 76)
- Manufacturer’s name

- Transformer serial number
- Year of manufacture
- Rated frequency in Hz (50)
- Rated voltages in KV (11/0.433)
- Number of phases (3)
- Rated power in KVA
- Type of cooling (ONAN)
- Rated currents in A
- Vector group symbol (Dyn11)
- 1.2/50µs wave impulse voltage withstand level in KVp
- Power frequency withstand voltage in KV
- Impedance voltage at rated current and frequency in percentage at 75 ^{0} C at normal tap
- Measured load loss in KW at rated current and at 75 ^{0} C at normal tap
- Measured no-load loss in KW at rated voltage and rated frequency
- Continuous ambient temperature at which ratings apply in ^{0}C
- Top oil and winding temperature rise at rated load in ^{0}C
- Winding connection diagram
- Total weight in kg with complete oil filled.
- Total weight of the transformer without oil
- Volume of oil in litres.
- Weight of core and windings in kg; and
- Name of the purchaser
- TPNODL

The rating plate shall conform to the requirements of the section of Labels in thisspecification.

9 (a) **PUNCHINGS: Non-erasable** Punching and embossing of Volume of oil in litres, name of the Purchaser- BGJY, Bhadrak, Odisha, Name of the Supplier – M/s -

----------, Year of Manufacture, Guarantee Period (i.e. 2 years from the date of installation)and Sl. No. of each transformer is to be made on top core channel, top cover, side walls and name plates of Transformers.

9 (b) BIS LEVEL: In addition to above, the supplied Distribution Transformers must contain BIS Level -II with style and information provided by the Bureau of Indian Standard (B.I.S), Ministry of Power, Government of India.

GUAR ANTEED TECHNICAL P ARTICUL ARS FOR 100 KVA , 63 KVA & 25 KVA 11/0. 4KV,3- PHASE DISTRIBUT ION TRANSFORMERS

(To be furnished by the Manufacturer)

Sl. No.	Description	As Specified			Bidder's Offer transformer wise
	Capacity of Transformer	100 KVA	63 KVA	25 KVA	
1	Make				
2	Name of the Manufacturer				
3	Place of Manufacture				
3(a)	BIS Regd. No. Energy Level - II	To be provided by bidder			
4	Voltage Ratio	11000/433V	11000/433V	11000/433V	
5	Rating in KVA	100	63	25	
6	Core Material used and Grade:	CRGO and M3 or Better	CRGO and M4 or Better	CRGO and M4 or Better	
	a) Flux density	1.5 Tesla (Max.)	1.5 Tesla (Max.)	1.5 Tesla (Max.)	
	b) Over fluxing without saturation (Curve tobe furnished by the Manufacturer in support of his claim)				
7	Maxim um temperature rise of:				
	a) windings by resistance method	40^0C over an ambient of 50^0C			
	b) Oil by thermometer	35^0C over an ambient of 50^0C			
8	Magnetizing (no- load) current at:				
	a) 90% Voltage	1% (Max.)	1% (Max.)	1% (Max.)	
	b) 100% Voltage	2% (Max.)	2% (Max.)	2% (Max.)	
	c) 112.5% Voltage	4% (Max.)	4% (Max.)	4% (Max.)	
9	Core loss in watts:				
	a) Normal voltage				
	b) Maximum voltage				

10	Resistance of windings at20^{0}C (with 5% tolerance)				
	a) HV Winding (ohms)				
	b) LV Winding (ohms)				
11	Full load losses (watts) at 75^{0}C				
12	Total losses at 100% load at 75^{0}C	1650 W (Max.)	1140 W (Max.)	635 W (Max.)	
13	Total losses at 50% load at 75^{0}C	475 W(Max.)	340 W Max.)	190 W Max.)	
14	Current density used for : (Amp./ Sq mm)				
	a) HV Winding				
	b) LV Winding				
15	Clearances : (mm)				
	a) Core and LV				
	b) LV and HV				
	c) HV Phase to Phase				
	d) End insulation clearanceto earth				
	e) Any point of windingto tank				
16	Efficienc yat 75^{0}C:				
	a) Unity P. F. and				
	b) 0.8 P.F				
	1) 125% load				
	2) 100% load				
	3) 75% load				
	4) 50% load				
	5) 25% load				
17	Regulation at:				
	a) Unity P.F.				
	b) 0.8 P.F. at 75^{0}C				
18	% Impedance at75^{0}C	4.5+10% (No negative tolerance)	4.5+10% (No negative tolerance)	4.5+10% (No negative tolerance)	

19	Separate Source Voltage withstand Test:				
	(I) HV 28kV/50 HZfor 1 minute	yes			
	(ii) LV 3kV/50 HZfor 1 miinute	yes			
20	Induced Over Voltage withstandTest (Double Voltage and Double frequencyfor 1 minute)				
21	Impulse test				
22	Mass of : (kg)				
	a) Core lamination (minimum)				
	b) Windings (Min)				
	c) Tank and fittings				
	d) Oil				
	e) Oil quantity (min) (litre)				
	f) Total weight				
23	Oil Data:				
	1. Quantity for first filling (m inimum) (litre)				
	2. Grade of oil used				
	3. Maker's name				
	4. BDV at the time of filling(kV)				
24	Transform er:				
	1) Overall length x breadth x height (mmxmmxmm)				
	2) Tank length x breadth xheight				
	3) Thickness of plates for				
	a) Side plate (min)	3.15mm			
	b) Top and bottom plate (min)	5 mm			
	4) Conservator Dimensions.				
25	Radiation				
	1) Heat dissipation by tankwalls excluding top and bottom				
	2) Heat dissipation by cooling tube.				

	3) Diameter and thickness of cooling tube.				
	4) Whether calculation sheet for selecting cooling area to ensure that the transform er is capable ofgiving continuous rated output without exceeding temperature rise is enclosed.				
26	Inter layer insulation provided in design for:				
	1) Top and bottom layer	Epoxy Dotted Kraft Paper/ 5 Mill			
	2) In between all layer	Epoxy Dotted Kraft Paper / 5 Mill			
	3) Details of end insulation.	Press Board			
	4) Whether wedges are provided at 50% turns ofthe HV coil				
27	Insulation materials provided				
	a) For conductors				
	(1) HV	DPC			
	(2) LV	DPC			
	b) For Core	Carlite			
28	Material and Size of the wireused.				
	1) HV Dia				
	2) LV				
	a) Strip size				
	b) No. of Conductors in parallel				
	c) Total area of cross section (sq mm)				
29	Whether the name plategives all particulars as required in Tender	yes			
30	Particulars of bushings HV/LV				
	1) Maker's name				
	2) Type IS-3347/ IS-2099/IS-7421				
	3) Rating as per IS				
	4) Dry power frequenc y voltage withstand test	HV-28KV, LV-3KV			
	5) Wet power frequenc y voltage withstand test	HV-28KV, LV-3KV			

Note:

The following shall be specifically confirm ed:

1) Whether the offer conforms to the limits of impenance mentioned in the specification.

2) Whether the offer conforms to the limits of temperature rise mentioned in the specification.

3) Whether the transformer offered is already type tested for the design & test reports enclosed

4) Whether the losses of the Transformers (BIS Leble-II) offered are within the limitsspecified.

Signature of the Bidder with Seeal

Technical Specifications

25 KVA/63 KVA/100 KVA L.T. Distribution Box (with MCCBs)

1. SCOPE:

Specification covers the design manufacture, testing at works and supply of Distribution Boxes for controlling the L.T. feeders from the L.T. side of Distribution Transformers. The system shall be A.C. 3phase, 4 wire, 433V 50 Hz with effectively grounded neutral.

2. SERVICE CONDITIONS:

The equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the climatic conditions of Uttar Pradesh.

3. SYSTEM DETAILS:

Distribution Boxes are meant for control and protection of Distribution Transformers with relevant parameters as under

S.No.	Transformer Capacity kVA	Full Current Amps	Incoming Circuit Configuration	Outgoing Circuits Configuration
1	25	34Amp	40A TP	3 x 16A TP

			MCCB	MCCB
2	63	88 Amp	90A TP MCCB	3 x 35A TP MCCB
3	100	139 Amp	140A TP MCCB	2 x 63A TP MCCB & 1 x 35A TP MCCB

4. INCOMING CIRCUIT :

Each distribution box shall have three pole MCCB as per above mentioned details. In addition to this provision of DT metering shall also be provided.

5. OUTGOING CIRCUITS :

Each distribution box shall have number of outgoing circuits as per the above mentioned details. In each outgoing circuit, three pole MCCB as per above mentioned details shall be provided.

6. Internal Connections:

As shown in drawing, the Incomer feeder should be on left side of the distribution box and all outgoing feeders shall be on right side of the distribution box. All the internal connections shall be made with Aluminum bus bar or PVC coated Aluminium cable with current density as 1Amp/mm^2. In case of bus bar, it should be properly insulated to avoid any contact with live terminal. Red-Yellow-Blue color coding shall be provided for connecting links of phases

7. ENCLOSURE:

9.1 The enclosure shall be made up of CRCA MS sheet of 1.8mm thickness. The manufacturing process of Box shall be Deep Drawn Process. No welding joints in the body / doors of box are permitted in Deep Drawn Process.

9.2 The general overall dimensions of Distribution Box shall be 1000 x 1000 x 225 mm. The enclosure shall have two doors. The base and doors of enclosure shall be individually in one piece **without any welding joint**, except for fixing of the accessories like hinges, clamps, mounting clamps, bolts etc. The Box and doors shall be made from 1.8mm thick CRCA M.S. sheet and sizes shall be as mentioned in the drawing. Base and doors shall have flange / collars as shown in drawing. Collar of Base and doors shall overlap by 10mm. Rubber gasket shall be provided in between base and doors, such that it provides proper sealing between the door and base of box to avoid ingress of water. Degree of protection shall be **IP- 33** as per IS 13947 (amended up to date). Rubber Gasket shall be fixed with suitable adhesive. Four hinges on each side shall be welded from inside of the box to fix the doors. Hinges shall be 50 mm in length and made from 2mm thick sheet. Hinge pin diameter shall be 4mm. Doors shall be fixed with three screws in each hinge. The hinges shall not be visible from outside. On closing of doors, right door shall rest on the left door. Viewing window shall be provided with toughened glass of 5mm thickness. Glass shall fixed from

inside of the distribution box with glass holder plate made without any welding joint and by draw process.

9.3 Four sets of Louvers (two sets on each side) shall be provided. The perforated sheet of 20 SWG CRCA MS shall be welded from inside of the louvers.

9.4 Mounting of components inside the enclosure shall allow free air circulation keeping the clearances as per specification.

9.5 The doors shall be centrally closed with triple position locking arrangement and shall be operational with a common handle from outside the door. Movement of handle will lock the doors at center, top & bottom. A Nylon washer shall be provided between the handle and door to avoid penetration of water. One central lock with brass levers shall be provided inside the door. Key way shall be provided on the door for operating the lock from out side. Key way shall be provided with cover.

9.6 The surface of the enclosure shall be properly Pre-treated / Phosphated in a Seven-Tank process and shall be applied with a powder coating of 40 micron thickness. The powder coating shall be of Light Admiralty Grey colour. Powder coating shall be suitable for outdoor use. Rating and Type of distribution box shall be printed or embossed on the door of the distribution box.

9.7 EC grade Aluminium Neutral Busbar capable of carrying full load current shall be provided for neutral. Neutral bus bar shall be completely insulated such that no live part is accessible. Neutral Bus bar shall be isolated with respect to body.

9.8 Two galvanized earthing clamps shall be welded on both sides of the box as shown in the drawing. There should be no powder coating on the earthing clamps. Bolt with washer shall be provided in each earth clamp.

9.9 Incoming & outgoing cable holes shall be provided as shown in drawing. Cable holes shall be provided with superior quality rubber glands of internal diameter
30mm. Rubber glands shall be made such that internal diameter of glands provided for cables should be closed with the rubber film of minimum 1mm thickness. Cable will go through the glands by cutting the film of the glands.

9.10 Necessary fixing arrangement shall be provided at the back of the enclosure to ensure proper fixing on double pole structure by means of suitable clamps at 4 places.

9.11 Danger marking as per drawing shall be provided on the box in red color.

9.12 All the components inside the Box shall be mounted on CRCA MS strips of 1.8mm thickness. The mounting strips shall be provided with required bends or ribs to give the extra strength and shall be powder coated or zinc plated.

9.13 Each distribution box shall be supplied with proper packing in five ply-corrugated box. Size of distribution box shall be provided on the packing box.

9.14 Manufacturer name shall be provided on the door of distribution box.

9.15 Adequate slope (as shown in the drawing) on the top of box shall be provided to drain out rainwater from the top.

9.16 Tolerance wherever not mentioned on enclosure and other component dimension shall be ±3%.

8. FINISHING OF DISTRIBUTION BOX:

The surface of the box shall be properly pretreated / phosphated in seven tank process and shall be applied with powder coating as per Clause No. 9.6. The process facility shall be in house of the manufacturer to ensure proper quality for outdoor application.

9. TESTS & TEST CERTIFICATES:

In case of bought out items, routine and acceptance tests as per relevant IS and this specification shall be carried out at the original manufacturers' works.

12.1 Routine Test (Carried out on all boxes):

12.1.1 Overall Dimensions Checking.
12.1.2 Insulation Resistance Tests.
12.1.3 High Voltage Test at 2500 V, 50 Hz AC for one minute.
12.1.4 High Voltage Test on MCCBs.

12.2 Acceptance Tests (on complete Distribution Box):

Following tests shall be carried out as per acceptance tests in addition to routine tests on one random sample of each rating out of the lot offered for inspection: Temperature rise test on one sample of each rating.

Temperature rise test will be carried out as per the procedure given below:

For temperature rise test, a distribution box with all assembly of MCCBs shall be kept in an enclosure such that the temperature outside the box shall be maintained at 50 ° C.

For 25 KVA load current of 40A, 63 KVA load current of 90A, for 100 KVA load current of 140A shall be maintained in incoming circuit of distribution box, keeping outgoing circuits short, till the temperature stabilizes and maximum temperature rise should be recorded.

10. TESTING & MANUFACTURING FACILITIES:

The Tenderer must clearly indicate what testing and manufacturing facilities are available in the works of manufacturer and whether the facilities are adequate to carry out all Routine & Acceptance Tests. These facilities should be available to inspection Engineers, if deputed to carry out or witness the tests in the manufacturer's works. The tenderer must have all the in-house testing facilities to carry out the acceptance tests on the Box.

The tenderer shall furnish detailed process of manufacturing & Powder coating. Facility of 7-tank phosphating and powder coating shall be in-house of the manufacturer.

11. SAMPLE:

The bidders are required to submit one sample of Distribution Box as per the specifications. In case order is placed on a firm, no change in design / manufacturer of LT Distribution box shall be allowed in supplies.

12. Past Experience: The firm must have supplied the NIT quantity or similar item to any Power in any one financial year in last 5 years. Past performance of the firm with Power utilities should be satisfactory both in quality and adhering to delivery schedule in last 5 years. Supporting documents shall be submitted along with the tender.

13. Inspection:

All routine & acceptance tests and inspection of material shall be carried out at the place of manufacturer by the inspecting officer. The manufacturer shall offer the Inspector (representing the purchaser) all reasonable facilities free of charge at the time of Inspection.

NB:- For detail dimension & design refer Annexure-V & VI for 25/63/100 KVA three phase Distribution Box.

TECHINICAL SPECIFICATIONS

PIPE EARTHING

1.0 SCOPE:

1.1 This specification covers design, manufacture, testing, supply and installation of Earthing Device (Heavy duty) for use of earthing of Sub-Station of transformer capacity 25/63/100 KVA 3 phase.

1.2 Excavation of earth pit with proper size, installation of pipe earthing includes supply of earth Electrodes, GI flats, GI nuts & bolts and earth chamber made of brick masonry with RRC slab cover.

1.3 Each Sub-Station earthing consists of 5 nos. earth pits for 3phase and 4 nos. for single phase connection with 50x6 mm GI flat for neutral earthing, 25x4 mm GI flat for Transformer body, AB switch, HG fuse, LA, DB earthing.

2.0 GENERAL REQUIREMENTS

2.1 Earthing pipe must be made out 40mm nominal bore & 3.2 mm wall thickness medium gauge (nominus Tolerance allowed) Hot Dip G.I pipe (as per IS;-1239, Part-1, 1990 & REC construction Standard-J-2) of reputed Make & 2.5 mtr. long. The pipe electrode shall be cut tapered at the bottom side for a length of 75mm and selded clamp at top end.

2.2 The pipe shall be in one piece and no joint shall be allowed in the electrode.

2.3 Staggered drills hole of 12 mm dia of interval of 150mm up to 2 meter from bottom side shall be made before galvanization.

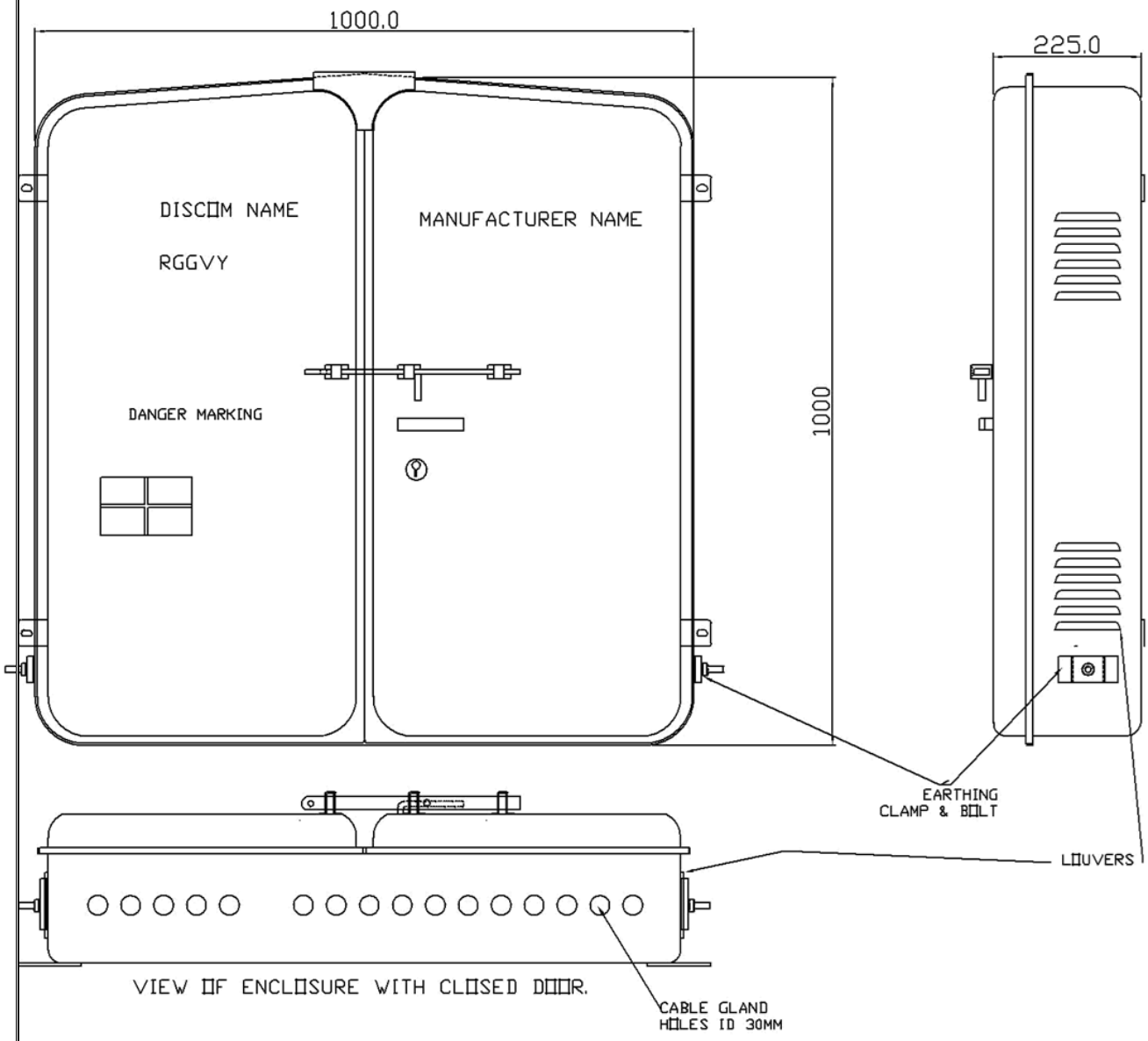
2.4 The GI earthing clamp/ Strip (c-Clamp Type) is to be of 50mm width, 6 mm thickness & flange length of 65 mm to be welded with pipe before galvanization. This should be suitable for termination of 4 nos. of GI flat earth electrodes. The Clamp/ Strip & Earthing pipe after fabrication will be hot dip galvanized confirming to IS: 2629/85 with latest amendments. The clamp shall have two holes in both sides suitable for 5/8x2" Bolt & provided with two GI Bolts of 5/8x2" long half threaded with two GI Bolts of 5/8x2" long half threaded with spring washer.

2.5 The galvanization tests are to be conducted as per IS: 2633/72 & IS: 6745/72 & its latest Amendments.

The weight of zinc deposited shall be in accordance with that stated in Standard IS 2629 and shall not less than 0.61kg/m^2 with a minimum thickness of 86 microns for items of thickness more than 5 mm, 0.46kg/m^2 (64 microns) for items of thickness between 2 mm and 5 mm and 0.33kg/m^2 (47 microns) for items less than 2mm thick.

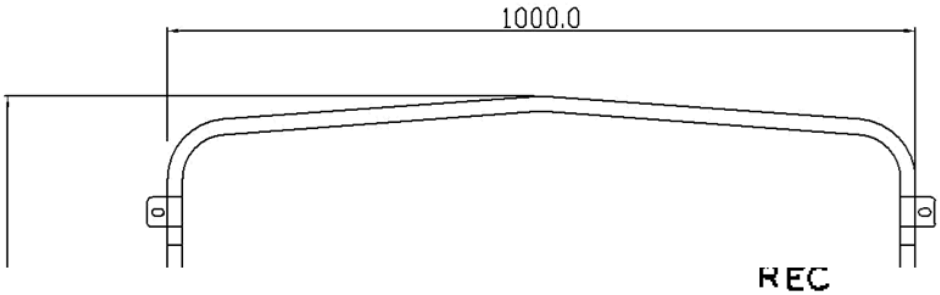
NB:- For detail construction standard refer Annexure-VII.

ANNEXURE– I



NOTES:–
ALL DIMENSIONS ARE IN MM
GENERAL TOLERANCE : ±2 %
FITTING TOLERANCE : ±3 %
SCALE : N.T.S.

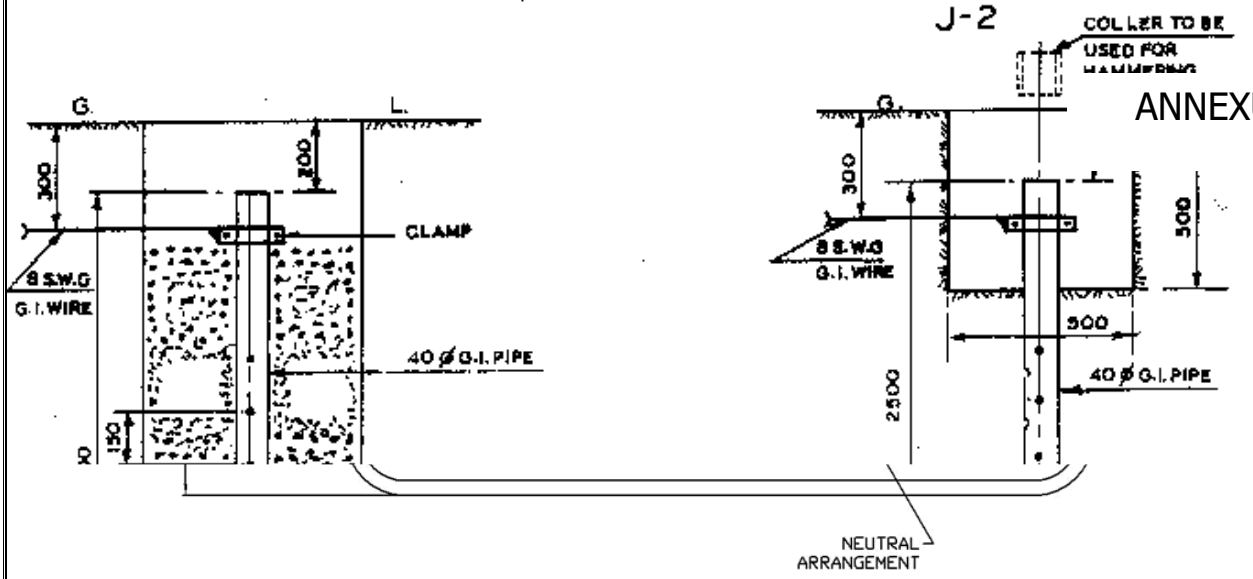
	DEEP DRAWN L.T. DISTRIBUTION BOX FOR 25/63/100 KVA WITH MCCB FOR RGGVY



REC

CONSTRUCTION STANDARD

J-2

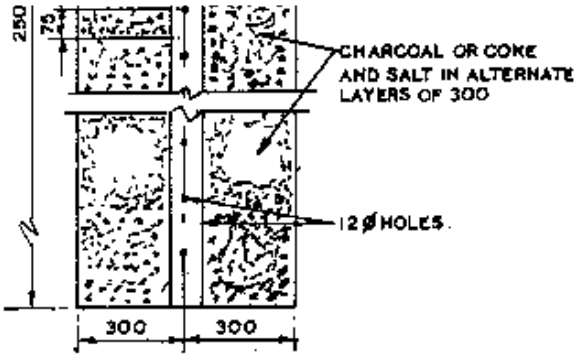


ANNEXURE-II

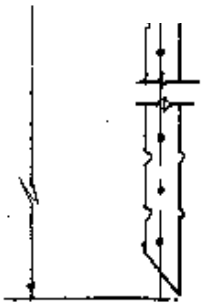
NOTES:–
ALL DIMENSIONS ARE IN MM
GENERAL TOLERANCE : ±2 %
FITTING TOLERANCE : ±3 %
SCALE : N.T.S.

	DEEP DRAWN L.T. DISTRIBUTION BOX FOR 25/63/100 KVA WITH MCCB FOR RGGVY

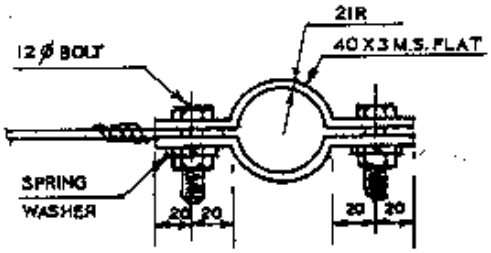
DEEP DRAWN L.T. DISTRIBUTION BOX FOR 25/63/100 KVA WITH TP MCCB FOR BGJY



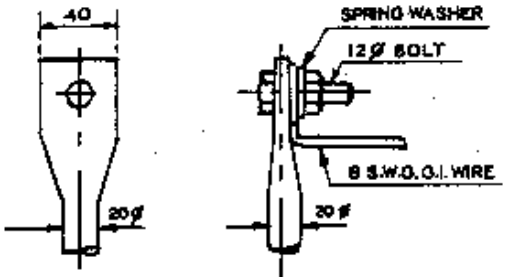
EARTHING FOR HARD, STIFF OR MEDIUM CLAY



EARTHING FOR ORDINARY SOIL WHERE PIPE COULD BE HAMMERED IN



TYPICAL DETAIL OF CLAMP FOR PIPE EARTH



TYPICAL DETAIL OF CONNECTION FOR ROD EARTH

ALL DIMENSIONS ARE IN mm.

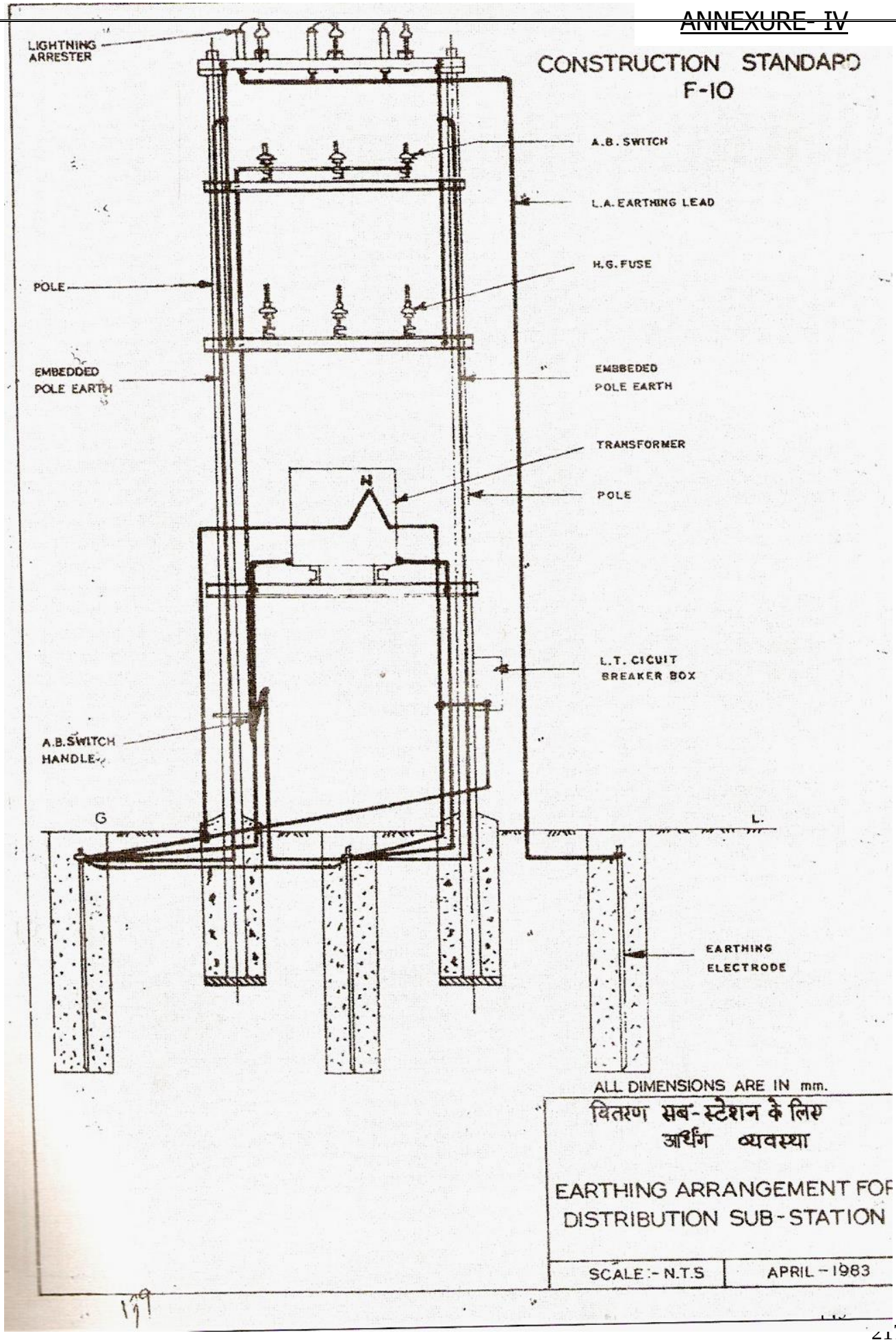
NOTES:-

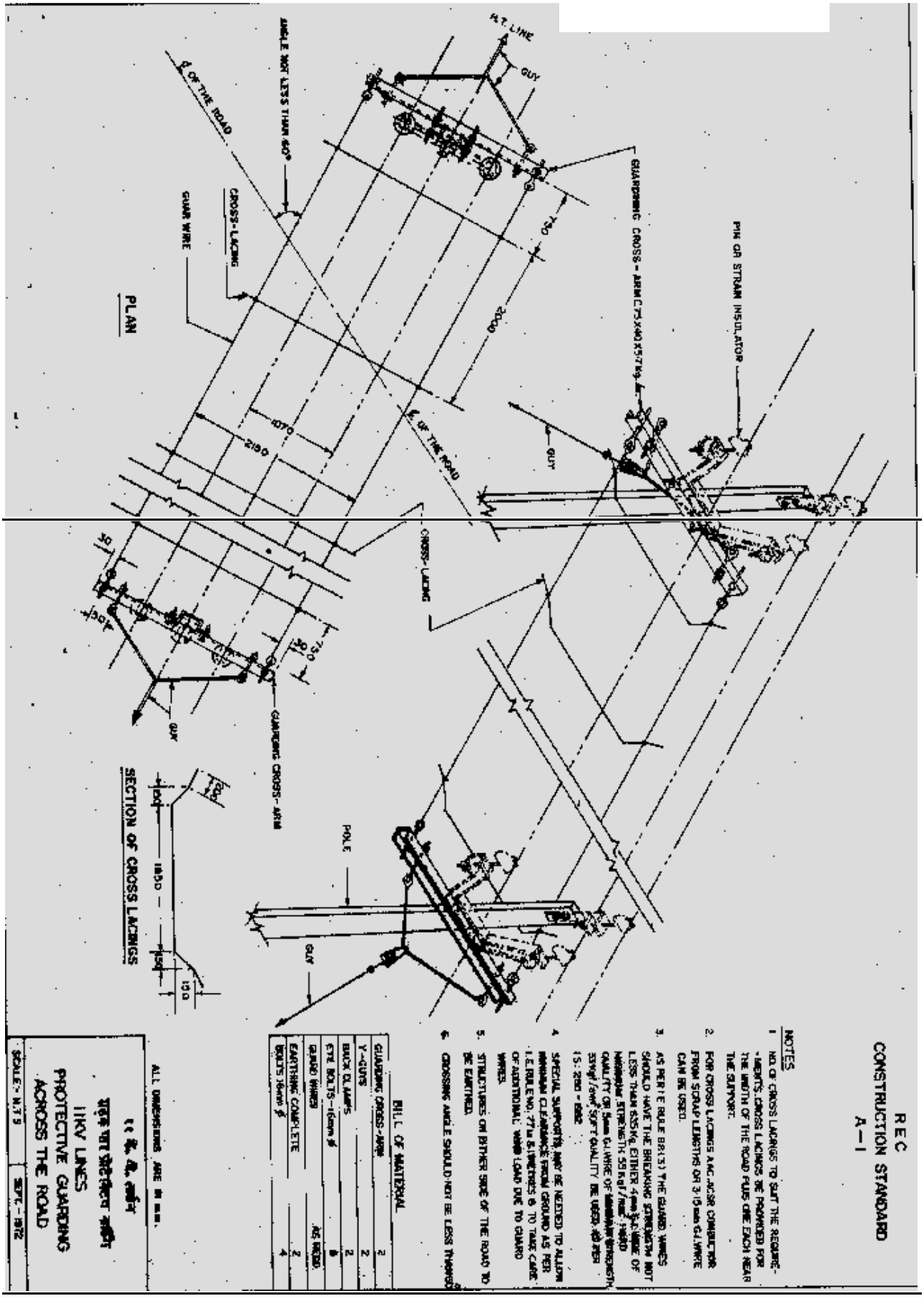
1. ALTERNATIVELY 20 Ø G.I. ROD MAY BE USED INSTEAD OF PIPE.
2. WATER TO BE POURED INTO SUMP TO KEEP THE SOIL SURROUNDING THE EARTH PIPE / ROD MOIST.
3. FOR COIL EARTHING REFER CONSTRUCTION STANDARD. J - 1.

पाइप / रॉड भू- सम्पर्कन

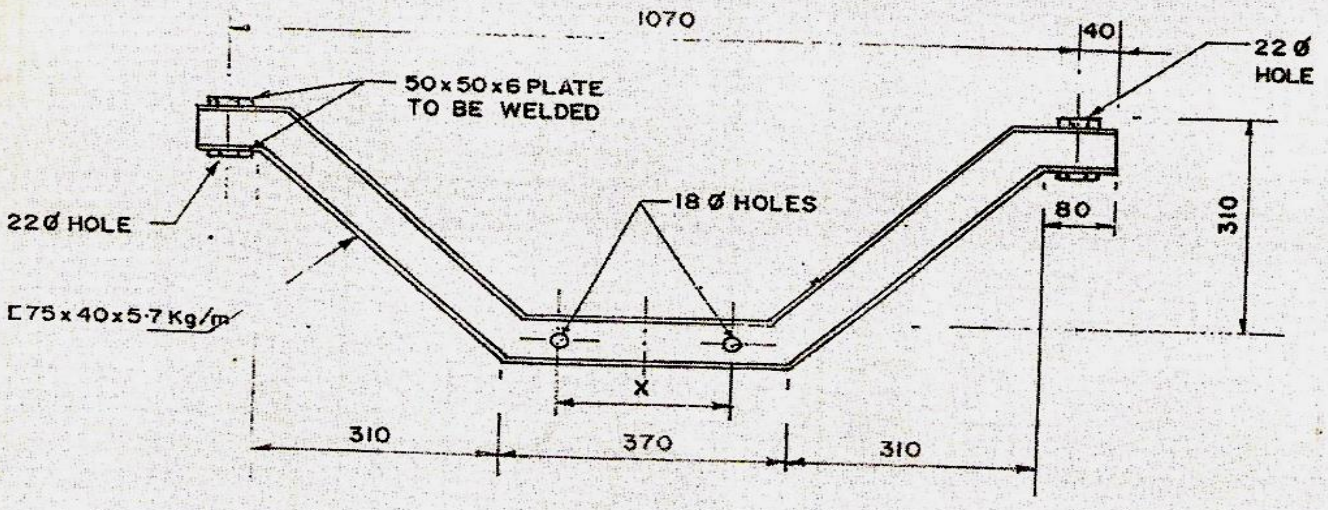
PIPE / ROD EARTHING

SCALE :- N.T.S	SEPT. - 1972

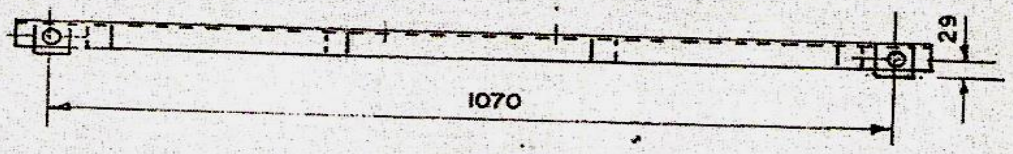

LIGHTNING ARRESTER
CONSTRUCTION STANDARD
F-10
A.B. SWITCH
L.A. EARTHING LEAD
H.G. FUSE
POLE
EMBEDDED POLE EARTH
EMBBEDED POLE EARTH
TRANSFORMER
POLE
L.T. CICUIT BREAKER BOX
A.B.SWITCH HANDLE
G
L
EARTHING ELECTRODE
ALL DIMENSIONS ARE IN mm.
वितरण सब-स्टेशन के लिए
आर्थिंग व्यवस्था
EARTHING ARRANGEMENT FOR
DISTRIBUTION SUB-STATION
SCALE:- N.T.S
APRIL - 1983


REC
CONSTRUCTION STANDARD
A-1
NOTES
1. NO OF CROSS LACINGS TO SUIT THE REQUIREMENTS. CROSS LACINGS BE PROVIDED FOR THE WIDTH OF THE ROAD PLUS ONE EACH NEAR THE SUPPORT.
2. FOR CROSS LACINGS ANGLE/ROD CONDUCTOR FROM SCRAP LENGTHS OR 3.15mm G.I.WIRE CAN BE USED.
3. AS PER IE RULE 88(3) THE GUARD WIRES SHOULD HAVE THE BREAKING STRENGTH NOT LESS THAN 635Kg. EITHER 4mm G.I. WIRE OF MINIMUM STRENGTH 551kgf/mm² HARD QUALITY OR 5mm G.I.WIRE OF MINIMUM STRENGTH 331kgf/mm² SOFT QUALITY BE USED AS PER IS: 280 - 1962
4. SPECIAL SUPPORTS MAY BE NEEDED TO ALLOW MINIMUM CLEARANCE FROM GROUND AS PER I.E.RULE NO. 77 i.e. 5.18METRES & TO TAKE CARE OF ADDITIONAL WIND LOAD DUE TO GUARD WIRES.
5. STRUCTURES ON EITHER SIDE OF THE ROAD TO BE EARTHED.
6. CROSSING ANGLE SHOULD NOT BE LESS THAN 60°
BILL OF MATERIAL
GUARDING CROSS-ARM 2
Y-GUYS 2
BACK CLAMPS 2
EYE BOLTS-16mm ϕ 6
GUARD WIRES AS REQD.
EARTHING COMPLETE 2
BOLTS 16mm ϕ 4
ALL DIMENSIONS ARE IN mm.
११ के. वी. लाईन
सड़क पार संरक्षित मार्ग
11KV LINES
PROTECTIVE GUARDING
ACROSS THE ROAD
SCALE- N.T.S
SEPT.-1972
PLAN
SECTION OF CROSS LACINGS
GUARDING CROSS-ARM
POLE
GUY
CROSS-LACING
GUARD WIRE
ANGLE NOT LESS THAN 60°
℄ OF THE ROAD
PIN OR STRAM INSULATOR
AT LINE

REC
CONSTRUCTION STANDARD
A-6



ELEVATION



PLAN

X :- -TO SUIT THE POLE
NOTE :-AS AN ALTERNATIVE, M.S. ANGLE CROSS-ARM (A-13) MAY BE USED IF CHANNEL SECTION AS PER THIS STANDARD IS NOT AVAILABLE

ALL DIMENSIONS ARE IN mm.

११ के०वी० लाईन
V-कैंची भुजा
11 KV LINES
V - CROSS ARM

SCALE :- N.T.S	SEPT. - 1972

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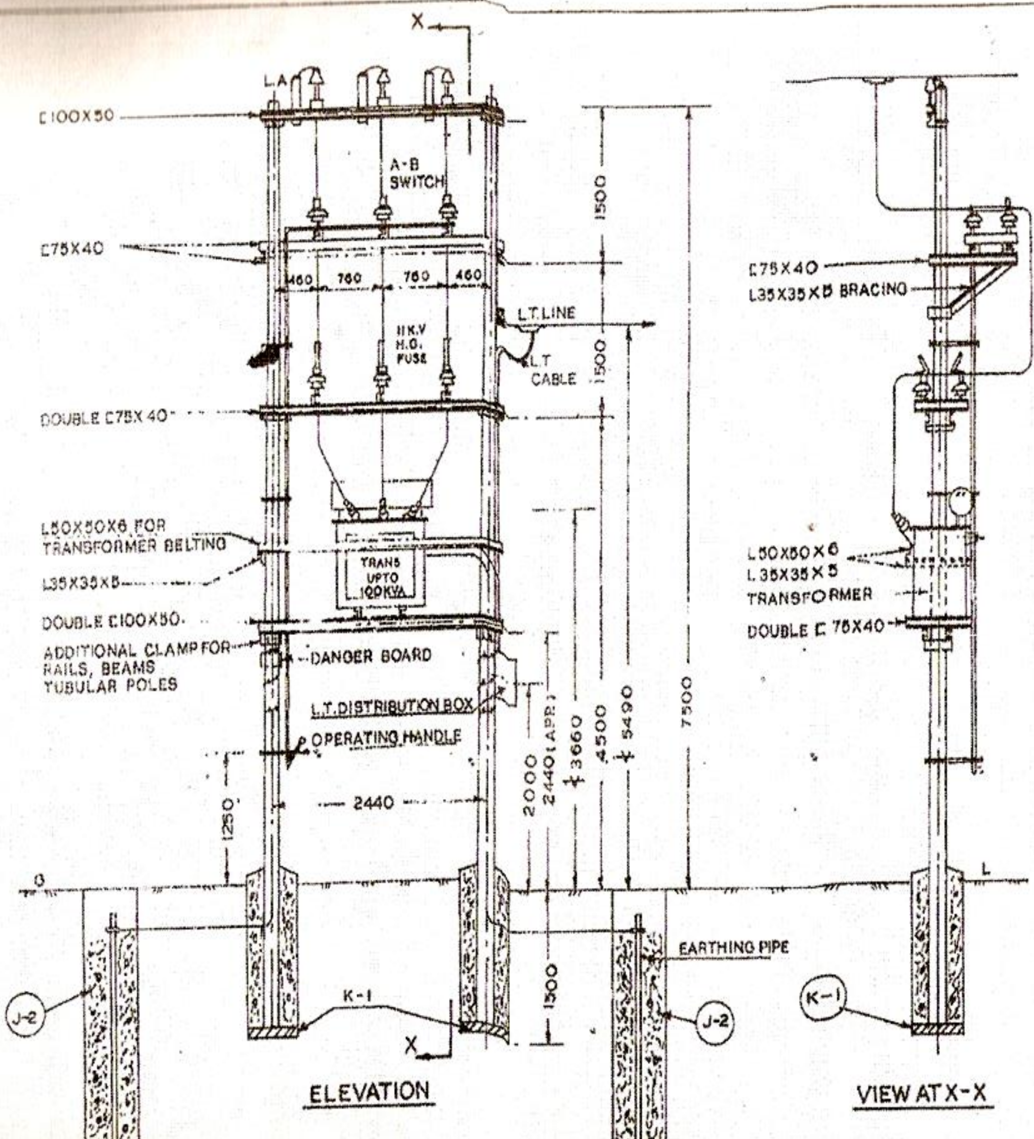
REC
CONSTRUCTION STANDARD
F-4



BILL OF MATERIAL

SUPPORT - 9m	2
CHANNEL 100X50 - 2800 (APP.)	3
CHANNEL 75X40 - 2800 (APP.)	4
CHANNEL 75X40 - X - ARM FOR A-B SWITCH - 1000 (APP.)	2
ANGLE 50X50X6 - 2800 (APP.)	4
ANGLE 35X35X5 - BRACING FOR SUPPORTING A-B SWITCH - 1000 (APP.)	2
ANGLE 35X35X5 - FOR TRANSFORMER BELTING	2
DISTRIBUTION TRANSFORMER	1
AIR BREAK SWITCH (HORIZONTAL TYPE	1 SET
H.G. FUSE UNIT - 3 PHASE	1 SET
11KV LIGHTNING ARRESTERS	3
DISTRIBUTION BOX	1
PIPE/ROD EARTHING (REFER J-2)	AS REQD.
BASE PLATE (REFER K-1)	2
DANGER BOARD	1
CLAMPS, NUTS, BOLTS, BARBED WIRE ETC.	AS REQD.
L.T CABLE	AS REQD

NOTE:- REFER F-5 FOR LOCATION OF EARTH PITS

११ के०वी०/४३३-२५० वी०
वितरण उप-केन्द्र
(चालू लाइन के स्थाननिर्धारण के लिए)
आरपार लाइन

11KV/433-250V
DISTRIBUTION SUB-STATION
(FOR ON LINE LOCATIONS-ACROSS LINE)

SCALE :- N.T.S | 1972/JAN - 1993

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SECTION- VI

LIST OF ANNEXURES

ANNEXURE-I

SCHEDULE OF BIDS FOR TECHNICAL

1. Name of tenderer with Office and factory address, Tel.No./Telex No./Fax No. :
2. Specification No. :
3. Address of Local Office and Tel.No./Telex/Fax No. :
4. Tenderer's Referance No. :
5. Last date and time of submission of Tender :
6. Date and time for opening of Tender :
7. Testing Facilities available :
8. Category of organization :
9. Whether qualifying certificates submitted :
10. Particulars of Earnest Money submitted :
11. Whether NESCO delivery clause accepted :
12. Whether agreed to :
    a) Inspection Clause :
    b) Packing Clause :
    c) Retesting Clause :
13. Whether Sample is enclosed :
14. Whether the material/equipment offered Conformed to the relevant ISS specification and drawing. :
15. Whether executed orders previously for the items tendered now. Please give full details of supplies made. :
16. Whether the materials bears ISI mark :

17. Offer valid up to :

18. Delivery Schedule :

a) Commence with minimum quantity :

b) Rate of delivery per month/quarter :
and completetion time.

19. If any deviation, please mention in deviation :
Sheet enclosed.

20. Technical literature/catalogue of the :
materials offered enclosed.

21. Bidders work experience
including user's certificate furnished or not. :

22. Type test certificate from any National Testing
Laboratory, Govt. of India :

23. ISO-9001 Certificate submitted :

24. Whether Guaranteed Technical Data Sheet
Particulars submitted.

Signature of Bidder

With Name and Seal of Firm

(This form is to be duly filled up and duly signed by the Bidder & submitted along with the tender.)

ANNEXURE-II

ABSTRACT OF GENERAL TERMS AND CONDITIONS

1. WhetherthebidderisaContractor / Firm&furnishedrelevantdocuments: Yes/No

2. Required CostofTenderFurnished Yes/No

3. Required EarnestMoneyFurnishedin Demand Draft Yes/No

4. WhetherInspection/Testcertificates by User,enclosed with thebid: Yes/No

5. Contractor / Firm's work experience
   including user's certificate furnished or not. : Yes/No

6. Audited annualreportsfor the last3 yearsfurnished ornot: Yes/No

7. Deviationtothespecification , ifany
   (Listenclosed ornot):- Yes/No

8. Whetheragreedto Purchaser's Delivery or work completetionschedule: Yes/No
   Ifagreed,

9. Whetheragreedto Purchaser'sGuaranteeclause:- Yes/No

10. Whetheragreedfor180 days'validityperiod ofPrices Yes/No

11. WhetherthePricesare**FIRM**? Yes/No

12.Whetheragreedtofurnish securitydepositin shapeof

B.G. encashableatBalasorein casehistenderis successful:- Yes/No

13.Whetheragreedto penalty fordelayed delivery:- Yes/No

14.Whetheragreedto Purchaser'sstandardtermsofpaymentornot: Yes/No

15. Test Certificate from any National. : Yes/No

Testing Laboratory. Govt. of India

16. ISO-9001 Certificate submitted : Yes / No

17.Valid IT Return &STCC,ED registration copy,PAN Cardfurnished ornot: Yes/No

(Self attested copy to be enclosed)

Signature of the Bidder

Name & With Seal of Firm

[This form is to be duly filled up and duly signed by the Bidder & submitted along with the tender.]

Tender Notice No. **Date:**

ANNEXURE– III

DECLARATION FORM

To

Sir,

Havingexamined theabovespecificationstogetherwith theTendertermsand conditions referred totherein.

1- I/wetheundersigneddoherebyoffertosupplythematerialscoveredthereonincompleteshapeinall respectsasperthe rulesenteredintheattached contractscheduleofpricesin thetender.

2- I/wedo herebyundertake to have thematerialsdelivered within thetimespecified inthetender.

3- I/wedoherebyguaranteethetechnicalparticularsgiveninthetendersupportedwithnecessaryreportsfrom concernedauthorities.

4-
I/wedoherebycertifytohavefurnishedacopyofthetenderspecificationsbyremittingCash/Demanddraft&thishas been dulyacknowledged by you in your letterNo……..Dt…….

5-
I/wedoherebyagreetofurnishthecompositeBankGuaranteeinthemannerspecified/acceptablebyTHE<PURCHASER>&forthesumasapplicabletome/usasperclauseNo.23&Annexure-IIIofthis specificationwithinfifteendaysofissueofLetterofintent/PurchaseOrder,intheeventofPurchaseorder being decided inmy/usfavour,failing whichI/weclearly understand thatthesaidLOI/P.O.shallbeliable to be withdrawn bythe Purchaser

Signed this…….Dayof……200….

Yoursfaithfully,

(SignatureofBidder with Seal)

(Thisformshould beduly filled up&signed bythebidder&submittedalongwith theoriginalcopyofthe bid)

ANNEXURE– IV

PROFORMA OF BANK GUARANTEE FOR EARNEST MONEY DEPOSIT

Bank Guarantee No……. Date…….

1. In accordance with invitation to Bid No…….. Dated…… of Collector & District Magistrate Bhadrak (herein after referred to as Collector) for the purpose of …….. M/s……. Address……..
…… wish / wishes to participate in the said tender and as the Bank Guarantee for the sum of Rs……. (Rupees……. only) valid for a period of …….. days (in words) is required to be submitted by the tenderer. We the …….. Bank (herein after referred to as the bank) at the request of M/s…….. hereby unequivocally and unconditionally guarantee and undertake to pay during the above said period or written request by the Collector, an amount not exceeding Rs…….. (Rupees……. only) to Collector without any reservation. The guarantee will remain valid up to 4.00PM of date…….. (date) and if any further extension is required the same will be extended on receiving instruction from M/s…….. on whose behalf this guarantee has been issued.
2. We, the …….. Bank do hereby undertake to pay the amounts, due and payable under the guarantee without any demur, merely on a demand from the Collector stating that the amount claimed is due by war of loss or damage caused to or suffered by Collector by reason of any breach by the said contractor(s) of any of the terms or conditions contained in the said agreement or by the reason of any breach by the said contractors failure to perform the said Bid. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. …….. (in words).
3. We undertake to pay to the Collector any money so demanded not withstanding any dispute or dispute raised by the contractor(s) / Supplier(s) in any suit or proceeding instituted / pending before any Court or Tribunal relating thereto our liability under this agreement being absolute and univocal. The payment made under this bond shall be a valid discharge of our liability for payment there under and the contractor(s) / supplier(s) shall have no claim against us for making such payment.
4. We, the …….. Bank our local Branch at Bhadrak (detail address & Code No. of local branch to be specified) further agree that the guarantee herein contain shall remain in full force and effect during eh period 240 days (two hundred and forty days) and it shall continue to do so enforceable till all the dues of the Collector under by the virtue of the said Bid have been fully paid and its claims satisfied or discharged or till Collector certifies that the terms and conditions of the said Bid have been fully and properly carried out by the said contractor(s) and accordingly discharge this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the …… we shall be discharged from all liabilities under this guarantee thereafter.
5. We, the …….. Bank our local Branch at Bhadrak further agree that Collector shall have the fullest liberty without our consent and without affecting any manner our obligations hereunder to very and of terms and conditions of the said Bid or to extend time of performance by the said contractor(s) from time to time to postpone for any time or from time to time any of the powers exercisable by Collector against the said contractor(s) and to forebear or enforce any of terms and conditions relating to the said Bid and we shall not be relived from our liability by reason of any such variation postponement or extension being granted by the contractor(s) or for any forbearance act of omission on part of Collector to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties should but for this provisions have effect of so relieving us.
6. The guarantee will not discharged due to change in the name, style and constitution of the Bank and contractor(s).
7. We, the …… Bank our local Branch at Bhadrak lastly undertake not to revoke this guarantee during its currency except with the previous consent of Collector in writing.

Dated……Day of ……..20…….
Witness :-

1…….. For ……

2…… (indicating name of the Bank with seal)

ANNEXURE-V
(A)

PROFORMA OF BANK GUARANTEE FOR PERFORMANCE GUARANTEE

(To be stamped in accordance with Stamp Act.)

Bank Guarantee No……. Date…….

This Guarantee Bond is executed this …….. Day …… 200 by us the ……Bank at …… P.O……. P.S……Dist…… State…….

Whereas the Collector & District Magistrate, Bhadrak (hereinafter called "Collector") has placed Order No……. Dt…… (herein after called "the Agreement") with M/s…….. (herein after called "Contractor") for Electrification of villages / hamlets under Biju Gram Jyoti Scheme on Turnkey basis and whereas Collector has agreed to exempt from depositing of performance guarantee amount on furnishing by the Contractor to the Collector a Bank Guarantee of the value of 10% (Ten percent) of the Contract price valid for 18 months from the date of completetion of work of the said Agreement.

1. Now, therefore, in consideration of the Collector having agreed to exempt from deposit of performance guarantee amount in terms of the said Agreement as aforesaid, we the ……Bank, Address…… (code No. ……..) (herein after referred to as "the Bank") do hereby undertake to pay to the Collector an amount not exceeding Rs……..……. (Rupees…… ……) only against any loss or damage caused to or suffered by the Collector by reason of any breach by the said Contractor(s) of any of the terms or conditions contained in the said Agreement.

2. We, the ……. Bank do hereby undertake to pay the amounts due and payable under the guarantee without any demur, merely on a demand from the Collector stating that the amount calmed is due by way of loss or damage caused to or suffered by Collector by reason of any breach by the said Contractor (s) of any of the terms or conditions contained in the said Agreement or by the reason of any breach by the said Contractor's failure to perform the said Agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this Guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs……..… (Rupees……

3. We, the ……. Bank also undertake to pay to the Collector any money so demanded not withstanding any dispute or dispute raised by the Contractor (s) in any suit or proceeding instituted / pending before any court or Tribunal relating thereto our liability under this Agreement being absolute and unrecoverable.

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

4. We, the …….. Bank further agree that the guarantee herein contain shall remain in full force and affect during the period that would be taken for the performance of this said Agreement and it shall continue to remain in force endorsable till all the dues of the Collector

under by virtue of the said Agreement have been fully paid and its claim satisfied or discharged or till Collector certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharge this guarantee and will not be revoked by us during the validity of the guarantee period.

Unless a demand or claim under this guarantee is made on us or with …… (Local Bank Name, Address and code No.)……, Bhadrak in writing on or before

……. (date) we shall be discharged from all liability under this guarantee thereafter.

5 We, the ……..Bank further agree that the Collector shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said Contractor(s) and we shall not be relieved from our liability by reason of any such variation or extension being granted to the said Contractor or for any forbearance act or omission on part of the Collector or any indulgence by the Collector to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to super ties would but for this provisions have effect of so relieving us.

6 The Guarantee will not be discharged due to change in the name, style and constitution of the Bank and or Contractor(s)

7. We the _____Bank lastly undertake not to revoke the Guarantee during its currency except with the previous consent of the Collector in writing.

Dated_____The_____Days of Two Thousand_____

Not with standing anything contained herein above.

(i) Our liability under this Bank Guarantee shall not exceed Rs……

(Rupees ……)only

(ii) The Bank Guarantee shall be valid upto ……..only

(iii) We or our Bank at ……(Name & Address of the Local Bank,Bhadrak) are liable to pay the guaranteed amount depending on the filling of claim and any part thereof under this Bank Guarantee only if your serve upon us or our local Bank at ……., a written

claim or demand and received by us or any Local Bank at ……on or before Dt……..otherwise bank shall be discharged of all liabilities under this guarantee thereafter.

For ……

(Indicate the name of the Bank)

NB:

1) Name of the Contractor
2) No. & Date of the Purchase Order/agreement
3) Name of the Bank
4) Amount of the Bank Guarantee
5) Name, address and Code No. of the local Bank
6) Validity Period or date upto which the agreement is valid
7) Signature of the Constituent Authority of the Bank with Seal
8) Name and address of the Witnesses with signature
9) The Bank Guarantee shall be accepted only after getting confirmation from the respective Bank

ANNEXURE-V
(B)

FORMOFEXTENSIONOFBANKGUARANTEE

(ONNON-JUDICIALSTAMPPAPEROFRs.100/-)

Ref.No._____Dated:_

TheAdministrator, _____.

DearSirs,

Sub: Extension of Bank Guarantee No. for Rs._____Favouring your selves expiring_____on account of M/s.__ _____inrespect of contractNo._____dated_____

AttherequestofM/s._____we_____bankBranchofficeat _____havingitsheadofficeat_____doherebyextendourliabilityunder theabovementioned

guaranteeNo. _____Dated_____forafurtherperiodof_____Years/monthsfrom _____

originalbankguaranteeNo._____dated____shallremainunalteredandbinding.

Pleasetreatthisasanintegralpartoftheoriginalguaranteetowhichitwouldbeattached.Yo urs faithfully,

For_____ Manager/Agent/AccountantPowerofAttorneyNo._____ Date:_____

SEAL OFBANK

Note:Thenon-judicialstamppaperofworthRs.100/- shallbepurchasedinthenameofthebank,whichhasissuedthebankguarantee.

ANNEXURE–VI(A)

LETTEROFCOMPLIANCEOFQUALIFYINGREQUIREMENT(Incaseof

Bidderbeing aJointVenture/ConsortiumFirm)

To,

The Collector & District Magistrate

BHADRAK

DearSirs,

I/We…….(Nameof Bidder) are submitting thebidasa singlefirm.Insupportof ourmeeting theQualifyingrequirements(QR)for bidders, stipulatedinthistender specification, wefurnishherewiththedetails/documentsetc.asfollows.

NameofthemembersoftheJV/Consortium

1.
2.
3.

Table–A:PreviousWorksExperience:Nameof theMember(anyonememberonly)

BlockQuotedfor	Description of ProposedWorks	TenderQty	QtyInstalled&Commissioned					
			Sl. No.	FY	NameofClient	WORef	QtyInstalled	Documentsprovided in proofofhaving executed the works during the relevant FY.

Table–B:AnnualTurnover:

BlockQuotedfor	**EstimatedCost of thePackage(Rs. inLakh)**	**AnnualTurnover(Rs.i nLakh)**	
		Financial Year	**Turnover (Rs. inLakh)**
		FY2017-18	
		FY2018-19	
		FY2019-20	
TotalEstimated Cost of the Blocksquotedfor			

Note:

Continuationsheets,oflikesizeandformat,maybeusedasperBidder"srequiremen ts andannexedtothis Schedule.

I/Wedeclarethatwearefulfillingthequalifyingrequirementsasperclauseno.2.0ofSection– I,Invitationfor Bids(IFB).

For &onbehalf of.....(NameoftheBidder).

Date: (Signature)……..

Place: (Printed Name)…….
(Designation) ……..
(Common Seal)……

Note:

1**.**Continuationsheets,oflikesizeandformat,maybeusedasperBidder"srequireme ntsandannexedtothisSchedule.

1. IncaseofJointVenture, separatesheetforeachpartner ofJointVentureshouldbeused.

Date: (Signature)……..

Place:

(PrintedName) …….

(Designation)……..

(CommonSeal)……

ANNEXURE–VII(A)

DETAILSOFCOMMERCIALDEVIATIONS

Bidder'sName&Address

To,

The Collector & District Magistrate

BHADRAK

DearSirs,

Sub:CommercialDeviationforConstructionofNameoftheproject.

ThefollowingaretheCommercialDeviationsandvariationsfromandexceptionstothespecificationsandd ocumentsforthesubjectProject.Thesedeviationsandvariationsareexhaustive.

Exceptforthesedeviations,theentireworkshallbeperformedasperyourspecifications anddocuments

Volume/Clause	Ref./Page No.	Asspecifiedin the Specification	Commercialdeviationandvariation tothespecification

Date: (Signature)……..

Place: (PrintedName)…….

(Designation)……..

(CommonSeal)……

Note:1.Continuationsheets,oflikesizeandformat,maybeusedasperBidder"srequirements andannexedtothis Schedule.

2. ThiswillbereadoutduringopeningofPart-IBid.

ANNEXURE–VII(B)

Bidder'sName&Address

DETAILSTECHNICALDEVIATIONS

To,

The Collector & District Magistrate

BHADRAK

DearSirs,

Sub:Technical DeviationforConstructionof .....(Nameof theProject)

The following are theTechnical Deviations andvariations fromand exceptions tothe specificationsanddocumentsforthesubjectpackage.Thesedeviationsandvariationsare exhaustive.Exceptforthesedeviations,theentireworkshallbeperformedasperyour specificationsanddocuments

Volume/Clause	Ref./PageNo.	As specified in theSpecification/RelevantISS	Technicaldeviationandvariation to the specification

Date: (Signature)……..

Place: (PrintedName) …….

(Designation)……..(CommonSeal)……

Note:1.Continuationsheets,oflikesizeandformat,maybeusedasperBidder'srequirements andannexedtothis Schedule.

2.Thedeviationsandvariations,ifany,shallbebroughtoutseparatelyforeachoftheequipment.

ANNEXURE–VIII

ADDITIONALINFORMATION

Bidder'sName&Address

To,

The Collector & District Magistrate

BHADRAK

DearSirs,

We have enclosed with our proposal the following additional information for the subject, package.

SL No	Brief description of Information
Ref.&PageNo.	

Date: (Signature)……..

Place: (Printed Name) …….

(Designation)……..(Common Seal)……

Note: Continuation sheets, of like size and format, may be used as per Bidder"s requirements and annexed to this Schedule.

ANNEXURE–IX

BOUGHT OUT & SUB CONTRACTED ITEMS

Bidder's Name & Address

TO

The Collector & District Magistrate

BHADRAK

DearSirs,

We here by furnish the details of the items / sub-assemblies amounting to more than 10% of our bid price, we propose to buy for the purpose of subject package

Sl.No Item description	**Qty.Proposed**	**Source of Supply**
Bebought/Sub-contracted		
1……	……..	……..
2…….	…….	……..
3……..	…….	……
4……..	…….	…….
5…….	……..	…….
6……	……..	…….
7……	……..	…….

Date:

(Signature)……..

Place:

(PrintedName)…….

(Designation).....(CommonSeal)

ANNEXURE–X

WORK COMPLETETION SCHEDULE

Bidder's Name & Address

To,

The Collector & District Magistrate

BHADRAK

DearSirs,

We here by declare that the following Work Completetion Schedule shall be followed by us for the purpose of subject package

Sl.No	Description of Work	Period in Months (from the date of LOA)
1	Completetionof detailedengineering	
2	Procurementofrawmaterials	
3	Establishmentofsiteoffices	
4	Erection	
(a) Commencement		
(b) Completetion		
5	Testing&Pre-commissioning	
(a) Commencement		
(b) Completetion		
6	Commissioning	

Date: (Signature)……..

Place: (PrintedName)…….

(Designation)……..(CommonSeal)……

ANNEXURE –XI

CHECKLIST

Bidder'sName&Address

To,

The Collector & District Magistrate

BHADRAK

DearSirs,

Sl. No.	**ItemDescription**	**StatusoftheSubmissionof Data**	**Remarks**
1	2	3	4
1.	BidGuarantee	Yes/No	IfyespleasegivedetailsNo,amount,validity&dateofissue.
2.	QualifyingData	Yes/No	
3.	CommercialDeviation	Yes/No	
4.	TechnicalDeviation	Yes/No	
5.	Costofwithdrawnofdeviations	Yes/No	
6.	Bidvalidity	Yes/No	Ifyesstateheretheperiod.
7.	Periodofcompletetion	Yes/No	If,yespleasestateheretheperiodofcompletetion.
8.	Additionalinformationofferedbybidder		Stateherebriefly

N.B.:-ThecontentsofthisschedulewillbereadoutduringopeningofPart-IBid.

.....**SignatureofBidderDate&Seal:**

N.B:-

1. The bidguarantee oneoriginaland onecopy shallbefurnishedintwoseparate sealedenvelopes appropriatelysuperscribedthereon.

2. All Schedules pertaining to prices (originals) shall be furnished in a sealed envelope dulysuperscribedthereon.Similarly oneset of copiesof suchschedulesshall be giveninaseparatesealedenvelope(thesearenottobeopenedduringopeningofPart–I).

3. All other schedules, one set original and another copy shall be submitted in two separate sealed envelope (these are to be opened during Part–I bid opening)

Date: (Signature)……..

Place: (Printed Name)…….

(Designation)……..(Common Seal)……..

SECTION- VII

SCHEDULED OF QUANTITY & PRICE

ERECTION & COMMISSIONING FOR RENOVATION OF HT, LT LINES & S/S FOR STRENTHENING OF INFRASTRUCTURE IN BHADRAK DISTRICT UNDER BGJY SCHEME

(Firm shall quote the unit rate and total rates inclusive of GST)

TENDER NOTICE NO:- **Dtd.**

PRICEBID

Name of District:-

Name of Block:-

To

The Collector & District Magistrate,

Bhadrak

Dear Sir,

We hereby furnish the detailed price of supply, erection & inspection of the equipment & materials covered for 1Km scope of Rural electrification Work in .....Block of Bhadrak **District** of Odisha under Biju Gram JyotiYojana (SI) Scheme of GOO. **(All Price in Rs.)**

ITEM WISE TOTAL COST FOR THE BLOCK.....ON TURNKEY BASIS							
Sl. No.	Description of work	Unit	Qty.	Per unit Cost in Rs.	Price offered (for Bidder)		
					Unit Rate (in Rs.)	GST @	Total Unit Price (in Rs.)
1	Stringing of 1 KM 33KV OH line with 100mm2 AAAC on Existing Pole (4nos. Of CP)	Km	1	4,00,469.00			
2	Construction of 11KV 2Ph OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC and Average span 60mtr(CP-4 with 2nos. Of SP & 2nos. Of DP)	Km	1	3,77,545.00			
3	Construction of 3 Phase 11KV OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC and Average span 60mtr (CP-4 with 2nos. Of SP & 2nos. Of DP)	Km	1	4,44,583.00			
4	Erection of 11mtr interposing PSC Pole in 11KV OH line	No	1	18,323.00			
5	Erection of 9mtr interposing PSC Pole in 11KV OH line	No	1	11,453.00			
6	Up gradation of 11KV 2Ph line to 3Ph OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC	Km	1	65,466.00			
7	Construction of DP Structure (with Existing Plinth Mounted Transformer)	No	1	1,57,755.00			
8	Construction of 100 KVA(3ph) DP Structure & Plinth Mounted Sub-station (without Transformer)	No	1	2,43,498.00			
9	Construction of 100 KVA(3ph) Plinth Mounted Sub-station over 9mtr long PSC Pole	No	1	4,49,738.00			

10	Construction of 63 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole	No	1	3,47,141.00			
11	Construction of 25 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole	No	1	2,61,638.00			
12	Construction of 16 KVA(1ph) Single Pole Mounted Sub-station over 9mtr long PSC Pole	No	1	1,73,447.00			
13	Construction of 10 KVA(1ph) Single Pole Mounted Sub-station over 9mtr long PSC Pole	No	1	1,49,890.00			
14	Upgradation from 63KVA to 100 (3ph)	No	1	2,59,014.00			
15 (a)	Upgradation from 25KVA (1Ph) to 63KVA ,11/0.4KV S/S	No	1	3,55,498.00			
(b)	Upgradation from 25KVA ,11/0.4KV to 63KVA ,11/0.4KV S/S	No	1	1,97,802.00			
16 (a)	Upgradation from 25KVA (1Ph) to 100KVA ,11/0.4KV S/S	No	1	4,58,095.00			
(b)	Upgradation from 25KVA ,11/0.4KV to 100KVA ,11/0.4KV S/S	No	1	2,53,935.00			
17 (a)	Upgradation from 10KVA (1Ph) to 25KVA 11/0.4KV S/S	No	1	2,67,385.00			
(b)	Upgradation from 16KVA (1Ph) to 25KVA 11/0.4KV S/S	No	1	2,69,578.00			
18	Upgradation from 16KVA (1Ph) to 63KVA 11/0.4KV S/S	No	1	3,55,082.00			
19	Upgradation from 16KVA (1Ph) to 100KVA 11/0.4KV S/S	No	1	4,52,526.00			
20	Construction of 1ph 2w LT (NEW)Line over 9mtr Long 300Kg PSC Pole with 1*35+1x25mm2 AB cable	km	1	2,88,979.00			
21	Construction of 3ph 4w (New) LT Line over 9mtr Long 300Kg PSC Pole with 3*50+1*35+1*16mm2 AB cable	km	1	4,60,147.00			
22	Conversion of 1ph (Bare) to 3ph 4w LT Line over existing PSC Pole with 3*50+1*35+1*16mm2 AB cable with existing Poles	km	1	2,66,009.00			
23	Replacement of damaged 1ph 2w LT Line with 1*35+1x25mm2 AB cable	km	1	95,174.00			
24	Conversion of 3 Ph LT Line having Bare conductor with 3*50+1*35+1*16mm2 AB cable	km	1	2,66,961.00			
25	Construction of Guarding for Road Crossing- 50 mtr crossing	km	1	27,469.00			
26	Installation of 11Kv line AB switch (3 Pole 400A) with DP Structure along with 9mtr long 300kg PSc pole	set	1	99,078.00			

27	Installation of 33Kv line AB switch (3 Pole 400A) with DP Structure along with 10mtr long 400kg PSc pole	set	1	1,20,625.00			
28	Construction of Barbed wire Fencing (dimension for which Barbed wire fencing to be done- 12ft x12ft) with fencing post 95.4feet),Barbed wire(44mtr-6mtr/kg),gate(4ftx3.5ft or say 20kg),excavation of fencing post & gate pillar and sand filling	No	1	32,692.00			
29	Installation of 250KVA 11/.4KV plinth mounted transformer, AB Switch, HG Fuse, LA, etc. on existing D.P structure – 1No	Nos.	1	7,07,027.00			
30	Installation of 100KVA 11/.4KV transformer, AB Switch, HG Fuse, LA, etc. on existing D.P structure – 1No	Nos.	1	4,20,516.00			
31	Installation of 63KVA 11/.4KV transformer, AB Switch, HG Fuse, LA, etc. on existing D.P structure – 1No	Nos.	1	2,88,771.00			
32	Installation of 25KVA 11/.4KV transformer, AB Switch, HG Fuse, LA, etc. on existing D.P structure – 1No	Nos.	1	2,33,582.00			
33	Supply & Erection of HT stay set complete along with stay wire (7/10 GI stay wire) & connecting the same to the HT pole complete in all respect.	No	1	4,460.00			
34	Supply & Erection of LT stay set complete along with stay wire (7/12 GI stay wire) & connecting the same to the LT pole complete in all respect.	No	1	3,206.00			
35	Supply & Erection of 2Nos of HT stay set complete along with stay wire (7/10 GI stay wire) & connecting the same to the 2Nos of DP pole of 25KVA /63KVA/100KVA S/S complete in all respect.	No	1	7,596.00			
36	Supply & Erection of 11mtr RS joist pole (116mmX100 mm) & construction of DP by providing appropriate top channel (100X50x6 mm Ms channel) & required size of N & B for road or river crossing for 11KV line.	No	1	1,14,585.00			
37	Supply & Erection of 11 mtr, 330Kg PSC Pole & construction of DP by providing appropriate top channel (100X50x6 mm Ms channel) & required size of N & B for road or river crossing for 11KV line.	No	1	57,998.00			
38	Supply ,Erection & fixing (suitably) of 9Mtr long PSC pole as strut on required points of LT & HT lines where stay cannot be fixed.	No	1	7,772.00			
39	Supply & Erection of 9Mtr long Psc pole with V cross arm & F clamp duly fitted over it (All supplied by contractor)3 Nos of 11KV Pin insulator (polyner type) with GI pin.	No	1	10,659.00			
40	Supply & Erection of 11Mtr long RS joist pole with V cross arm & F clamp duly fitted over it (All supplied by contractor) 3 Nos of 11KV Pin insulator with GI pin.	No	1	51,076.00			

41	Supply & Erection of 9mtr PSC pole (SP) for road or river crossing for LT line.	No	1	8,442.00			
42	Installation of Service Connections complete work for BPL consumer for Power supply to BPL Households	No	1	2,000.00			
43	The display of sign Board made of in 40 x 40 x 6 mm MS iron angle as pillar. The horizontal MS angle in 25 X 25 X 6 mm to be fixed on the Top. The 18 gauge (5Feet Length X 4Feet width) carbon MS sheet should be affixed on the platform and the departmental supplied sign board should be pasted on it showing the name of the village/ hamlet and year of electrification.	No.	1 per village/ Hamlet	3,000.00			
TOTAL PRICE IN RS.							

N.B:

1	All the required materials for the above work has to be provided by the bidder as per on going REC specification & the workmanship should also be of REC standard. The iron materials should be painted with two coats of red oxide paint. Proof of purchase of material is required. If the number stays per K.M becomes less or more than 6 Nos taking the block as unit then the cost of that number of stay will be deducted from the bill or added in the bill. Here the cost of stay will be treated as the unit cost price of stay as per schedule rate. Stay to be provided wherever the angular deviation of line exceeds 15 degree. The padding & cooping work of all HT supports must be done as per REC standard. There should be inscribed in each pole "BIJU GRAM JYOTI" and the year of electrification in white paint in the background of deep green paint.
2	Cable for connection of transformer to LTDB,GI pipe & lamps for routing of cable & all other sundry items & Supply and erection of 11Kv Stay set Complete & Supply with all accessories such as 11KV, 3-pole AB Switch, 11KV HG fuse set & LA, LT Distribution box with energy meter complete as per RE specification
3	Supply & installation of barbed wire fencing (Barbed wire run over fencing posts)as per standard specification covering the whole s/s area size(12'x8')providing one 10Kg iron gate having size(2.5'x4')duly red oxide &aluminum painted.
4	The old Transformer & other materials dismantelled from the S/S should be returned to the E.E. of Concerned distribution division of TPNODL.
5	All the required materials including fixtures are to be provided by the bidder and the work inspected by the authrosied official of ELBO Odisha so as to enable the s/s to be charged . The materials should be of good quality conforming to REC standard. Proof of purchase of materials is required .There should be inscribed in each pole and transformer BIJU GRAM JYOTI and the year of electrification in white paint in the background of deep green paint

Any items not specified above but required for construction work are to be taken into account by the bidder and the bidder should quot eaccordingly.

TotalPriceinwords

(.....)

Bidder will be permitted to enter the item wise rates only. No other modification shall be permitted. Bidders are required to sign each and every page and enclose the same in the Price Bid in sealed Condition.

NB:

1. **The schedule of rate (Unit Cost) mentioned in the above columns are including GST & Cess.The Bidders are required to quote their rate accordingly, as no extra amount for GST &Cess will be paid over and above the bill amount.**
2. **The Bidders are required to quote their price in percentage basis i.e. LESS or EXCESS on the amount put to tender for the project, in the blank space provided below, both in figure and words compulsorily, failing which the bid will be cancelled.** In case of any confusion in percentage rate quoted by the Bidder(s), the rate mentioned in words will be taken as final.
3. Any discrepancy in unit rate and amount, unit rate stands.
4. Anycolumn left blank shall be treated as nil / inclusive of.
5. Erection charges shall be inclusive of transportation of materials.

My / Ourquoted Rate is _____% (In Figure),_____ (In words)

- **Less than /Excess over / Equal to the amount put to tender.**

01	**Number of Correction:**	
02	**Number of Over Writing:**	

('*'CKm: Circuit Km means length of line, 1CKm=3.0Km length of 1 core insulated conductor)

Signature of the Bidder with Seal

(This form should be duly filled up by the tenderer & submitted in duplicate in separate envelopes Package wise super-scribing **"PRICEBID",** Package No. signed & sealed in each page).

SECTION-VIII

MATERIAL LIST OF STANDARD ESTIMATE

Tender Notice No: **Date:**

1.Material List for Stringing/Replacement of 1 KM 33KV OH line with 100mm2 AAAC on Existing Pole (4nos. Of CP)			
Sl.No	**Description of Materials**	**Unit**	**Qnty/KM**
1	33KV B&S H.W Fitting	No.	24
2	33KV B&S Disc Insulator (Polymer)	No.	24
3	HT Stay set(Complete)	Set	8
4	HT Stay Insulator	No.	8
5	HT stay clamp(1.95Kg/Pair)	Pair	8
6	7/8 SWG Stay Wire 10kg/Stay	kg	80
7	100 mm2 AAAC	KM	3.1
8	100*50*6 mm MS channel	Kg	160
9	50*50*6 mm MS Angle	Kg	84
10	GI Nut,Bolt& Washer of different sizes	Kg	10
11	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	8
12	Sundriesfor survey, tree cutting, small size nut & bolt with washer, Allm. Binding Tape, Danger Board, etc	LS	1

2.Material List for construction of 11KV 2Ph OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC and Average span 60mtr(CP-4 with 2nos. Of SP & 2nos. Of DP) (1KM)			
Sl.No	**Description of Materials**	**Unit**	**Qnty/KM**
1	300KG 9mtr long PSC pole	No.	21
2	11 KV V cross Arm	No.	17
3	11KV F Clamp	No.	17
4	Back Clamp for V Cross Arm	No.	17
5	11kv Pin Insulator (Polymer)	No.	40
6	11KV H W fitting(T&C)45KN	Set	16
7	11KV Disc insulator (T&C)45 KN polymer	No.	16
8	HT Stay set(Complete)	Set	8
9	HT Stay Insulator	No.	8
10	HT stay clamp(1.95Kg/Pair)	Pair	8
11	7/10 SWG Stay Wire 10kg/Stay	Kg	80

12	Earthing of Support(Coil type)	No.	21
13	55 mm2 AAAC	KM	2.06
14	Anti Climbing Device made of GI barbed wire,Clamping arrangement etc.(2kg Per Support)	Kg	42
15	100*50*6 mm MS channel	Kg	88
16	75x40x6mm MS channel	Kg	72
17	50*50*6 mm MS Angle	Kg	34
18	GI Nut,Bolt& Washer of different sizes	Kg	30
19	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	21
20	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	8
21	Sundries for survey, tree cutting, small size nut & bolt with washer, Allm. Binding Tape, Danger Board, etc	LS	1

3. Material List for construction of 3 Phase 11KV OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC and Average span 60mtr (CP-4 with 2nos. Of SP & 2nos. Of DP) (1KM)

Sl.No	Description of Materials	Unit	Qnty/KM
1	300KG 9mtr long PSC pole	No.	21
2	11 KV V cross Arm	No.	17
3	11KV F Clamp	No.	17
4	Back Clamp for V Cross Arm	No.	17
5	11kv Pin Insulator (Polymer)	No.	57
6	11KV H W fitting(T&C)45KN	Set	24
7	11KV Disc insulator (T&C)45 KN polymer	No.	24
8	HT Stay set(Complete)	Set	8
9	HT Stay Insulator	No.	8
10	HT stay clamp(1.95Kg/Pair)	Pair	8
11	7/10 SWG Stay Wire 10kg/Stay	Kg	80
12	Earthing of Support(Coil type)	No.	21
13	55 mm2 AAAC	KM	3.09
14	Anti Climbing Device made of GI barbed wire,Clamping arrangement etc.(2kg Per Support)	Kg	42
15	100*50*6 mm MS channel	Kg	88
16	75x40x6mm MS channel	Kg	72
17	50*50*6 mm MS Angle	Kg	34
18	GI Nut,Bolt& Washer of different sizes	Kg	30
19	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	21

20	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	8
21	Sundries for survey, tree cutting, small size nut & bolt with washer, Allm. Binding Tape, Danger Board, etc	LS	1

4. Material List for erection of 11mtr interposing PSC Pole in 33/11KV OH line (1No)			
Sl.No	**Description of Materials**	**Unit**	**Qnty/KM**
1	11 mtr long 330kg PSC Pole	No.	1
2	11 KV V cross Arm	No.	1
3	11KV F Clamp	No.	1
4	Back Clamp for V Cross Arm	No.	1
5	11kv Pin Insulator (Polymer)	No.	3
6	Earthing of Support(Coil type)	No.	1
7	Anti Climbing Device made of GI barbed wire,Clamping arrangement etc.(2kg Per Support)	Kg	2
8	GI Nut,Bolt& Washer of different sizes	Kg	1
9	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	1
10	Sundries for survey, tree cutting, small size nut & bolt with washer, Allm. Binding Tape, Danger Board, etc	LS	1

5. Material List for erection of 9mtr interposing PSC Pole in 11KV OH line(1No)			
Sl.No	**Description of Materials**	**Unit**	**Qnty/KM**
1	300KG 9mtr long PSC pole	No.	1
2	11 KV V cross Arm	No.	1
3	11KV F Clamp	No.	1
4	Back Clamp for V Cross Arm	No.	1
5	11kv Pin Insulator (Polymer)	No.	3
6	Earthing of Support(Coil type)	No.	1
7	Anti Climbing Device made of GI barbed wire,Clamping arrangement etc.(2kg Per Support)	Kg	2
8	GI Nut,Bolt& Washer of different sizes	Kg	1
9	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	1
10	Sundries for survey, tree cutting, small size nut & bolt with washer, Allm. Binding Tape, Danger Board, etc	LS	1

6. Material List for Up gradation of 11KV 2Ph line to 3Ph OH line over 9mtr long 300 kG PSC pole with 55mm2 AAAC (1KM)			
Sl.No	**Description of Materials**	**Unit**	**Qnty/KM**
1	11kv Pin Insulator (Polymer)	No.	23
2	55 mm2 AAAC	KM	1.03

3	100*50*6 mm MS channel	Kg	30
4	GI Nut,Bolt& Washer of different sizes	Kg	10
5	Sundries for survey, tree cutting, small size nut & bolt with washer, Allm. Binding Tape, Danger Board, etc	LS	1

7. Material List for construction of 100 KVA(3ph) DP Structure (with Existing Plinth Mounted Transformer) = 1No			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	300KG 9mtr long PSC pole	No.	2
2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
4	Cross Bracing Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
5	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
6	11kv AB Switch 3 pole (200Amp)	set	1
7	11KV HG Fuse 3 pole(200 Amp)	No.	1
8	11KV LA 12KV-10KA	No.	3
9	HT Stay Set(Complete)	Set	2
10	HT Stay Insulator	No.	2
11	HT Stay Clamp	pair	2
12	7/10 SWG Stay wire	Kg.	20
13	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
14	No. 6 GI Wire	Kg.	20
15	25x5mm GI Flat for neutral earthing	Kg.	20
16	55mm2 AAAC	Km	0.04
17	Red Oxide Paint	Ltr	3
18	All paint	Ltr	4
19	Black Paint	Ltr	0.5
20	MS Nut,Bolt& Washer	Kg.	36
21	LT Distribution box including Kit kat fuse with MCCB for 100 KVA S/S	No.	1
22	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
23	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
24	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
25	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

8. Material List for construction of 100 KVA(3ph) DP Structure & Plinth Mounted Sub-station (without Transformer)=1No			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	300KG 9mtr long PSC pole	No.	2
2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
4	Cross Bracing Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
5	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
6	11kv AB Switch 3 pole (200Amp)	set	1
7	11KV HG Fuse 3 pole(200 Amp)	No.	1
8	11KV LA 12KV-10KA	No.	3
9	HT Stay Set(Complete)	Set	2
10	HT Stay Insulator	No.	2
11	HT Stay Clamp	pair	2
12	7/10 SWG Stay wire	Kg.	20
13	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
14	No. 6 GI Wire	Kg.	20
15	25x5mm GI Flat for neutral earthing	Kg.	20
16	55mm2 AAAC	Km	0.04
17	Red Oxide Paint	Ltr	3
18	All paint	Ltr	4
19	Black Paint	Ltr	0.5
20	MS Nut,Bolt& Washer	Kg.	36
21	LT Distribution box including Kit kat fuse with MCCB for 100 KVA S/S	No.	1
22	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
23	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
24	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
25	Material Cost of Plinth	No.	1
26	Barbed wire fencing	No.	1
27	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

9. Material List for construction of 100 KVA (3ph) Plinth Mounted Sub-station over 9mtr long PSC Pole			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	300kg 9mtr PSc pole	No.	2
2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
4	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
5	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
6	11kv AB Switch 3 pole (200Amp)	set	1
7	11KV HG Fuse 3 pole(200 Amp)	No.	1
8	11KV LA 12KV-10KA	No.	3
9	HT Stay Set(Complete)	Set	2
10	HT Stay Insulator	No.	2
11	HT Stay Clamp	pair	2
12	7/10 SWG Stay wire	Kg.	20
13	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
14	No. 6 GI Wire	Kg.	20
15	25x5mm GI Flat for neutral earthing	Kg.	20
16	55mm2 AAAC	Km	0.04
17	Red Oxide Paint	Ltr	3
18	All paint	Ltr	4
19	Black Paint	Ltr	0.5
20	MS Nut,Bolt& Washer	Kg.	36
21	100 KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
22	LT Distribution box including Kit kat fuse with MCCB for 100 KVA S/S	No.	1
23	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
24	All. Cable Socket	No	32
25	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
26	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
27	Material Cost of Plinth	No.	1
28	Boundary wall with Grill Gate, metal & sand	No.	1
29	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

10. Material List for construction of 63 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole

Sl No.	Item Description	Unit	Qnty/Sub-Station
1	300kg 9mtr PSc pole	No.	2
2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	Transformer mounting channel 100*50*6mm MS channel each 2.8mtr long(9.2kg per mtr)*2 Nos	Kg.	52
4	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
5	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
6	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
7	11kv AB Switch 3 pole (200Amp)	set	1
8	11KV HG Fuse 3 pole(200 Amp)	No.	1
9	11KV LA 12KV-10KA	No.	3
10	HT Stay Set(Complete)	Set	2
11	HT Stay Insulator	No.	2
12	HT Stay Clamp	pair	2
13	7/10 SWG Stay wire	Kg.	20
14	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
15	No. 6 GI Wire	Kg.	20
16	25x5mm GI Flat for neutral earthing	Kg.	20
17	55mm2 AAAC	Km	0.04
18	Red Oxide Paint	Ltr	3
19	All paint	Ltr	4
20	Black Paint	Ltr	0.5
21	MS Nut,Bolt& Washer	Kg.	36
22	63 KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
23	LT Distribution box including Kit kat fuse with MCCB for 63KVA S/S	No.	1
24	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
25	All. Cable Socket	No	32
26	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
27	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	20
28	Material cost for Concreting of RS Joist Pole 1.8mtrx0.5mtrx0.5mtr =0.45cum (PCC 1:2:4)	No.	2
29	Barbed wire fencing	No.	1
30	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

11.Material List for construction of 25 KVA(3ph) Double Pole Mounted Sub-station over 9mtr long PSC Pole = 1 No			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	300kg 9mtr PSc pole	No.	2
2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	Transformer mounting channel 100*50*6mm MS channel each 2.8mtr long(9.2kg per mtr)*2 Nos	Kg.	52
4	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
5	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
6	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
7	11kv AB Switch 3 pole (200Amp)	set	1
8	11KV HG Fuse 3 pole(200 Amp)	No.	1
9	11KV LA 12KV-10KA	No.	3
10	HT Stay Set(Complete)	Set	2
11	HT Stay Insulator	No.	2
12	HT Stay Clamp	pair	2
13	7/10 SWG Stay wire	Kg.	20
14	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
15	No. 6 GI Wire	Kg.	20
16	25x5mm GI Flat for neutral earthing	Kg.	20
17	55mm2 AAAC	Km	0.04
18	Red Oxide Paint	Ltr	3
19	All paint	Ltr	4
20	Black Paint	Ltr	0.5
21	MS Nut,Bolt& Washer	Kg.	36
22	25KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
23	LT Distribution box including Kit kat fuse with MCCB for 25KVA S/S	No.	1
24	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
25	All. Cable Socket	No	32
26	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
27	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
28	Barbed wire fencing	No.	1
29	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

12. Material List for construction of 16 KVA(1ph) Single Pole Mounted Sub-station over 9mtr long PSC Pole = 1 No			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	300KG 9mtr long PSC pole	No.	1
2	100* 50*6mm MS Channel	Kg.	52
3	75*40*6 mm MS Channel	Kg.	38
4	50*50*6mm MS Angle	Kg.	40
5	Transformer Mounting bracket	No.	1
6	11kv AB Switch 2pole (200Amp)	set	1
7	11KV HG Fuse 2pole(200 Amp)	No.	1
8	11KV LA 12KV-10KA	No.	2
9	HT Stay Set(Complete)	Set	2
10	HT Stay Insulator	No.	2
11	HT Stay Clamp	pair	2
12	7/10 SWG Stay wire	Kg.	20
13	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	3
14	No. 6 GI Wire	Kg.	20
15	25x5mm GI Flat for neutral earthing	Kg.	20
16	55mm2 AAAC	Km	0.04
17	Red Oxide Paint	Ltr	3
18	All paint	Ltr	4
19	Black Paint	Ltr	0.5
20	MS Nut,Bolt& Washer	Kg.	20
21	Mounting Bracket for 16/10 KVATfrs.	No	1
22	16KVA,11/0.23KV 3 star rated TFR	No.	1
23	LT Distribution box including Kit kat fuse with MCCB for 16KVA S/S	No.	1
24	2 * 16mm2 PVC Cable	Mtr	15
25	All. Cable Socket	No	**24**
26	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
27	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	1
28	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

13. Material List for construction of 10 KVA(1ph) Single Pole Mounted Sub-station over 9mtr long PSC Pole

Sl No.	Item Description	Unit	Qnty/Sub-Station
1	300KG 9mtr long PSC pole	No.	1
2	100* 50*6mm MS Channel	Kg.	52
3	75*40*6 mm MS Channel	Kg.	40
4	50*50*6mm MS Angle	Kg.	20
5	Transformer Mounting bracket	No.	1
6	11kv AB Switch 2pole (200Amp)	set	1
7	11KV HG Fuse 2pole(200 Amp)	No.	1
8	11KV LA 12KV-10KA	No.	2
9	HT Stay Set(Complete)	Set	2
10	HT Stay Insulator	No.	2
11	HT Stay Clamp	pair	2
12	7/10 SWG Stay wire	Kg.	20
13	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	3
14	No. 6 GI Wire	Kg.	20
15	25x5mm GI Flat for neutral earthing	Kg.	20
16	55mm2 AAAC	Km	0.04
17	Red Oxide Paint	Ltr	3
18	All paint	Ltr	4
19	Black Paint	Ltr	0.5
20	MS Nut,Bolt& Washer	Kg.	20
21	Mounting Bracket for 16/10 KVATfrs.	No	1
22	10 KVA,11/0.23KV(Al) BIS Energy Level -II	No.	1
23	LT Distribution box including Kit kat fuse with MCCB for 10 KVA S/S	No.	1
24	2 * 16mm2 PVC Cable	Mtr	15
25	All. Cable Socket	No	**24**
26	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
27	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	1
28	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

14. Material List for upgradation from 63KVA to 100 (3ph)			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	2
2	No. 6 GI Wire	Kg.	5
3	25x5mm GI Flat for neutral earthing	Kg.	5
4	55mm2 AAAC	Km	0.04
5	MS Nut,Bolt& Washer	Kg.	10
6	100 KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1

7	LT Distribution box including Kit kat fuse with MCCB for 100 KVA S/S	No.	1
8	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
9	All. Cable Socket	No	32
10	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

15.a) Material List for upgradation from 25 KVA (1ph)to 63 (3ph)			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	300kg 9mtr PSc pole	No.	2
2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	Transformer mounting channel 100*50*6mm MS channel each 2.8mtr long(9.2kg per mtr)*2 Nos	Kg.	52
4	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
5	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
6	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
7	11kv AB Switch 3 pole (200Amp)	set	1
8	11KV HG Fuse 3 pole(200 Amp)	No.	1
9	11KV LA 12KV-10KA	No.	3
10	HT Stay Set(Complete)	Set	2
11	HT Stay Insulator	No.	2
12	HT Stay Clamp	pair	2
13	7/10 SWG Stay wire	Kg.	20
14	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
15	No. 6 GI Wire	Kg.	20
16	25x5mm GI Flat for neutral earthing	Kg.	20
17	55mm2 AAAC	Km	0.04
18	Red Oxide Paint	Ltr	3
19	All paint	Ltr	4
20	Black Paint	Ltr	0.5
21	MS Nut,Bolt& Washer	Kg.	36
22	63 KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
23	LT Distribution box including Kit kat fuse with MCCB for 63KVA S/S	No.	1
24	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
25	All. Cable Socket	No	32
26	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2

27	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	20
28	Material cost for Concreting of RS Joist Pole 1.8mtrx0.5mtrx0.5mtr =0.45cum (PCC 1:2:4)	No.	2
29	Barbed wire fencing	No.	1
30	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

15. b)Material List for upgradation from 25 KVA 11/0.4KV to 63 KVA,11/0.4KV on Existing S/S			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	2
2	No. 6 GI Wire	Kg.	5
3	25x5mm GI Flat for neutral earthing	Kg.	5
4	55mm2 AAAC	Km	0.04
5	MS Nut,Bolt& Washer	Kg.	10
6	63 KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
7	LT Distribution box including Kit kat fuse with MCCB for 63KVA S/S	No.	1
8	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
9	All. Cable Socket	No	32
10	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

16;.a)Material List for upgradation from 25 KVA(1ph) to 100 KVA ,11/0.4KV S/S			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	300kg 9mtr PSc pole	No.	2
2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
4	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
5	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
6	11kv AB Switch 3 pole (200Amp)	set	1
7	11KV HG Fuse 3 pole(200 Amp)	No.	1
8	11KV LA 12KV-10KA	No.	3
9	HT Stay Set(Complete)	Set	2
10	HT Stay Insulator	No.	2
11	HT Stay Clamp	pair	2
12	7/10 SWG Stay wire	Kg.	20

13	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
14	No. 6 GI Wire	Kg.	20
15	25x5mm GI Flat for neutral earthing	Kg.	20
16	55mm2 AAAC	Km	0.04
17	Red Oxide Paint	Ltr	3
18	All paint	Ltr	4
19	Black Paint	Ltr	0.5
20	MS Nut,Bolt& Washer	Kg.	36
21	100 KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
22	LT Distribution box including Kit kat fuse with MCCB for 100 KVA S/S	No.	1
23	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
24	All. Cable Socket	No	32
25	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
26	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
27	Material Cost of Plinth	No.	1
28	Boundary wall with Grill Gate, metal & sand	No.	1
29	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

16.b) Material List for upgradation from 25 KVA 11/0.23KV to 100 KVA,11/0.4KV on Existing S/S			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	2
2	No. 6 GI Wire	Kg.	5
3	25x5mm GI Flat for neutral earthing	Kg.	5
4	55mm2 AAAC	Km	0.04
5	MS Nut,Bolt& Washer	Kg.	10
6	100 KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
7	LT Distribution box including Kit kat fuse with MCCB for 100 KVA S/S	No.	1
8	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
9	All. Cable Socket	No	32
10	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

17.a)Material List for upgradation from 10 KVA (1Ph) to 25 KVA S/S			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**

1	300kg 9mtr PSc pole	No.	2
2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	Transformer mounting channel 100*50*6mm MS channel each 2.8mtr long(9.2kg per mtr)*2 Nos	Kg.	52
4	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
5	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
6	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
7	11kv AB Switch 3 pole (200Amp)	set	1
8	11KV HG Fuse 3 pole(200 Amp)	No.	1
9	11KV LA 12KV-10KA	No.	3
10	HT Stay Set(Complete)	Set	2
11	HT Stay Insulator	No.	2
12	HT Stay Clamp	pair	2
13	7/10 SWG Stay wire	Kg.	20
14	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
15	No. 6 GI Wire	Kg.	20
16	25x5mm GI Flat for neutral earthing	Kg.	20
17	55mm2 AAAC	Km	0.04
18	Red Oxide Paint	Ltr	3
19	All paint	Ltr	4
20	Black Paint	Ltr	0.5
21	MS Nut,Bolt& Washer	Kg.	36
22	25KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
23	LT Distribution box including Kit kat fuse with MCCB for 25KVA S/S	No.	1
24	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
25	All. Cable Socket	No	32
26	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
27	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
28	Barbed wire fencing	No.	1
29	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

17.b) Material List for upgradation from 16 KVA (1Ph) to 25 KVA S/S			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	300kg 9mtr PSc pole	No.	2

2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	Transformer mounting channel 100*50*6mm MS channel each 2.8mtr long(9.2kg per mtr)*2 Nos	Kg.	52
4	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
5	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
6	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
7	11kv AB Switch 3 pole (200Amp)	set	1
8	11KV HG Fuse 3 pole(200 Amp)	No.	1
9	11KV LA 12KV-10KA	No.	3
10	HT Stay Set(Complete)	Set	2
11	HT Stay Insulator	No.	2
12	HT Stay Clamp	pair	2
13	7/10 SWG Stay wire	Kg.	20
14	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
15	No. 6 GI Wire	Kg.	20
16	25x5mm GI Flat for neutral earthing	Kg.	20
17	55mm2 AAAC	Km	0.04
18	Red Oxide Paint	Ltr	3
19	All paint	Ltr	4
20	Black Paint	Ltr	0.5
21	MS Nut,Bolt& Washer	Kg.	36
22	25KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
23	LT Distribution box including Kit kat fuse with MCCB for 25KVA S/S	No.	1
24	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
25	All. Cable Socket	No	32
26	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
27	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
28	Barbed wire fencing	No.	1
29	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

18. Material List for upgradation from 16 KVA (1Ph) to 63 KVA S/S			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	300kg 9mtr PSc pole	No.	2

2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	Transformer mounting channel 100*50*6mm MS channel each 2.8mtr long(9.2kg per mtr)*2 Nos	Kg.	52
4	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
5	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
6	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
7	11kv AB Switch 3 pole (200Amp)	set	1
8	11KV HG Fuse 3 pole(200 Amp)	No.	1
9	11KV LA 12KV-10KA	No.	3
10	HT Stay Set(Complete)	Set	2
11	HT Stay Insulator	No.	2
12	HT Stay Clamp	pair	2
13	7/10 SWG Stay wire	Kg.	20
14	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
15	No. 6 GI Wire	Kg.	20
16	25x5mm GI Flat for neutral earthing	Kg.	20
17	55mm2 AAAC	Km	0.04
18	Red Oxide Paint	Ltr	3
19	All paint	Ltr	4
20	Black Paint	Ltr	0.5
21	MS Nut,Bolt& Washer	Kg.	36
22	63 KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
23	LT Distribution box including Kit kat fuse with MCCB for 63KVA S/S	No.	1
24	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
25	All. Cable Socket	No	32
26	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
27	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	20
28	Material cost for Concreting of RS Joist Pole 1.8mtrx0.5mtrx0.5mtr =0.45cum (PCC 1:2:4)	No.	2
29	Barbed wire fencing	No.	1
30	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

19. Material List for upgradation from 16 KVA (1Ph) to 100 KVA S/S			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	300kg 9mtr PSc pole	No.	1

2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
4	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
5	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
6	11kv AB Switch 3 pole (200Amp)	set	1
7	11KV HG Fuse 3 pole(200 Amp)	No.	1
8	11KV LA 12KV-10KA	No.	3
9	HT Stay Set(Complete)	Set	2
10	HT Stay Insulator	No.	2
11	HT Stay Clamp	pair	2
12	7/10 SWG Stay wire	Kg.	20
13	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
14	No. 6 GI Wire	Kg.	20
15	25x5mm GI Flat for neutral earthing	Kg.	20
16	55mm2 AAAC	Km	0.04
17	Red Oxide Paint	Ltr	3
18	All paint	Ltr	4
19	Black Paint	Ltr	0.5
20	MS Nut,Bolt& Washer	Kg.	36
21	100 KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
22	LT Distribution box including Kit kat fuse with MCCB for 100 KVA S/S	No.	1
23	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
24	All. Cable Socket	No	32
25	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
26	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
27	Material Cost of Plinth	No.	1
28	Boundary wall with Grill Gate, metal & sand	No.	1
29	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

20. Material List for construction of 1ph 2w LT (NEW)Line over 9mtr Long 300Kg PSC Pole with 1*35+1x25mm2 AB cable (Span-40Mtr)

Sl No.	Description of Materials	Unit	Qnty./KM
1	9mtr long 300kg PSC pole	No.	25
2	LT Stay Set Complete	Set	6
3	7/12 SWG Stay Wire	Kg	60

4	LT Stay Clamp(1.4Kg/pair)	Pair	6
5	LT Stay Insulator	No.	6
6	Pole Clamp for Eye Hook	Pair	25
7	Suspension clamp	No.	15
8	Dead End Clamp	No.	10
9	Nuts and bolts	Kg	10
10	Piercing Connector	No.	50
11	Neutral Connector	No.	50
12	Earthing coil each 5th pole to earth	No.	5
13	AB Cable(1 *35+1*25mm2)	Km	1.1
14	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	25
15	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	6
16	Sundries for survey,treecutting,insulatedtape,Mceal Compound etc.	LS	1

21. Material List for construction of 3ph 4w (New) LT Line over 9mtr Long 300Kg PSC Pole with 3*50+1*35+1*16mm2 AB cable (Span-40Mtr)

Sl No.	Description of Materials	Unit	Qnty./KM
1	9mtr long 300kg PSC pole	No.	25
2	LT Stay Set Complete	Set	6
3	7/12 SWG Stay Wire	Kg	60
4	LT Stay Clamp(1.4Kg/pair)	Pair	6
5	LT Stay Insulator	No.	6
6	Pole Clamp for Eye Hook	Pair	25
7	Suspension clamp	No.	15
8	Dead End Clamp	No.	10
9	Nuts and bolts	Kg	10
10	Piercing Connector	No.	50
11	Neutral Connector	No.	50
12	Earthing coil each 5th pole to earth	No.	5
13	3x50+1x35+1x16 LT AB Cable	Km	1.1
14	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	25
15	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	6
16	Sundries for survey,treecutting,insulatedtape,Mceal Compound etc.	LS	1

22. Conversion of 1ph (Bare) to 3ph 4w LT Line over existing PSC Pole with 3*50+1*35+1*16mm2 AB cable with existing Poles

Sl No.	Description of Materials	Unit	Qnty./KM
1	Pole Clamp for Eye Hook	Pair	25

2	Suspension clamp	No.	15
3	Dead End Clamp	No.	10
4	Nuts and bolts	Kg	10
5	3x50+1x35+1x16 LT AB Cable	Km	1.1
6	Sundries for survey,treecutting,insulatedtape,Mceal Compound etc.	LS	1

23. Material List for replacement of damaged 1ph 2w (Bare) LT Line with 1x35+1x25mm2 AB cable on Existing Pole

Sl No.	Description of Materials	Unit	Qnty./KM
1	Pole Clamp for Eye Hook	Pair	25
2	Suspension clamp	No.	15
3	Dead End Clamp	No.	10
4	Nuts and bolts	Kg	5
5	Piercing Connector	No.	5
6	Neutral Connector	No.	5
7	AB Cable(1 *35+1*25mm2)	Km	1.1
8	Sundries for survey,treecutting,insulatedtape,Mceal Compound etc.	LS	1

24. Material List for Conversion of 3 Ph LT Line having Bare conductor with 3x50+1x35+1x16mm2 AB cable

Sl No.	Description of Materials	Unit	Qnty./KM
1	Pole Clamp for Eye Hook	Pair	25
2	Suspension clamp	No.	15
3	Dead End Clamp	No.	10
4	Nuts and bolts	Kg	10
5	Piercing Connector	No.	5
6	Neutral Connector	No.	5
7	3x50+1x35+1x16 LT AB Cable	Km	1.1
8	Sundries for survey,treecutting,insulatedtape,Mceal Compound etc.	LS	1

25. Material List for construction of Guarding for Road Crossing- 50 mtr Span crossing

Sl No.	Description of Materials	Unit	Qnty./KM
1	75x40x6 mm Channel - 2x 2.2mtr (@7.1kg/mtr)	kg	40
2	Eye Bolts (16mm)	Nos	8
3	6 SWG (4.9 mm) GI wire for tension (2 nos x52mtr) -0.192kg/mtr - Width-2.15 mtr	kg	15

4	8 SWG (4.06 mm) GI wire for lacing (2.55 mtr each)- 0.131kg/mtr (Lacing at each 0.5 mtr)	kg	33.4
5	HT Stay Set(Complete)	Set	**2**
6	HT Stay Insulator	No.	**2**
7	HT Stay Clamp	pair	**2**
8	7/10 SWG Stay wire	Kg.	**20**
9	Coil Earthing	Set	2
10	8 SWG (4.06 mm) GI wire for earthing of Guarding- (2 X 7mtr) - 0.131kg/mtr	kg	**30**
11	Nuts and bolts	Kg	5
12	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
13	Sundries for survey,treecutting,insulatedtape,Mceal Compound etc.	LS	1

26. Material List for installation of 11Kv line AB switch (3 Pole 400A) with DP Structure along with 9mtr long 300kg PSc pole			
Sl No.	**Item Description**	**Unit**	**Qnty / Sub-Station**
1	300kg 9mtr PSc pole	No.	2
2	Pressure Channel 100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	52
3	AB Switch Mounting Channel 75*40*6 each 2.8mtr long 2no.s(6.8kg per mtr)	Kg.	38
4	Cantilever channel for supporting AB Switch (75X40X6) mm 1 mtr 2 No. (6.8 Kg. / Mtr.)	Kg.	13.5
5	Angle for cantilever arrangement for AB switch 50*50*6mm-2 mtr Long 2 Nos(4.5kg per mtr)	Kg.	18
6	Bracing channel 75*40*6mm MS channel 2.8mtr (2Nos)	Kg.	38
7	50*50*6mm MS Angle for cross bracing -2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
8	11KV H W fitting(B&S)70KN	Set	6
9	11KV Disc insulator (B&S)70 KN polymer	No.	6
10	11 KV 3 Pole 400 A AB Switch	Set	1
11	HT Stay Set(Complete)	Set	4
12	HT Stay Insulator	No.	4
13	HT Stay Clamp	pair	4
14	7/10 SWG Stay wire	Kg.	40
15	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	2
16	Earthing of Support(Coil type)	No.	2
17	Anti Climbing Device made of GI barbed wire,Clamping arrangement etc.(2kg Per Support)	Kg	2
18	No. 6 GI Wire	Kg.	10
19	MS Nut,Bolt& Washer	Kg.	15

20	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
21	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	4
22	Material for masonary work for earth pit, charcoal,salt, etc.	No.	2
23	Sundries	LS	1

27. Material List for Construction of DP Mounted 33 KV 400 AMP Line AB Switch - 1 Set			
Sl No.	**Item Description**	**Unit**	**Qnty / Sub-Station**
1	10 mtr PSC pole 400 Kg.	No	2
2	33 KV 3 Pole 400 A AB Switch	Set	**1**
3	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	2
4	50x6mm GI Flat for neutral earthing	Kg.	10
5	33KV B&S H.W Fitting	No.	**6**
6	33KV B&S Disc Insulator (Polymer)	No.	6
7	100 x 50 x 6 mm MS Channel	Kg	60
8	75 x 40 x 6 mm MS Channel	Kg	40
9	50 x 50 x 6 mm MS Angle	Kg	30
10	HT Stay Set (Complete)	Set	**4**
11	HT Stay Insulator	No.	**4**
12	HT Stay Clamp	pair	**4**
13	7/10 SWG Stay wire	Kg.	**60**
14	100 mm2 AAA Conductor	Km	0.010
15	Earthing of Support(Coil type)	No.	2
16	Earthing Materials	LS	2
17	Anti Climbing Device made of GI barbed wire,Clamping arrangement etc.(2kg Per Support)	Kg	4
18	GI Nut,Bolt& Washer of Different Sizes	Kg.	15
19	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	**4**
20	Material cost for Concreting of PSC Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	**2**

28. Material List Barbed wire Fencing (dimension for which Barbed wire fencing to be done- 12ft x12ft)			
Sl No.	**Item Description**	**Unit**	**Qnty / Sub-Station**
1	Fencing Post (5.4feet)	No.	13
2	Barbed Wire (32rftx4run = 144rft =44mtr)6mtr/kg	kg	8

3	Gate(4ft x3.5ft or say 20kg)	kg	20
4	Excavation of fencing Post (0.6x0.45x0.6=0.162cum per fencing post	Cum	2.106
5	Excavation of Gate Pllar (0.8x0.45x0.8=0.288 cum	Cum	0.576
6	PCC(1:4:8) of fencing Post (0.6x0.4x0.6=0.144cum per fencing post	Cum	1.872
7	PCC(1:4:8) for Gate Pllar (0.8x0.4x0.8=0.256 cum	Cum	0.512
8	Sand filling for fencing Post (0.6x0.05x0.6=0.018cum per fencing post	Cum	0.234
9	Sand filling for Gate Pllar (0.8x0.05x0.8=0.032 cum	Cum	0.064

29. Material List for Installation of 250KVA 11/.4KV transformer, AB Switch, HG Fuse, LA, etc. on existing D.P structure – 1No			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
2	Bracing Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
3	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
4	11kv AB Switch 3 pole (200Amp)	set	1
5	11KV HG Fuse 3 pole(200 Amp)	No.	1
6	11KV LA 12KV-10KA	No.	3
7	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
8	No. 6 GI Wire	Kg.	20
9	25x5mm GI Flat for neutral earthing	Kg.	20
10	55mm2 AAAC	Km	0.04
11	Red Oxide Paint	Ltr	3
12	All paint	Ltr	4
13	Black Paint	Ltr	0.5
14	MS Nut,Bolt& Washer	Kg.	20
15	LT Distribution box with MCCB,AluminiumBusbar of 3 Bay with kit-kat fuse for 250 KVA Trf.	No	1
16	250 KVA 11/0.4 kv (AL) Transformer, BIS, EL-II	No	1
17	240 mm2 31/2 Core LT PVC Cable	Mtr	15
18	All. Cable Socket	No	32
19	Material Cost of Plinth	No.	1
20	Boundary wall with Grill Gate, metal & sand	No.	1
21	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

30. Material List for Installation of 100KVA 11/.4KV transformer, AB Switch, HG Fuse, LA, etc. on existing D.P structure – 1No			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
2	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
3	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
4	11kv AB Switch 3 pole (200Amp)	set	1
5	11KV HG Fuse 3 pole(200 Amp)	No.	1
6	11KV LA 12KV-10KA	No.	3
7	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
8	No. 6 GI Wire	Kg.	20
9	25x5mm GI Flat for neutral earthing	Kg.	20
10	55mm2 AAAC	Km	0.04
11	Red Oxide Paint	Ltr	3
12	All paint	Ltr	4
13	Black Paint	Ltr	0.5
14	MS Nut,Bolt& Washer	Kg.	20
15	100 KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
16	LT Distribution box including Kit kat fuse with MCCB for 100 KVA S/S	No.	1
17	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
18	All. Cable Socket	No	32
19	Material Cost of Plinth	No.	1
20	Boundary wall with Grill Gate, metal & sand	No.	1
21	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

31. Material List for Installation of 63KVA 11/.4KV transformer, AB Switch, HG Fuse, LA, etc. on existing D.P structure – 1No			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	Transformer mounting channel 100*50*6mm MS channel each 2.8mtr long(9.2kg per mtr)*2 Nos	Kg.	52
2	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
3	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32

4	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
5	11kv AB Switch 3 pole (200Amp)	set	1
6	11KV HG Fuse 3 pole(200 Amp)	No.	1
7	11KV LA 12KV-10KA	No.	3
8	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
9	No. 6 GI Wire	Kg.	20
10	25x5mm GI Flat for neutral earthing	Kg.	20
11	55mm2 AAAC	Km	0.04
12	Red Oxide Paint	Ltr	3
13	All paint	Ltr	4
14	Black Paint	Ltr	0.5
15	MS Nut,Bolt& Washer	Kg.	20
16	63 KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
17	LT Distribution box including Kit kat fuse with MCCB for 63KVA S/S	No.	1
18	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
19	All. Cable Socket	No	32
20	Barbed wire fencing	No.	1
21	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

32. Material List for Installation of 25KVA 11/.4KV transformer, AB Switch, HG Fuse, LA, etc. on existing D.P structure – 1No

Sl No.	Item Description	Unit	Qnty/Sub-Station
1	Transformer mounting channel 100*50*6mm MS channel each 2.8mtr long(9.2kg per mtr)*2 Nos	Kg.	52
2	AB Switch & HG Fuse,Mounting Channel 75*40*6 each 2.8mtr long 4no.s(6.8kg per mtr)	Kg.	76
3	Transformer belting Angle 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
4	Angle for mounting LT Distribution Box 50*50*6mm MS Angle - 2.5 mtr each long 2 no.s(4.5kg per mtr)	Kg.	23
5	11kv AB Switch 3 pole (200Amp)	set	1
6	11KV HG Fuse 3 pole(200 Amp)	No.	1
7	11KV LA 12KV-10KA	No.	3
8	GI Pipe Earthing 40 Dia Medium gage 3 mtrs. Long	No.	5
9	No. 6 GI Wire	Kg.	20
10	25x5mm GI Flat for neutral earthing	Kg.	20
11	55mm2 AAAC	Km	0.04
12	Red Oxide Paint	Ltr	3
13	All paint	Ltr	4
14	Black Paint	Ltr	0.5

15	MS Nut,Bolt& Washer	Kg.	20
16	25KVA,11/0.4KV(Al) BIS Energy Level -II	No.	1
17	LT Distribution box including Kit kat fuse with MCCB for 25KVA S/S	No.	1
18	3 & 1/2 * 185mm2 PVC Cable	Mtr	15
19	All. Cable Socket	No	32
20	Barbed wire fencing	No.	1
21	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

33. Material List for Supply & Erection of HT stay set complete along with stay wire (7/10 GI stay wire) & connecting the same to the HT pole complete in all respect.– 1No

Sl No.	Item Description	Unit	Qnty/Sub-Station
1	HT Stay Set(Complete)	Set	1
2	HT Stay Insulator	No.	1
3	HT Stay Clamp	pair	1
4	7/10 SWG Stay wire	Kg.	10
5	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	1

34. Estimate forSupply& Erection of LT stay set complete along with stay wire (7/12 GI stay wire) & connecting the same to the LT pole complete in all respect =1no

Sl No.	Item Description	Unit	Qnty/Sub-Station
1	LT Stay Set Complete	Set	1
2	7/12 SWG Stay Wire	Kg	7
3	LT Stay Clamp(1.4Kg/pair)	Pair	1
4	LT Stay Insulator	No.	1
5	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	1

35. Supply & Erection of 2Nos of HT stay set complete along with stay wire (7/10 GI stay wire) & connecting the same to the 2Nos of DP pole of 25KVA /63KVA/100KVA S/S complete in all respect.

Sl No.	Item Description	Unit	Qnty/Sub-Station
1	HT Stay Set(Complete)	Set	2
2	HT Stay Insulator	No.	2
3	HT Stay Clamp	pair	2
4	7/10 SWG Stay wire	Kg.	20
5	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	1

36. Supply & Erection of 11mtr RS joist pole (150mmX150 mm) & construction of DP for S/S by providing appropriate top channel (100X50x6 mm Ms channel) & required size of N & B for road or river crossing for 33/11KV line.			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	150x150mm 11 mtr RS Joist	No	2
2	100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	104
3	Bracing angel 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
4	HT Stay Set(Complete)	Set	2
5	HT Stay Insulator	No.	2
6	HT Stay Clamp	pair	2
7	7/10 SWG Stay wire	Kg.	20
8	Red Oxide Paint	Ltr	3
9	All paint	Ltr	4
10	Black Paint	Ltr	0.5
11	MS Nut,Bolt& Washer	Kg.	36
12	Concreting of Joist pole	No.	2
13	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
14	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

37. Supply & Erection of 11 mtr, 330Kg PSC Pole & construction of DP for S/S by providing appropriate top channel (100X50x6 mm Ms channel) & required size of N & B for road or river crossing for 33/11KV line.			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	11 mtr PSC pole 330 Kg.	No	2
2	100* 50*6mm MS Channel each 2.8 mtrlong(9.2 Kg per mtr.)*2 No.s	Kg.	104
3	Bracing angel 50*50*6mm-2.8mtr Long 2 Nos(4.5kg per mtr)with side angle(Total 7mtr)	Kg.	32
4	HT Stay Set(Complete)	Set	2
5	HT Stay Insulator	No.	2
6	HT Stay Clamp	pair	2
7	7/10 SWG Stay wire	Kg.	20
8	Red Oxide Paint	Ltr	1

9	All paint	Ltr	1.5
10	MS Nut,Bolt& Washer	Kg.	36
11	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
12	Material cost for Concreting of Stay (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	2
13	Sundries for survey,PVCtape,AmpireTape,DangerBoard,small size nut & bolt preparation of drawimh cable socket etc.	LS	1

38. Supply ,Erection & fixing (suitably) of 9Mtr long PSC pole as strut on required points of LT & HT lines where stay cannot be fixed.

Sl No.	Item Description	Unit	Qnty/Sub-Station
1	300kg 9mtr PSc pole	No.	1
2	Strut Clamp	No.	2
3	GI Nut,Bolt& Washer of different sizes	Kg	2
4	Material cost for Concreting of Strut Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	1
5	Sundries for survey, tree cutting, small size nut & bolt with washer, Allm. Binding Tape, Danger Board, etc	LS	1

39. Supply & Erection of interposing 9Mtr long Psc pole with V cross arm & F clamp duly fitted over it (All supplied by contractor)3 Nos of 11KV Pin insulator (polymer type) .

Sl No.	Item Description	Unit	Qnty/Sub-Station
1	300kg 9mtr PSc pole	No.	1
2	11 KV V cross Arm	No.	1
3	11KV F Clamp	No.	1
4	Back Clamp for V Cross Arm	No.	1
5	11kv Pin Insulator (Polymer)	No.	3
6	Earthing of Support(Coil type)	No.	1
7	Anti Climbing Device made of GI barbed wire,Clamping arrangement etc.(2kg Per Support)	Kg	2
8	GI Nut,Bolt& Washer of different sizes	Kg	1
9	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	1
10	Sundries for survey, tree cutting, small size nut & bolt with washer, Allm. Binding Tape, Danger Board, etc	LS	1

40. Supply & Erection interposing of 11Mtr long RS joist pole with V cross arm & F clamp duly fitted over it (All supplied by contractor) 3 Nos of 11KV Pin insulator with GI pin.

Sl No.	Item Description	Unit	Qnty/Sub-Station
1	150x150mm 11 mtr RS Joist	No	1
2	11 KV V cross Arm	No.	1
3	11KV F Clamp	No.	1
4	Back Clamp for V Cross Arm	No.	1
5	11kv Pin Insulator (Polymer)	No.	3
6	Earthing of Support(Coil type)	No.	1
7	Anti Climbing Device made of GI barbed wire,Clamping arrangement etc.(2kg Per Support)	Kg	2
8	Red Oxide Paint	Ltr	1.5
9	All paint	Ltr	2
10	Black Paint	Ltr	0.5
11	GI Nut,Bolt& Washer of different sizes	Kg	1
12	Concreting of Joist pole	No.	1
13	Sundries for survey, tree cutting, small size nut & bolt with washer, Allm. Binding Tape, Danger Board, etc	LS	1

41. Supply & Erection of 9mtr PSC pole (SP) for road or river crossing for LT line.			
Sl No.	**Item Description**	**Unit**	**Qnty/Sub-Station**
1	300kg 9mtr PSc pole	No.	1
2	Pole Clamp for Eye Hook	Pair	1
3	Suspension clamp	No.	1
4	Nuts and bolts	Kg	1
5	Piercing Connector	No.	1
6	Neutral Connector	No.	1
7	Material cost for Concreting of Pole (1.65mtrx.3mtrx.3mtr=0.1485cum - PCC 1:2:4)	No.	1
8	Sundries for survey, tree cutting, small size nut & bolt with washer, Allm. Binding Tape, Danger Board, etc	LS	1

42.Power supply to BPL Households			
Sl No.	**Item Description**	**Unit**	**Qty**
1	Installation of Service Connections complete work for BPL consumer as specified below 1. Supply & fixing of NESCO approved energy meter with TP box as per specification. 2. Supply of C.F.L bulb i) 18W –1No	No	1

	ii) 11W- 1No		
	iii) power supply to BPL House hold		
	3. Providing service connection 1.5sqmm Twin core PVC cable with piercing connector Meter Board, 16 amp DP main switch with earthing terminal, Coil earthing, Wooden distribution board with two nos. of flush type 5 A Switch, two nos. of holders, house wiring including all other sundry items such as GI Pipe & bends with clamps, PVC Conduit, 10SWG GI Wire complete works as per specification.		
	N.B. – All the required materials for the above work has to be provided by the bidder of ISS standard. The work should be complete in all respect duly inspected by authorized officials so as to be ready for providing power supply to BPL house holds.		

43.DISPLAY OF SIGN BOARD			
Sl No.	**Item Description**	**Unit**	**Qty**
1	The display of sign Board made of in 40 x 40 x 6 mm MS iron angle as pillar. The horizontal MS angle in 25 X 25 X 6 mm to be fixed on the Top. The 18 gauge (5Feet Length X 4Feet width) carbon MS sheet should be affixed on the platform and the departmental supplied sign board should be pasted on it showing the name of the village/ hamlet and year of electrification.	per village/ Hamlet	1

GENERAL CONDITION OF CONTRACT/TENDER

1 The Tenderwill be examinedfor the document called for. The bid of the tenderer if not complete in all respect shall be rejected. However there can be consideration in case of documents which are not very important for the point of view of work i.e. which will not give indication of poor workmanship if deemed appropriate by the consideration of District Electricity Committee constituted for the purpose of electrification under the Chairmanship of Collector and District Magistrate, Bhadrak**.**

2. In case of HT line or LT lines on the average there should be on D.P per K.M of line. Besides to take care of bends more than 80 degree or for other exigencies if there is necessity there will be one cut point per KM on the average over and above the D.P. Point. If for some reason the average cut point becomes more than 1 cut point per K.M. for which the tenders had to bear additional financial burden, the matter will be referred to the District Electricity Committee constituted for the purpose of electrification. Depending upon the justification after going, into details the committee under the chairmanship of the Collector and District Magistrate Bhadrak may pass the higher bill. The additional cost should be maximum within 5% of the cost of line, which the tenderer has constructed as per his rate submitted in the tender. The average will be decided taking block as a unit.

3. The rate quoted by the contractor should be inclusive of the materials cost plus transportation cost plus the labour cost and the cost of inspection. At the time of handing over the line or sub station they should be ready for charging and operation.

4. The work of the contractor will be inspected from time to time (stage inspection) by the authorized representative of the Collector cum District Magistrate Bhadrak and in case it is seen that the materials used is substandard or workmanship is substandard the contractor will be asked to change the materials or re do the work within the stipulated time. If the Contractor fails to do so his bill will not be passed and the work may be awarded to another Contractor for whole or balance part of the work.

5. In case of any difference in opinion in work or work related matter the District Electricity Committee(Created for Village Electrification purpose) will settle the issue which will be binding contractor/bidder.

6. The Contractor has to give an undertaking to the effect that he will abide by all the terms and conditions stipulated in the general conditions of Contract/Tender and at no point of time he will disagree with the terms and conditions mentioned in the Contract/tender. In case of such an incident the Contract may be cancelled and may be re- awarded to another bidder.

7. Prior to bidding all the tenderer should clarify their doubts pertaining to tender, if any, from the Superintending Engineer/AGM, Electrical Circle , NESCO Bhadrak.

8. Bidder must quote for the **complete Package for the Block.**

NB:

i) Bidders are free to quote one or multi–Block ,but work will be awarded maximum for 1 block to each bidder.

ii) Bidders offering multi blocks, the tender paper cost & EMD to be furnished for individual block.

iii) Bidder should go through the tender specification and may attend the Pre-bid meeting on scheduled date & time for discussion..

Collector & District Magistrate

Bhadrak.