

# **ELECTRICAL TENDER DOCUMENT**

**FOR**

**Construction of 11 KV Line at Somnathpur**

**NOCCinfra**

**NOCCI BALASORE INFRASTRUCTURE COMPANY  
UNDER IIU Scheme, GOVT. OF INDIA**

Regd. Off: C-12, Ganeswarpur Industrial Estate, Dist: Balasore-756 019

## **INTRODUCTION**

Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce & Industry, Government of India (GOI) had introduced a scheme called Industrial Infrastructure Upgradation Scheme. The Scheme WOULD TARGET EXISTING Industrial Clusters with high growth potential requiring assistance for up-gradation of Infrastructure to world class standards.

Central assistance is by way of one time grant-in – aid to the SPV formed by the cluster association. The Central grant would be restricted to 75% of the project cost subject to a ceiling of 60 crore. The remaining 25% would be financed by other stake holders of the respective cluster / location with a minimum industry contribution of 15% of total project cost.

North Orissa Chamber of Commerce & Industry (NOCCI) in association with IDCO are currently playing a proactive role in promoting the cause of industrial units in the northern districts of the State. NOCCI is operational from its office premises within the Plastics, Polymer & Allied Cluster i.e Industry Facilitation Center, Ganeswarpur Industrial Estate, Balasore, Orissa-756019

### **PLASTICS, POLYMERS AND ALLIED CLUSTER, BALASORE (PPACB)**

Balasore is around 200 km from Orissa's Capital Bhubaneswar. The location of the PPACB cluster is quite strategic, being very close to National Highway No.5 (part of the Golden Quadrilateral connecting Kolkata to Chennai). The industrial estates of Ganeswarpur and Balgopalpur were established around 1983 and are amongst the oldest of such industrial estates developed in Orissa.

The PPACB was developed by the Orissa Industrial Infrastructure Development Corporation (IDCO), Government of Orissa in the outskirts of Balasore town with three nodal centers viz. Ganeswarpur (64 acres), Somnathpur (458 acres) and Balgopalpur (155 acres). Most of the units established in the cluster are involved in processing of plastics and polymers including manufacturing of plastic pipes, polypropylene based household products, polymer-based woven sacks, rubber-based prophylactics etc. Other units in the area are involved in paper manufacturing, Ferro-chrome production, manufacturing of multi-wall paper sacks, ceramics-based components for steel plants, fabrication and engineering.

### **PROJECT OUTLINE OF PPACB**

Considering the requirement of addition and up-gradation of infrastructure facilities in the identified cluster, promoters of units within the cluster under the framework of NOCCI and IDCO decided to come together and incorporate a non-profit making Special Purpose Vehicle (SPV) named **NOCCI Balasore Infrastructure Company**. Recognizing the inherent potential of the above cluster and in an endeavor to upgrade infrastructure facilities in the same, the above SPV would obtain financial assistance from Govt. of India & Govt. of Orissa by accessing funds under the existing Industrial Infrastructure Upgradation Scheme (IIUS). The overall objective is to infuse efficiency and enhance competitiveness of industries located in the cluster through improved infrastructure facilities.

**DESCRIPTION OF WORKS:** The CEO, on behalf of Nocci Balasore Infrastructure Company , Balasore, Orissa , invites sealed item rate bids from eligible bidders for the construction & completion of the following works:

Construction of 11 KV Line at Somnathpur

**2.0 ADDITIONAL INFORMATION:** Interested eligible bidders may obtain further information from and inspect the bidding documents at the office of the NBIC, at the address given below.

**3.0 REQUEST FOR BIDDING DOCUMENT :**

Bidders may download a complete document from the NBIC web site (www.nocci.in) and submit the same (without any alternation/ modifications) along with the bid in favour of NBIC for value to price of bidding document as specified in clause 4(b) below.

**4.0 BID DETAILS :** Detailed terms and conditions as well as the technical specifications for all the items of works as indicated in the invitation for bid are contained in one bidding document comprising Commercial and Technical

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|---|---|
| (a) Bid reference   |   |
| (b) Price of bidding document (inclusive of Sales Tax)                            | ₹ 1000/-  |
| (c) Incidental charges (in land) in case documents are to be sent by courier/post | .....   |
| (d) Date of commencement of sale of bidding Document.                             | 24.12.2011  |
| (e) Last date for the sale of bidding document                                    | 05.01.2012  |
| (f) Last Date and time for receipt of bids  |   |
| (g) Date and time for opening of bids in presence of interested bidders           | 16 hours of 05.01.2012  |
| (g) Address for communication   | NOCCI BALASORE INFRASTRUCTURE COMPANY<br>Industry Facilitation Centre, C-12,<br>Ganeswarpur Industrial Estate, Po.-<br>Januganj, Dist: Balasore-756 019<br>(Orissa), Tele/ Fax: 06782-267273,<br>Email: <a href="mailto:nocciibls@gmail.com">nocciibls@gmail.com</a><br>Web: <a href="http://www.nocci.in">www.nocci.in</a> |
| (h) Estimated Cost of works   |   |
| (i) Time of completion  | : 3 Months  |
| (j) Amount of Bid Security  | : <b>One percent (1%) of the Quoted cost</b>  |

**1.0 INTRODUCTION:**

The NOCCI Balasore Infrastructure Company (NBIC) is revamping power distribution infrastructure in industrial estates of Balasore, Orissa under Industrial Infrastructure

Upgradation Scheme (IIUS) of Government of India .The total work in this tender involves Construction of 11 KV Line in the industrial Infrastructure Development layout area in the Industrial estate of Somnathpur.

The contractor shall undertake the complete work and there shall not be any exclusion What-so-ever of any PART. It is understood that any minor work, which may not be explicitly detailed but is necessary for the proper functioning of the individual equipment or infrastructure as a whole, is included in the scope of work without any additional cost.

The general technical specification of the major components and the ancillary item described in the technical section and the equipment, its capacities and quantity proposed by the Purchaser is furnished in the design data and schedule of quantities are for the guidance of the contractor only. However, contractor had been requested to get themselves familiarized / acquainted about the nature and the quantum of work involved before submitting its offer without deviating the basic requirement of the packages.

The quantity of cables, cable trays, earthing, instruments, supporting structure etc are to be provided based on the actual requirement at site. The contractor has to work out the substation layout, site layout and schematic diagram exact details based on the system offered and submit the same for the approval of the purchaser.

Water for installation shall be provided at one point within the site, free of charge.

**Electricity for installation** has to be arranged by the supplier. However, if the power is provided by the Purchaser, **the recovery shall be made @ 0.5% of the total purchase order value.**

**Completion period : 3 (Three) months from the date of order.**

Foundation and other civil works shall be provided by the contractor.

## **2.0 PROJECT SITE DETAILS :**

Name of the project	Strengthening of power distribution infrastructure at Industrial estate at Balasore.
Project Authority/Owner	NOCCI Balasore Infrastructutre Company
Site Adress	Somnathpur industrial estate, Balasore.
Nearest Railway staion	Balasore
Nearest Airport:	Kolkatta/Bhubaneswar
Nearest City	Balasore

THE EQUIPMENT TO BE SUPPLIED AND INSTALLED BY THE CONTRACTOR MUST BE SUITABLE FOR CONTINUOUS OPERATION UNDER VARYING CLIMATIC CONDITIONS AT THE PROJECT SITE.

**TROPICALISATION :**

All equipment supplied against these specifications shall be given tropical treatment in view of the severe climatic conditions prevailing at the site. Tropical protection shall conform to **BS:CP:1014:1963 entitled Protection of Electrical Equipment against Climatic Conditions OR IS: 3202**

**ELIGIBILITY CRITERIA**

1. The Bidder can be a single bidder or joint venture having not more than two members, including the lead bidder.
2. The Bidder, either single or members of JV taken together, should have an average annual turnover of Rs. 1 crore for the last three financial years. Audited balance sheets should be submitted with the bid towards proof for turnover.
3. The Bidder, either single or both members or the JV, should be in possession of valid Electrical Contractors' License.
4. The prospective bidder should have experience in supply & installation of 11 KV LINE / equivalent work etc. Such works should have been completed at least 12 calendar months prior to the date of due date of submission of this EOI.
5. Should have PAN no, VAT registration and labour license. Should have filed IT return for last three years.

## **INVITATION FOR BIDS (IFB)**

1. NOCCI Balasore Infrastructure Company invites sealed tender from reputed EPC Contractors with required license, either in individual capacity or as part of a joint venture agreement / consortium for carrying out various Electrical Installation works on "Turnkey" basis in the jurisdiction of their respective licensed area. The bidder must fulfill all the qualification requirements as specified in clause 2.0 stated below. The sealed envelopes shall be duly superscribed as "TENDER NOTICE NO: and DUE DATE OF OPENING : **05.01.2012 AT 16.00 HOURS.**

3. The tender documents can also be downloaded from the website: [www.nocci.in](http://www.nocci.in). In case tender papers are downloaded from these websites then the bidder has to enclose a **Demand Draft of Rs. 1000/- (One thousand only)** towards the cost of tender document, drawn on any scheduled bank, payable at Balasore, covering the cost of bid documents as stated above in a separate envelope with suitable superscription "Cost of Bid documents: Tender Notice Ref No. This envelope should accompany the Bid Documents."

4. The Bid shall be received and submitted in the office of the under signed on all office working days up to **15.00 hrs by date 05.01.2012. If the event date of opening is a holiday, the next working day shall be treated as the date of opening.**

5. The financial Bid will be opened on **dated 05.01.2012 at 16.00 hrs** as indicated above, in the presence of the authorized representatives of the Bidders. Bidders shall depute only one representative to attend pre bid meeting if any and tender opening if they wish to be present. The undersigned reserves the right to reject any or all tenders if the situations so warrants.

6. All correspondence with regards to the above shall be made to the following address:

**General Manager (Project & Administration)  
NOCCI Balasore Infrastructure Company  
Industry Facilitation Centre, Ganeswarpur Industrial Estate,  
Balasore, Orissa-756019  
Tele/ Fax:- 06782-267273**

# GENERAL CONDITIONS OF CONTRACT (GCC)

## 1.0 GENERAL:

NOCCinfra, hereinafter referred to as the "Publisher" have taken up of Upgradation of power at Ganeswarpur Industrial Estate and Somnathpur Industrial Estate on "Turnkey" basis . Six km. of 11 kV line is required to be erected for power evacuation from 5MVA 33/11 KV substation at Somnathpur.

## 2.0 SCOPE OF WORK :-

For details the technical specification specified in Item no.8 may be referred to.

## 3.0 DEFINITION OF TERMS

- (i)** The "Contract" means the agreement entered into between the Purchaser and the Contractor as per the Contract Agreement signed by the parties, including all attachments and appendices there to and all documents incorporated by reference therein.
- (ii)** 'Purchaser' shall mean NOCCi Balasore Infrastructure Company and shall include its legal representatives, successors and assigns.
- (iii)** "EPC Contractor" shall mean the Bidder whose bid will be accepted by the Purchaser for the award of the works and shall include such Successful Bidder's legal representatives, successors and permitted assigns.
- (iv)** "Sub-Contractor" shall mean the person named in the Contract for any part of the works or any person to whom any part of the Contract has been sublet by the Contractor with the consent in writing of the Engineer and will include the legal representatives, successors and permitted assigns of such person.
- (v)** "Engineer in Charge" shall mean the officer appointed in writing by the Purchaser to act as Engineer from time to time for the purpose of the Contract.
- (vi)** "Specifications" shall mean the specifications and Bidding Document forming a part of the Contract and such other schedules and drawings as may be mutually agreed upon.
- (vii)** "Site" shall mean and include the land and other places on, into or through which the works and the related facilities are to be erected or installed and any adjacent land, paths, street or reservoir which may be allocated or used by the purchaser or Contractor in the performances of the Contract.
- (viii)** "Inspector" shall mean the purchaser or any person nominated by the Purchaser from time to time, to inspect the equipment: stores or Works under the Contract and/or the duly authorized representative of the Purchaser.
- (ix)** 'Notice of Award of Contract' / 'Letter of Award' shall mean the official notice issued by the Purchaser notifying the Contractor that his bid has been accepted.
- (x)** 'Date of Contract' shall mean the date on which notice of Award of Contract/Letter of Award has been issued.
- (xi)** "Performance and Guarantee Tests", shall mean all operational checks and tests required to determine and demonstrate capacity, efficiency and operating,

characteristics as specified in the Contract Documents.

**(xii)** The term "Final Acceptance"/ 'Taking Over' shall mean the Purchaser's written acceptance of the works performed under the Contract, after successful commissioning/ completion of Performance and Guarantee Tests, as specified in the accompanying Technical Specifications or otherwise agreed in the contract.

**(xiii)** 'Commercial Operation' shall mean the condition of operation in which the complete equipment covered under the Contract is officially declared by the Purchaser to be available for continues operation at different loads up to and including rated capacity. Such declaration by the Purchaser, however, shall not relieve or prejudice the Contractor of any of his obligations under the Contract.

**(xiv)** Words imparting 'Person' shall include firms, companies, corporations and associations or bodies of individuals, whether incorporated or not.

**(xv)** Terms and expressions not herein defined shall have the same meaning as are assigned to them in the Indian Sale of goods Act (1930), failing that in the Indian Contract Act (1872) and failing that in the General Clauses Act(1897) including amendments thereof, if any.

**(xvi)** In addition to the above the following definition shall also apply

**a)** 'All equipment and materials' to be supplied shall also mean 'Goods'.

**b)** 'Constructed' shall also mean erected and installed.

**c)** 'Contract Performance Guarantee' shall also mean 'Contract Performance Security'.

#### **4.0 SUBMISSION OF TENDER:**

4.01 Sealed tenders complete in all respects in the manner hereinafter specified are to be submitted in the

**NOCCI BALASORE INFRASTRUCTURE COMPANY,**

**Industry Facilitation Centre,**

**Ganeswarpur Industrial Estate,**

**Balasore , Orissa- 756019, Telefax: 06782-267273**

on or before the date and time specified in the notice inviting the tenders. Bids shall be submitted as per format provided. The bid shall be submitted in separate double sealed envelopes superscribed on each of the covers, the tender specification number and the due date

of opening of the bids on the right hand top side of the envelope. On the left top side original/ duplicate as is relevant shall be written.

4.02 The tenders are required to be submitted in sealed covers superscribed as "**Construction of 11 KV line for Somnathpur Industrial Estate**" shall contain **EMD of Rs. 30,000/- (Rupees Thirty thousand only) with** documents.

4.03 Fax and Telegraphic tenders shall not be accepted.

4.04 Receipt of bids /revised bids after the cut off time and date as specified in the tender document shall not be permitted and such bids shall be rejected outright. The purchaser shall not be responsible for any delay in transit in post/ courier etc. in this regard.

#### **5.0 VALIDITY :**

The offer shall be valid for a period not less than 90 days from the date of bid opening.

#### **6.0 PRICE:**

Bidders are required to quote firm price as per the prescribed format enclosed herewith in prescribed format . The quoted price shall be for destination firm and inclusive of all taxes, duties, freight & insurance and other levies, if any. NOCCinfra shall not be liable to pay anything



over and above the quoted price. However, any variation in taxes & duties shall be borne by the bidder during the period of contract.

**7.0 RECEIPT AND OPENING OF THE BID:**

7.01 Bids in duplicate as described under clause 4.0 shall be received in the office of the Purchaser and shall be opened on the scheduled date and time. The Purchaser's authorized representatives shall open bids in the presence of bidders representatives on the date and time

for opening of bids as specified in the Invitation to Bid or in case any extension has been thereto, on the extended bid opening date and time notified.

7.02 Maximum one representative for each bidder shall be allowed to witness the opening of bids. The representative must produce suitable authorization in this regard to be eligible to witness the bid opening on behalf of the bidder. Bidder's representatives who are present shall

sign in a register evidencing their attendance.

7.03. The Bidder's names, bid prices, modifications, bid withdrawals and the presence or absence

of the requisite bid guarantee and such other details as the purchaser, at its discretion, may consider appropriate will be announced at the opening. No electronic recording devices will be

permitted during bid opening.

7.04 Information relating to the examination, clarification, evaluation and comparison of Bids and recommendation for the the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process. Any effort by a Bidder to influence the

purchaser's processing of Bids or award decisions may result in the rejection of the Bidder's Bid.

**8.0 EVALUATION OF BIDS & AWARD OF CONTRACT:**

8.01 To assist in the examination, evaluation and comparison of Bids may, at its discretion, ask the Bidder for a clarification of its Bid. All responses to requests for clarification shall be in

writing and no change in the price or substance of the Bid shall be sought, offered or permitted.

8.02 Purchaser will examine the Bids to determine whether they are complete, 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.

8.03 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price

and quantity, the unit price shall prevail and the total price per item will be corrected. If there is

discrepancy between the total amount and the sum of the total price per item, the sum of the total price per item shall prevail and the total item will be corrected.

8.04 Price to the detailed evaluation, purchaser will determine the substantial responsiveness of

each bid to the bidding documents including production capability and acceptable quality of the

goods offered. A substantially responsive bid is one, which confirms to all the terms and conditions of the bidding documents without material deviation.

8.05 The purchaser's evaluation of a bid will take into account, in addition to the bid price, the following factors, in the manner and to the extent indicated in this clause;

a) Work schedule.

b) Deviation from bidding documents.

has been determined to the lowest evaluated responsive bid., when the lowest bidder is not ready and / or capable to undertake the entire work envisaged, then the purchaser may explore

the possibility of the execution of works through other bidders if they are willing to execute at L1

rate. Such exploration shall be carried out in sequential order starting with L2 bidder then with L3

bidder and so on.

## **9.0 EARNEST MONEY DEPOSIT (EMD)**

9.01 The tender must be accompanied by Earnest Money Deposit (EMD), in shape of account payee Bank Draft drawn on any scheduled bank in favour of NOCCI BALASORE INFRASTRUCTURE COMPANY, payable at Balasore. EMD shall be **Rs. 30,000/-** (Rupees Thirty thousand only) for this project. Bids without EMD deposit will be rejected outrightly. The EMD should be deposited in the manner specified above.

9.02 No adjustment of any previous deposit or any amount payable from purchaser shall be entertained for EMD. The EMD amount so submitted shall not carry any interest payable to the bidder.

9.03 The Earnest money so deposited shall be forfeited :

a) If the bidder

i) withdraws its bid during the period of bid validity specified by the bidder in the bid form; (or)

b) in the case of a successful bidder, if the bidder fails

i) to sign the contract (or)

ii) to furnish the required Contract Performance Bank Guarantee.

9.04 The EMD of unsuccessful bidders shall be returned within 30 days from the date of finalization of the Tender.

**9.05**

## **10.0 PURCHASER'S RIGHT TO VARY QUANTITIES AT TIME OF AWARD:**

While placing orders and or during execution of contract, purchaser reserve the right to increase

or decrease the quantity of goods and services specified in the schedule of requirement up to 20% of the tender quantity without any change in price or other terms and conditions.

## **11.0 INSPECTION & TESTING:**

The Engineer-in-Charge shall be entitled at all reasonable times during manufacture/ 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. If the said materials are being manufactured in other premises, the contractor shall provide unhindered 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 testing. The inspecting officer for the entire work shall be the (Respective purchaser Authority) of the concerned site.

### **12.0 COMPLETION AND COMPLETENESS OF THE EQUIPMENT:**

12.01 Time being the essence of the contract, the work shall be completed within 3 months from the date of issue of work order for each package.

12.02 The work shall be treated as complete item wise when one 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 and electrical inspection thereof. No extra payment shall be payable for such mounting , fittings, fixtures, accessories and electrical inspection (by competent Authority) which are needed for safe operations of the equipment as required by as required by applicable code of the country though this might not have included in the contract.

12.03 All similar components and / or parts of similar equipment supplied shall be interchangeable with one another. Various equipments supplied under this contract shall be subject to purchaser's approval.

12.04 Purchaser however reserves the right to reschedule the completion period, if required.

### **13.0 REJECTION OF MATERIALS:**

In the event of the materials supplied by the contractor and or the installation works are found

to be defective in quality and the workmanship is poor or otherwise not in conformity with the

requirements of the contract specification as per the section –IV (Technical specification).

Purchaser shall reject such materials / services and ask the contractor in writing to replace / rectify the defects. The contractor on receipt of such notification shall either rectify or replace the

defective materials and or re-install the work already executed , free of cost to the purchaser. If

the contractor fails to do so the purchaser may at his opinion take the following actions which could be on concurrent basis.

**A)** Replace or rectify such defective materials and recover 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 materials at reduce price considered acceptable under the circumstances.

**D)** Forfeit the contract performance Bank Guarantee.

**14.0 EXPERIENCE OF BIDDERS:****15.0 DEVIATION FROM SPECIFICATION:**

The bidders are requested to study the specification and the attached drawings thoroughly before tendering so that if they make any deviations, the same are prominently brought on a separate sheet under the headings "Deviations" as per formats provided under section VIII. All such deviations to the technical & commercial terms of the specification shall be indicated in a separate list as indicated above. In absence of such deviation schedule, it will be presumed that

the bidder has accepted all the conditions stipulated in the tender specification, notwithstanding

any deviations mentioned elsewhere in the bid. However the acceptance of deviation is not binding on the purchaser.

**16.0 CONTRACTOR TO INFORM HIMSELF FULLY:**

The contractor shall examine the instructions , general conditions of the contract, specifications

and the schedule of quantity and delivery to satisfy himself as to all the terms and conditions and

circumstances affecting 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.

**17.0 PATENT RIGHT:**

The contractor shall indemnify the purchaser against all claims , actions, suits and proceedings for

the alleged infringement any patent design or copy right protected either in country 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 informed from the specification.

**18.0 GUARANTEE PERIOD:**

18.01 The materials to be supplied by the contractor shall be guaranteed for satisfactory operation against defects in design and workmanship for a period of 24 months from the date of

handing over the completed installations.

18.02 The above guarantee certificate shall be furnished in triplicate to the purchaser for his approval. Any defects noticed during the above period should be rectified by the contractor free

of cost to the utility provided such defects are due to faulty design , bad workmanship, or bad materials used on receipt of written notice from the purchaser.

**19.0 PENALTY FOR DELAY IN COMPLETION OF CONTRACT:**

19.01 If the contractor fails to complete the works by the scheduled period or any extension granted thereby , the contractor shall be liable for payment of penalty amounting to 0.5% (half percent of the contract price) per week of unfinished works subject to the maximum of 5% (five

percent of the total contract price) and subject to force majeure conditions.

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

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

purchaser.

**20.0 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 for early resolution of these issues.

**21.0 CONTRACTOR'S DEFAULT ;**

21.01 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 the notice in writing to make good the failure, neglect or contravention complained of.

Should the contractor fail to comply with 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 be pay if the completion of works is delayed.

21.02 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.

21.03 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 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.

**22.0 TERMINATION OF CONTRACT ON PURCHASER'S INITIATIVE:**

22.01 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.

22.02 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 to 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 circumstances prevalent at the time of

termination.

22.03 If the contractor is an individual or 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 proprietor of

the propriety concern and in case of the 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 in completed 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 bidding 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 Contractors firm liable to damages for not completing the Contract.

### **23.0 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, act of Govt., Fires, Flood, Epidemics, Quarantine restrictions, Strikes, Freight Embargos and provided that the Contractor shall within (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. "

### **24.0 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 the Purchaser in writing of his claim for an extension time. The Purchaser on receipt of such notice may be agree to extend the contractor period as may be reasonable but without prejudice to other term & conditions of the contract.

#### **25.0 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.

#### **26.0 STORE**

Storing 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.

#### **27 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 handling

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 work

as well as arrange third party insurance cover to indemnify any possible damages to public at large not connected with the works process. Any claims (s) pertaining to this shall be the responsibility of the Contractor.

The contractor shall under take 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 at purchaser's

stores.

#### **28.0 ENGINEERS-IN-CHARGE**

General Manager (Project & Admin.) shall be the Engineer- in- charge for the Project.

#### **29.0 CONTRACT PERFORMANCE BANK GUARANTEE:-**

29.01 Within 15 days of issue of the work order / Letter of Award, whichever is earlier, the Contractor shall submit Contract **Performance Bank Guarantee** issued by a scheduled Bank, in favour of the Purchaser, covering 10% (Ten percent) of the total value of the work order,

29.02 The said Bank Guarantee shall be prepared in the prescribed Performa as attached in Section IV, Annexure – III. The Bank Guarantee furnished shall be executed on Non-Judicial Stamp paper worth of Rs. 100/- (Rupees Hundred only), purchased in the name of the issuing bank, as per the prevalent rules. The bank Guarantee so provided shall be encashable

on the Balasore branch of issuing Bank.

29.03 The Contact Performance Bank Guarantee shall remain valid for a period not less than 90

days over and above the completion period basing on stipulated completion period in the W.O. towards security and acceptance thereof, failing which the work order (W.O.) will be liable for cancellation without any further notice with forfeiture of E.M.D.

29.04 No interest shall be allowed by the Purchaser on the above Performance Security Deposit submitted by the Bidder .

**30.01 TERMS OF PAYMENT:**

30.1 An advance of 10% (ten percent) of total lump sum contract price shall be paid as Mobilization Advance, subject to the following.

(a) Submission of Invoice for payment of advance.

(b) Receipt and acceptance of unconditional irrevocable Contract Performance Bank Guarantee in favour of Purchaser as mentioned in clause 29.01.

(c) Receipt & Acceptance of unconditional and irrevocable Advance Payment Bank Guarantee in favour of Purchaser for an amount equivalent to the amount of advance as per the prescribed format as provided in Section IV, Annexure IV. The Bank Guarantee so provided should be en-cashable on the Balasore Branch of the issuing Bank.

(d) Establishment of contract site office and certified by the engineer that satisfactory mobilization for erection exists.

(e) An advance of 10% of the total contract price towards mobilization advance, so availed, shall be recovered from the first progressive bill i.e 70% of the contract price.

f) 70% (seventy Percent) of contract price including 10 % mobilization advance on pro-rata basis along with taxes and duties shall be paid progressively for each quantum of completed work of an item as per the agreed Bill of Materials within 30 days of submission of claim subject to certification by Purchaser's Engineer-in-charge on the basis of check points involved in such items of work.

g) Balance 30% (thirty percent) of contract price shall be paid after completion of all works, envisaged under this package including any additions and alterations, testing & commissioning, return of dismantled materials/ un-used free supply material, taking over certificate and entire stretch is fully ready for commercial operation. The payment shall be subjected to clearance from electrical inspectorate of NESCO.

h) TDS of appropriate value as per income tax act shall be deducted while releasing payment.

Note: In case of joint venture / Consortium all BGs shall be in the name of Joint Venture / Consortium covering all the partners including the lead partner.

**31.0 PAYING OFFICER**

VP/GM(Project & Admn) NBIC shall be the paying officer for the project.

**32.0 PURCHASER'S RIGHTS:-**

The purchaser reserves the right to accept any bid or reject any or all bids or cancel/ withdraw invitation of bid or to vary the quantity for placement of order without assign any reason to such any decision. Such decision by the purchaser shall bear no liability.

**33.0 DISTINCT MARK ON EQUIPMENT AND MATERIALS :**

All the equipments & Materials required for the works shall have distinct mark of NBIC Power Up-gradation at Somnathpur & Ganeswarapur either by way of punching on metal parts and/or inbuilt during casting and/or painting as per common practice and/or as



mutually agreed. This should be clearly visible in day light in naked eye.

### **34.0 DISPUTE RESOLUTION & JURISDICTION**

(a) For the purpose of dispute resolution, this agreement shall be Governed by the provision of arbitration & conciliation act 1996.

(b) All disputes shall be subject exclusively to jurisdiction of the **Courts at Balasore** and the writ jurisdiction of **Honourable High court of Orissa, Cuttack**.

### **35.0 TRANSFER AND SUB-LETTING**

The contractor shall not sub late, transfer, assign or otherwise part with the contract or any part thereof, either directly or indirectly, without prior permission of the purchaser.

### **36.0 FREE ISSUE OF MATERIALS**

36.01 There is no free issue of materials for this project, however in case if situation warrants so

the following is to be addressed to,

36.02 Before issue of the free issue materials the contractor act its own cost shall arrange suitable stores adjacent to the work site and shall offer the same for inspection to purchasers Engineers.

36.03 The Contract shall furnish Indemnity Bond for an amount equivalent to the estimated value of the free supply materials / dismantled materials returnable as certified by engineer in charge, the contractor shall submit indemnity bond in the prescribed format.

36.04 Subject to compliance of above clauses, the contractor shall be permitted to draw the materials from the designated stores of the purchaser. The contractor shall duly acknowledge the materials along with copies of the notification to the Insurer regarding such transit of material from designated stores of the purchaser to the stores of the contractor.

36.05 After completion of the works all surplus materials shall be returned to the purchaser stores for any shortage with regard to materials supplied by the purchaser. The purchaser shall be entitled to recover 125% of the purchase cost of such materials or present market cost whichever is higher, from the dues of the contractor.

### **37.0 SUBMITTALS REQUIRED AFTER AWARD OF CONTRCT**

37.01 Within 30 days of the effective date of contract the contractor shall provide 3 copies of a outline program of production, inspection, testing, delivery, survey, erection, precommissioning

& commissioning in chart form. Included in the program will be the detailed schedule of drawing to be submitted.

37.04 the periodic progress report as required by the purchaser shall be submitted by the contractor as per the format prescribed by the engineer's in charge.

### **38.0 DRAWINGS**

EPC Contractor shall prepare all the drawings & shall submit to appropriate authority for approval. The schedule shall also provide a program of drawing submission for approval by the engineers in charge. All drawings & design should be submitted to engineer in charge within the period specified above.

### **39.0 APPROVAL PROCEDURE OF SUB-VENDORS AND DRAWING OF BOUGHT OUT MATERIALS**

39.01 The contractor shall submit all drawings documents and type test reports, QAP, Name of sub-vendor, samples (as applicable) etc., to the Engineer-in-charge within 15 days of award of LOA for approval. If modifications to be made if such are deemed necessary, the contractor has to submit them for approval without delaying the initial deliveries of completion of the contract work.

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

39.03 If the drawings will be as per the technical specification, the competent authority of the Purchaser will return the drawings & Documents to the Contractor marked with "Approved" stamp.

#### **40.0 TAKING OVER**

40.1 Upon successful completion of the tests to be performed at site on equipment / materials supplied and erected 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. 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. 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.

40.2 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.

#### **41.0 LATENT DEFECT WARRANTY**

41.1 The period of latent defect warranty in terms of this bidding documents, shall be limited to five (05) years from the date of completion of Guarantee period.

#### **42 DEVIATION IN SCOPE**

Without prior intimation to the Engineer in charge no deviation what so ever required during execution shall be allowed.

#### **42.0 EMBOSING/PUNCHING/CASTING/PAINTING**

42.1 The all equipments and materials supplied / erected under this project shall bear distinct mark of **NOCCI Balasore Infrastructure Company**, by a way of embossing / punching / casting / painting etc. This should be clearly visible to naked eye.

### **3.0 SCOPE OF WORK:**

The scope of work under this contract involves construction of three separate 11 KV lines including take off arrangement from 11 KV bays of the 33/11KV substation under construction at Somnathpur. The line is to be erected using 9mtr. PSC poles in 50mtr. Span and 100mm<sup>2</sup> **Insulated All Aluminium Alloys Conductor**. Total length as per scope is 6 km. which may vary after detailed survey and actual construction.

The scope of work includes design, fabrication, supply, installation, testing and commissioning of all equipment, cabling and earthing etc. of complete upgradation as per the general technical specifications and the schedule of quantities mentioned in these work packages.

The contractor shall be responsible for designing and developing the conceptual layout, Power and Control Wiring diagram etc., to ensure that the system is installed with minimum investment and least operating cost to meet all the quality standards as well as to fulfill the design data and technical specifications specified in the bidding document. The work shall be carried out with the best quality materials and in a best workmanship manner, strictly in conformity with the specifications mentioned hereunder.

The system shall be designed, supplied and executed in accordance with prevailing and applicable

- Bureau of Indian Standards
- Indian Electricity Rules
- Indian Electricity Act
- Fire Insurance Regulations
- Indian Factory Act
- State Statutory Requirement

and any other applicable Indian Act. Wherever Indian Standards are not available / applicable, the contractor shall follow International Standards. In case of nonavailability / applicability of both the standards mentioned above, DIN, British or American Standards shall be used.

The supplier shall be responsible for arranging approval from various Central and State Statutory Authorities viz. Electrical Inspectorate, etc., for the entire electrical execution carried out by them on behalf of the Purchaser / Owner. Submission of filled-in application and pro-forma furnishing all the necessary details, drawings, test reports to the appropriate authorities shall be the responsibility of the Supplier. The actual prescribed statutory fees shall, however, be reimbursed by the Purchaser on production of money-receipt.

The technical specification for supply and installation for upgradation has been specified in few sections and brief content of each of these is given under Design Data.

The scope of work includes **DESIGN, SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF EQUIPMENT FOR UPGRADATION OF POWER SUPPLY INFRASTRUCTURE** as mentioned in the schedule of quantities.

The Contractor shall ensure performance tests be carried out in the presence of and to the satisfaction of purchaser. Necessary test kits required for performance test shall be arranged by the contractor.

Contractor shall ensure satisfactory performance and after sales service of bought-out items.

The Contractor shall impart necessary training to the plant personnel on operation and maintenance of the equipment.

Detailed Preventive maintenance schedule as well as operational manuals of equipment shall be provided by the Supplier at the time commissioning:

The manual shall cover the following aspects:

- Start up, commissioning, normal operation, emergency operation.
- Trouble shooting chart covering operational status, reasons (causes) and actions to be taken (remedy)
- As-built drawings of the equipment, electrical schematic, controls wiring drawings,
- etc

Manuals and drawings are to be supplied as follows:

- 4 Sets of drawings and manuals in hard copy
- 3 Sets of drawings and manuals in CDs (softcopy)

**Note :**

Scope of cables laying includes providing necessary terminating lugs and glands including termination with respective PCC, MCC.

CPRI approved panel boards should be supplied. Necessary proof (short circuit test, temperature rise test and ingress protection test reports) to this effect are to be submitted and NBIC's approval is to be obtained prior to taking up the panel fabrication work.

**4.0 SCHEMATIC DIAGRAM & DESCRIPTION:**

The supplier / contractor has to design and develop the schematic diagram based on major parameters specified in bidding document.

The supplier / contractor has to submit the building plan drawing showing the tentative layout of equipment and schematic single line diagram for feeder details of HT and LT power control centres and the conceptual schematic diagram of the complete electrical installation and how the electrical energy shall be received from Local Electricity Supply Authority / State Electricity Board and distributed. This needs to be submitted along with the bid.

**EQUIPMENT SPECIFICATION**

This section provides general technical specification of all major equipment required. It may be

noted that specifications of the equipment mentioned are very brief and the contractor is to design, manufacture, supply and install the complete system to ensure the best performance of

the individual equipment as well as the complete system.  
IRRESPECTIVE OF WHETHER THE SPECIFICATION OF AN EQUIPMENT OR ACCESSORY IS  
MENTIONED OR NOT IN THIS SECTION OR SCHEMATIC DIAGRAM, ALL THE EQUIPMENT  
AND  
ACCESSORIES REQUIRED TO MEET THE DESIGN DATA WITHIN THE BATTERY LIMITS SHALL  
BE  
SUPPLIED INSTALLED AND COMMISSIONED BY THE SUPPLIER.

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# **TECHNICAL SPECIFICATION FOR CONSTRUCTION OF 11KV DISTRIBUTION LINES**

## **1.0 NATURE OF WORK**

The work covered by this Specification is for 11 kV distribution lines as specified herein and in the attached Schedules.

## **1.1 GENERAL PARTICULARS OF THE SYSTEM**

The following are the general particulars governing the design and working of the complete system of which the Works will form a part —

- a) Electrical energy is transmitted from 132/33 KV or from 220/33 KV grid S/S of OPTCL to Primary 33/11 KV sub-stations as three-phase supply at a frequency of 50 Hz, and transmitted there from by means of overhead lines.
- b) The system will be in continuous operation during the varying atmospheric and climatic conditions occurring at all seasons.

## **1.2 SCOPE-**

Construction of 6 km of 11 kv line in form of 3 feeders for evacuation of power from 33/11KV substation under construction using 9mtr. PSC poles 100mm<sup>2</sup> insulated AAAC conductor in 50 mtr. Spans.

## **2.0 SURVEY**

Walk over survey, Theodolite survey, profile survey (if required) shall have to be carried out to establish the Route alignment by the contractor for new 11 KV lines. If the line is passing in any Municipal/ NAC areas permission from local bodies has to be obtained prior to execution of work. Suitable distance from the side of the road has to be made towards placement of line poles.

### **2.0.1 CHECK SURVEY**

The contractor shall undertake the check survey during execution on the basis of the alignment profile drawing and tower schedule approved by the employer. If during check survey necessity arises for minor change in route to eliminate way leave or other unavoidable constraints, the contractor may change the said alignment after obtaining prior approval from the employer

**2.0.2 GENERAL:** Preliminary route alignment in respect of the proposed 11KV transmission lines has been fixed by the employer subject to alteration of places due to way leave or other

unavoidable constraints. The Right of way shall be solved by the contractor and all expenses there of shall be borne by him. However, the owner shall render all helps in co-ordination with law and order department for solving the same. Involvement of Forest land should be restricted as far as possible.

**2.0.3** Provisional quantities/numbers of different types of PSC poles 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, preparation of route profile drawing and designing of the different types of PSC poles as elaborated in the specification and scope of work.

**2.0.4** The contractor shall undertake detailed survey on the basis of the tentative alignment fixed by the employer. The said preliminary alignment may, however, change in the interest of economy to avoid forest and hazards in work. While surveying the alternative route the following points shall be taken care by the contractor.

- (a) The line is as near as possible to the available roads in the area.
- (b) The route is straight and short as far as possible.
- (c) Good farming areas, religious places, forest, civil and defense installations, aerodromes, public and private premises, ponds, tanks, lakes, gardens, and plantations are avoided as far as practicable.
- (d) The line should be far away from telecommunication lines as reasonably possible. Parallelism with these lines shall be avoided as far as practicable.
- (e) Crossing with permanent objects are minimum but where unavoidable preferably at right angles.
- (f) Difficult and unsafe approaches are avoided.
- (g) The survey shall be conducted along the approved alignment only.
- (h) For river crossing/ Crossing of Nalas : Taking levels at 25 meter interval on bank of river and at 50 meter interval at bed of river so far as to show the true profile of the ground and river bed railway/road bridge, road The levels shall be taken at least 100 m. on either side of the crossing alignment. Both longitudinal and cross sectional shall be drawn preferably to a scale of 1:2000 at horizontal and 1:200 vertical.

After completing the detailed survey, the contractor shall submit the final profile and tower schedule/ pole schedule (with no. of stay or strut) for final approval of the employer. To facilitate checking of the alignment, suitable reference marks shall be provided. For this purpose, concrete pillars of suitable sizes shall be planted at all angle locations and suitable

wooden/iron pegs shall be driven firmly at the intermediate points. The contractor shall quote his rate covering these involved jobs.

## **2.0.5 (a) OPTIMIZATION OF POLE LOCATION**

### **I. POLE SPOTTING**

To optimize the line length, the contractor shall spot the poles in such a way so that the line is as close as possible to the straight line drawn between the start & end point of the line.

### **II. CROSSINGS**

**a) ROAD CROSSINGS:** - At all road crossings, the double tension HW fittings should be used. There should absolutely no joints in the conductors in all road, power line and all other major crossing. The ground clearance from the road surfaces under maximum sag condition shall be not less than 8.5mtr over roads. In National High way the minimum height of guarding at the maximum sagging point should be less than 8.5mts.

**b) RAILWAY CROSSINGS:** - The railway crossing overhead or underground shall be carried out in the manner as approved & prescribed by the railway authorities from time to time.

The crossing shall normally be at right angle to the railway track. In case crossing is required to be done through underground cable, cost of the cable including laying and other accessories shall be in the scope of the contractor. During detailed engineering, the contractor shall submit his proposed arrangement for each railway crossing to the owner. The approval for crossing railway track shall be obtained by the owner from the Railway Authority.

### **c) POWER LINE CROSSINGS:-**

Where the line is to cross over another line of the same voltage or lower voltage, provisions to prevent the possibility of their coming into contact with each shall be made in accordance with the Indian Electricity Rules.

### **III. DETAILS EN-ROUTE:-**

After survey and finalization of route, the contractor shall submit detailed route map for each line. This would be including following details:

All poles on both sides of all the crossings shall be tension poles i.e. disc type insulators shall be used on these poles. At all the crossing described above the contractor shall use protective guarding as per REC Construction Standard A-1 to fulfill statutory requirements.

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 up to date. The vendor shall select the height of the poles in order to achieve the prescribed electrical clearances.

#### **IV. FINAL SCHEDULE:**

The final schedule including Bill of quantity indicating location of poles specifically marking locations of failure containment pole/structure, DTs 11 kV line sectionalizes, line tapping points; angle of deviation at various tension pole locations, all type of crossings and other details shall be submitted for the approval of the owner. After approval, the contractor shall submit six more sets of the approved documents along with one set in reproducible form to purchaser for record purpose.

#### **V. DANGER BOARDS**

The vendor shall provide & install danger plates on all 33kv, 11kv DP structures , H pole structures and towers besides in all poles where DT is installed. The danger plates shall conform to REC specification No. 57/1993.

#### **VI. ANTI-CLIMBING DEVICE**

The vendor shall provide and install anti-climbing device on all 33kv and 11kv DP structures, towers and at all poles as per CEA guide line. This shall be done with G.I. Barbed wire or modified spikes as specified. The barbed wire shall conform to IS-278 (Grade A1). The barbed wires shall be given chromatin dip as per procedure laid down in IS: 1340.

#### **VII. FITTINGS COMMON TO ALL LINE**

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

Mid Span Compression Joint & Repair Sleeves: The contractor shall supply & install the Mid Span Compression Joint and Repair Sleeves as per IS: 2121 (Part II). Guy/Stay wire Clamp: The contractor shall supply & install Guy/Stay wire Clamp as per REC Construction Standard G-1 or better here of as specified.

#### **VIII. STAY/GUY SETS**

**a)** The Stay/Guys shall be used at the following pole locations;

At all the tapping points & dead end poles

At all the points where DT is to be installed

At all the points as per REC construction dwg. No. A-10 (for the diversion angle of 10-60 degree)

At every alternative pole for 11 kV line (two sets)

Both side poles at all the crossing for road, nala, railway crossings etc.

**b)** The arrangement and number of stay sets to be installed on different pole structures shall be as per REC Construction Standards no. A-23 to A-27, G-5 & G-8. However, this shall be decided finally during erection, as per the advice of Engineer.

**c)** The stay set to be installed complete in all respect and would broadly consist of following items:

7/10 SWG G.I. Stay wire for 11 kV lines and 7/12 SWG for LT line as per REC Specification No.46/1986 Stay Insulator type A for LT line and type C for 11 kV line as per REC Specification No. 21/1981, Turn Buckle. Anchor rod and plate (Hot Dipped galvanized). Thimbles and Guy Grip Complete stay set shall be as per REC Construction Standards no. G-1. The stay clamp is envisaged as GS structure along with other clamps brackets etc.

#### **IX. ERECTION OF STAY SETS**

The contractor shall install the stay set complete in all respect. This includes excavation of pit in all kinds of soil with PCC in the ratio 1:2:4 as specified which shall be placed in the bottom of the pit.

The rest (upper half) of the pit shall be filled with excavated soil duly compacted layer by layer. An angle between 30 to 45 degrees shall be maintained between stay wire and the pole. The stay wire shall be used with a stay insulator at a height of 5 mts. above ground level with F.I. turn buckle.

#### **X. STRINGING AND INSTALLATION OF LINE WITH BARE CONDUCTORS.**

##### **a) GENERAL**

The scope of erection work shall include the cost of all labor, tools and plants such as tension stringing equipment and all other incidental expenses in connection with erection and stringing work. The Bidders shall indicate in the offer the sets of stringing equipment he would deploy exclusively for work under each package. The stringing equipments shall be of sufficient capacity to string AAA conductor or ACSR conductor.

The Contractor shall be responsible for transportation to site of all the materials to be provided by the Contractor as well as proper storage, insurance etc. at his own cost, till such time the erected line is taken over by the owner.

Contractor shall set up required number of stores along the line and the exact location of such stores shall be discussed and agreed upon with the owner.

## **b) INSULATOR FIXING**

Pin insulators shall be used on all poles while strain insulators shall be used on all angle & dead end poles. The special type Pin Insulators should be used for conductors more than 100 mm<sup>2</sup>. In saline areas like PURI division, Paradeep division, Marshaghai division, Kendrapada division & part of Nimapada division long rod insulators may be used in 33 KV lines. Damaged insulators and fittings, if any, shall not be used. Prior to fixing, all insulators shall be cleaned in a manner that shall not spoil, injure or scratch the surface of the insulator, but in no case shall any oil be used for this purpose. Torque wrench shall be used for fixing various line materials and components, such as suspension clamp for conductor, whenever recommended by the manufacturer of the same.

## **c) RUNNING OUT OF THE CONDUCTORS**

The contractor shall be entirely responsible for any damage to the pole or conductors during stringing. The conductors shall be run out of the drums from the top in order to avoid damage to conductor.

A suitable braking device shall be provided to avoid damaging, loose running out and kinking of the conductors. Care shall be taken to ensure that the conductor does 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. Wherever applicable, inner phase off-line conductors shall be strung before the stringing of the outer phases is taken up.

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 voltage build up due to electromagnetic and electrostatic coupling in the pulling wire, conductors and earth wire during stringing operations.

The Contractor shall also take adequate safety precautions to protect personnel from potentially dangerous voltage build up due to distant electrical storms or any other reason.

## **d) REPAIRS TO CONDUCTORS**

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 and not more than one repair sleeve will be used in one span.

Repairing of the conductor surface shall be carried out free of cost 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. After compression the sharp edges must be smoothed by filing.

The Contractor shall be entirely responsible for any damage to the poles, insulators etc during stringing.

#### **e) STRINGING OF CONDUCTOR**

The stringing of the conductor shall be done by the standard stringing method. The Bidder shall submit complete details of the stringing method for owner's approval. Conductors shall not be allowed to hang in the stringing blocks for more than 96 hours before being pulled to the specified sag.

Derricks/ scaffoldings or other equivalent methods shall be used to ensure that normal services are not interrupted and any property is not damaged during stringing operations for roads, telecommunication lines, power lines and railway lines. However, shut-down shall be obtained when working at crossings of overhead power lines. The contractor shall make specific request for the same to the owner.

#### **f) JOINTING**

When approaching the end of a drum length at least three coils shall be left in place when the stringing operations are stopped. These coils are to be removed carefully, and if another length is required to be run out, a joint shall be made as per the recommendations of the accessories manufacturer.

Conductor splices shall not crack or otherwise be susceptible to damage during stringing operation. The Contractor shall use only such equipment/methods during conductor stringing which ensures complete compliance in this regard.

All the joints on the conductor shall be of compression type, in accordance with the recommendations of the manufacturer, for which all necessary tools and equipment like compressors, dies etc., shall be arranged by the contractor. Each part of the joint shall be cleaned by wire brush till it is free of rust or dirt, etc. This shall be properly greased with anti-corrosive compound if recommended by the manufacturer, before the final compression is carried out with the compressors.

All the joints or splices shall be made at least 30 meters away from the pole. No joints or splices shall be made in spans crossing over main roads, railway line and Small River spans. Not more than one joint per conductor per span shall be allowed. The compression type fittings shall be of the self centering type or care shall be taken to mark the conductors to indicate when the fitting is centered properly.

During compression or splicing operation, the conductor shall be handled in such a manner as to prevent lateral or vertical bearing against the dies. After compressing the joint, the Aluminium sleeve shall have all corners rounded; burrs and sharp edges removed and smoothed.

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. In case of ACSR conductors the filler compound should be used during compression. In case AAAC is used each press should overlap 25% of the previous press.

**g) TENSIONING AND SAGGING OPERATIONS:**

The tensioning and sagging shall be done in accordance with the approved stringing charts or sag tables.

The sag shall be checked in the first and the last section span for sections up to eight spans and in one additional intermediate span for sections with more than eight spans. Tensioning and sagging operations shall be carried out in calm weather when rapid changes in temperature are not likely to occur.

**h) CLIPPING IN:**

Clipping of the conductors into position shall be done in accordance with the manufacturer's recommendations.

Jumpers at section and angle towers shall be formed to parabolic shape to ensure maximum clearance requirements. Pilot pin insulator shall be used, if found necessary, to restrict jumper swing & to ensure proper clearance to design values. Fasteners in all fittings and accessories shall be secured in position. The security clip shall be properly opened and sprung into position.

**i) FIXING OF CONDUCTORS AND EARTH WIRE ACCESSORIES:**

Conductor and earth wire accessories supplied by the Contractor shall be installed by the Contractor as per the design requirements and manufacturer's instructions. While installing the conductor and earth wire accessories, proper care shall be taken to ensure that the surfaces are clean and smooth and that no damage occurs to any part of the accessories or of the conductors.

**j) REPLACEMENT:**

If any replacements are to be effected after stringing and tensioning or during maintenance e.g. replacement of cross arms, the conductor shall be suitably tied to the pole at tension points or transferred to suitable roller pulleys at suspension points.

**k) STRINGING OPERATIONS**

The contractor shall follow one of the following methods for stringing.

**1. SAG METHOD**

- Fix a dead end clamp on the neutral messenger wire at the pole. The messenger shall be bent behind the clamp to ensure sufficient friction between the messenger and the clamp in the initial stays during stringing.
- Bind the conductor together beside the dead end clamp using a nylon tie.
- Hand the clamp on the hook at the end pole Rewind simultaneously the slack cable length on the cable drum.
- Attach the come along' on the neutral messenger wire at the first pole of the line.
- Tighten the cable by the shackle or the winch when required sag is obtained.
- Hand the dead end clamp on the hook and install it on the neutral messenger.
- Remove the come along
- Bind the conductors together on the messenger wire using a nylon tie
- Check the length of the cable needed and cut it at an appropriate point.

## **2. DYNAMOMETER METHODS**

- Start the operation as above up to the stage.
- Install the dynamo meter on the come-along
- Tighten the cable at the required value by reading the Dynamo meter
- Finish the stringing as in the sag method operation.

## **I) 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 shall inspect 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 handing over. The cable shall be megger tested before and after jointing. The AB cable shall be tested for.

- Continuity of messenger wire and conductors
- Absence of cross phasing
- Insulation resistance to earth
- Insulation resistance between conductors
- DC Resistance
- Capacitance
- 

As per IS 1255:1983 of the latest issue and as per manufacturer's instructions.

Sufficient backfilled earth covers each foundation pit and is adequately compacted.

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

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

All conductor and messenger wire accessories are properly installed.

All other requirements for completion of works such as fixing of danger plate and anticlimbing device have been fulfilled.

The insulation of the line as a whole is tested by the Contractor through provision of his own equipment, labour etc., to the satisfaction of the owner. Proper earthing of the poles.

### **m) HT/LT/ROAD CROSSING GUARDING**

The contractor shall provide & install protective guarding as per REC construction standard for both 33 and 11 kV line, The guarding shall be provided at all the crossing i.e. road, telecommunication & power lines, railway line, nallaha etc.

The contractor is required to follow local statutory regulations stipulated in Electricity (Supply) Act 1948, Indian

Electricity Rules 1956 as amended and other local rules and regulations referred in these specifications.

### **n) REFERENCE STANDARDS**

The codes and/or standards referred to in the specifications shall govern, in all cases wherever such references are made. In case of a conflict between such codes and/or standards and the specifications, latter shall govern. Such codes and/or standards, referred to shall mean the latest revisions, amendments/changes adopted and published by the relevant agencies unless otherwise indicated. Other internationally accepted standards which ensure equal or better performance than those specified shall also be accepted, subject to prior approval by the owner. In case no reference is given for any item in these specifications, latest REC specification & Construction Standards shall be referred to.

### **2.0.5 (b) PROFILE PLOTTING AND POLE SPOTTING**

With the help of sag template, final tower location shall be marked on the profiles and while locating the tower on survey chart, the following shall be kept in mind:

#### **2.0.6 SPAN**

1. The span should be as near as possible to the basic design span so that the minimum ground clearance should not less than 7.0 mts in cross country at maximum sag condition.(The span length should be applicable for both 33KV& 11 KV lines.)
2. In urban areas minimum in every Half KM one Double Pole Structure (Cut point) has to be provided.
3. In other areas in every 1.0 KM one Double Pole Structure (Cut point) may be provided.

#### **2.0.7 WAY-LEAVE AND TREE CUTTING**

Way-leave permission which may be required by the contractor shall be arranged at his cost. While submitting final-survey report for approval, proposals for way-leave right of way shall be submitted by the contractor. Employer may extend help to get the permission within a reasonable time as mutually agreed upon for which due notice shall be given by the contractor



in such a way so that obtaining permission from appropriate authority do not hinder the continued and smooth progress of the work.

The employer shall not be held responsible for any claim on account of damage done by the contractor or his personnel to trees, crops and other properties.

The contractor shall take necessary precaution to avoid damage to any ripe and partially grown crops and in the case of unavoidable damage, the employer shall be informed and necessary compensation shall be paid by the contractor.

All the documents required for application to the statutory authorities must be prepared by the contractor & submitted to the employer for submission of the application towards approval of Railway Crossing etc. However, the responsibilities lie with the contractor to get the clearance.

Trimming of tree branches or cutting of a few trees en-route during survey is within the scope of survey to be done by the contractor. Contractor shall arrange for necessary way-leave and compensation in this regard. During erection of the line, compensation for tree cutting, damage caused to crops, actual cutting and falling of the trees including way-leave permission for such route clearance shall be arranged by the contractor at his cost. The contractor will identify the number of trees and detail of obstructions to be removed for erection of the line and intimate the employer well in advance in case of any help. Other related works like construction of temporary approach roads, etc. as required, shall be done by the contractor and the same will lie within the scope of contractor's work and such cost shall be considered to be included in the rates quoted by him.

### **3.0 CONDUCTOR**

Insulated AAAC conductors of 100 Sq mm will be used in 11 KV lines.

#### **3.0.1 ROAD CROSSING (CROSS COUNTRY, VILLAGE PUCCA ROADS)**

At all major road crossings, the angle towers/ poles shall be provided. The ground clearance above the roads should not be less than 8.5 mtrs. Double tension fittings should be provided in every road crossing span. Guarding should be provided in each road crossing.

#### **3.0.2 POWER LINE CROSSINGS**

Where the lines 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.

#### **3.0.3 TELECOMMUNICATION LINE CROSSINGS**

- i) The angle of crossing shall be as near to 90 degree as possible. However, deviation to the extent of 20 degree may be permitted under exceptionally difficult situations. The existing line route may be changed where required.
- ii) HT line shall be routed with requisite suppression with parallel telecom line to avoid inductance during faults.

### **3.0.4 DETAILS EN –ROUTE**

All topographical details, permanent features, such as trees, telecommunication lines, building etc. 3.5 mtr (11 kV) on either side of the alignment shall be detailed on the route plan before execution of work. However, any problems arising out of Right of way shall be taken care of by the Contractor. The owner shall extend all possible Co-operations.

### **3.0.5 CLEARANCE FROM GROUND, BUILDING, TREES ETC.**

**3.0.5.1 Clearance** from ground, buildings, trees and telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended up to date. The bidder shall select the height of the poles such that all electrical clearances are maintained.

**3.0.5.2 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. Where there is no such provision in the existing line.

**3.0.5.3 Pole accessories** like danger plates and number plates shall be provided.

## **4.0 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.

### **4.1 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.

### **5.0.1 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.

**5.0.2** Following arrangement shall be adopted for proper erection of poles wherever necessary 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**) of thickness 75 mm is laid. The base footing of the pole concreting RCC (M-15) 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 GI base plate (450x450x10) mm or RCC Pre –cast slab of size (500 x 500 x 100) mm has to be provided over the Lean concrete.

**5.0.3 CEMENT CONCRETE (PLAIN OR REINFORCED), STUB SETTING GROUNDING AND BACK FILLING etc.**

**A) MATERIALS**

All materials whether to be consumed in the work or used temporarily shall conform to relevant 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 (mix 1:4:8) 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 RCC pedestal concrete (M-15) 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/750 mm above the existing ground level in urban area and in cultivated lands respectively. The top portion of the cooping should be made tapered.

3. Above the cooping 450 mm of pole or structure should be painted with double layer of Black Bituminous paints.
4. **All the bolted joints** should be tightened properly by providing suitable size GI Bolt Nuts and spring washers. After completion of erection works all the bolts should be spot welded in order to avoid theft of members.
5. **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. **Curing of concrete** should be done for 28 day continuously. Curing should not be done within 24 Hours of concreting.
7. **All the excess** excavated materials and other unused materials from the concreting site should be disposed of to a suitable site by the contractor.
  - a) Mixer (Running time-2 min.)
  - b) **In case of** hand mixing, 10% extra cement has to be provided. Hand mixing should be done on GI sheet platform only.
  - c) **Poking rod** may be used for compacting in locations at PSC poles only
  - d) **Use of vibrator** for compacting is mandatory.
  - e) **Clean water** (free from saline and alkaline) should be used for concreting.
  - f) **Aggregates** (both coarse and fine) used should be free from foreign materials.
  - g) **Shutters** used should not be removed before 24hrs. of casting.
  - h) **In case of** black cotton soil borrowed earth (morum soil mixed with sand is preferable) may be used for back filling.
  - i) **Sufficient qty. of water** should be sprinkled over backfilled earth and chimney kept wet by using wet gunny bags.

**5.0.4 All the persons** working on tower shall wear safety helmet, safety belt and safety shoes, Similarly all the persons working on ground shall wear safety helmet and safety shoes.

**5.0.4.1. If there is any LT/HT** power line near the vicinity of tower 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.

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

**5.0.4.3 Safe working** conditions shall be provided at the stringing site.

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

## **6.0 APPLICABLE STANDARD:**

The PSC Poles shall comply with latest standards as under:

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

## **7.0 MATERIALS:**

### **a) 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).

### **b) 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) .The nominal maximum sizes of aggregates shall in no case exceed 12 mm.

### **c) WATER**

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

### **d) ADMIXTURE**

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

### **e) 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 prestressed concrete).The type design given in the annexure are for plain wires of 4 mm diameter with a guaranteed ultimate strength of 160 kg/mm<sup>2</sup>. 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.

## **f) 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 following special conditions:

- Minimum works cube strength at 28 days should be at least 420 Kg/cm<sup>2</sup>.
- The concrete strength at transfer should be at least 210 Kg/cm<sup>2</sup>.
- 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.

## **8.0 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 owner. 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/cm<sup>2</sup>.
- At the design value of first crack load, the modulus of rupture shall not exceed 53.0kg/cm<sup>2</sup> for M-40.
- The ultimate moment capacity in the longitudinal direction should be at least one fourth of that in the transverse direction.
- The maximum compressive stress in concrete at the time of transfer of pre-stress should not exceed 0.8 times the cube strength.
- The concrete strength at transfer shall not be less than half, the 28 days strength ensured in the design, i.e.  $420 \times 0.5 = 210 \text{ kg/cm}^2$ . 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".

## **9.0 DIMENSION 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 other fixtures 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-stress 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.

## **10.0 COVER**

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

## **11.0 WELDING AND LAPPING 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.

## **12.0 COMPACTING**

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

## **13.0 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/cm<sup>2</sup> as applicable). The cubes cast for the purpose of determining the strength at transfer should be cured, as far 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 owner 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).

## **14.0 LIFTING EYE-HOOKS OR HOLES**

Separate eye-hooks or hoists 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.

## **15.0 HOLES FOR CROSS ARMS ETC**

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



## 16.0 STACKING AND TRANSPORTATION

Stacking should be done in such a manner that the broad side of the pole is vertical. Each tier in the stack 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.

## 17.0 EARTHING

- (a) Earthing shall be provided by having length of 6 SWG GI wire embedded in Concrete during manufacture and the ends of the wires left projecting from the pole to a length of 100mm at 250 mm from top and 1000 mm below ground level.
- (b) Earth wire shall not be allowed to come in contact with the pre-stressing wires.

SL NO	DESCRIPTION	UNIT	9 MTR X 300 KG	11 MTR X 330 KG
1	Type of pole		PSCC	PSCC
2	Factor of Safety		2.5	2.5
3	Overall Length of Pole Meters	meters	9 Mtrs	11 Mtrs
4	Working Load Kg	Kg	300 Kg	330 Kg
5	Overall Dimensions		355X185X100	385X190X100
(a)	Bottom Depth	mm	185 mm	190 mm
(b)	Top Depth		355 mm	385 mm
(c)	Breadth		100 mm	100 mm
6	Reinforcement Detail:		H.T Steel wire	H.T Steel wire
7	Diameter of prestressing wire		4mm	4mm
8	No. of Tensioned wires		20	24
9	No. of Untensioned wire		4	4
10	Length of each untensioned wire		9 Mtr Each	11 Mtr Each
11	Concrete Detail			

(a)	Cement Type		OPC	OPC
(b)	Grade		43	43
(c)	Type		M-42	M-42
(d)	Quantity	Cubic meter/pole	0.243 M <sup>3</sup>	0.330 M <sup>3</sup>
(e)	Standard confirming to:		IS-1343	IS-1343
12	Steel Quality	Kg/Pole	18.4 Kg	24.4 Kg
(a)	Ultimate Tensile Strength (UTS)	Km/Cm <sup>2</sup>	175 Kg/mm <sup>2</sup>	175 Kg/mm <sup>2</sup>
(b)	Weight		610 Kg	920 Kg

17.0.1 All the poles shall be provided with a RCC block base or MS base plate 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.

17.0.2 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 pit for foundation concreting & backfilling with proper compacting the soil. The backfilling should be done in layers (maxm. 0.5 mts at a time with sprinkling of water and by using wooden hammer. No stone more than 75 mm should be used during back filling.

**17.0.3** Suspension type H/W fittings in all tangent locations and Four pair bolted type tension H/W fittings should be used in all new 33 & 11 Kv lines. 45 KN & 70 KN normal B&S insulators will be used in suspension & tension locations respectively.

**17.0.4** Concreting of foundation up to a minimum 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: 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) .

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.

## **18.0 EARTHING OF SUPPORT**

**18.0.1** Each pole shall be earthed with coil type earthing as per REC Construction Standard J-1.

**18.0.2** All DP & Four pole structures & the poles on both sides of railway crossing shall be earthed by providing two nos. **pipe earth.**

### **18.03 EARHTING COIL**

Earthing coils shall be fabricated from soft GI Wire Hot Dip Galvanized. The Hot Dip galvanized wire shall have clean surface and shall be free from paint enamel or any other poor conducting material. The coil shall be made as per REC constructions standard.

The Hot Dip galvanizing shall conform to IS: 2629/1966, 2633/1972 and 4826/1969 with latest amendments.

## **19.0 PROVISION OF GUYS/STRUT POLES TO SUPPORTS**

**19.0.1** The arrangement for guys shall be made wherever necessary. Strut poles/flying guys wherever required shall be installed on various pole locations as per REC construction standards. In order to avoid guys/ Strut self supported GI poles/ structures may be used.

**19.0.2** In this work anchor type guy sets are to be used. These guys shall be provided at following locations where guys are damaged or not provided.

- Angle locations
- Dead end locations
- T-off points
- Steep gradient locations.
- Double Pole, & four pole

The stay rod should be placed in a position so that the angle of rod with the vertical face of the pit is 300 to 450 as the case may be maximum movement for tightening or loosening.

**19.0.3** 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.

**19.0.4** The guy insulator should have a minimum vertical clearance of 3.5 mtr from the ground.

## **20.0 HT & LT STAY SETS**

### **21.0 SCOPE**

This specification covers design, manufacture, testing and dispatch of LT Stay Sets of 16 mm and HT stay sets 20 mm dia.

### **22.0 GENERAL REQUIREMENTS**

#### **22.0.1 20 MM DIA STAY SETS FOR 33 KV, 11 KV LINES (GALVANISED) HT STAY SET**

The Stay Set (Line Guy Set) will consist of the following components:

##### **22.0.2 ANCHOR ROD WITH ONE WASHER AND NUT**

Overall length of Rod should be 1800mm to be made out of 20 mm dia GI rod one end threaded up to 40 mm length with a pitch of threads per cm. And provided with one square G.I Washer of Size 50x50x1.6mm and one GI Hexagonal nut conforming to IS: 1363:1967 & IS:1367:1967. Both washer and nut to suit the threaded rod of 20mm. The other end of the rod to be made into a round eye having an inner dia of 40mm with best quality of welding. Dimensional and other details are indicated and submitted by bidders for owner's approval before start of manufacturing.

##### **22.0.3 ANCHOR PLATE SIZE 300X300X8 MM**

To be made out of G.S. Plate of 8 mm thickness. The anchor plate to have at its centre 22mm dia hole.

##### **22.0.4 TURN BUCKLE, EYE BOLT WITH 2 NUTS**

To be made of 20 mm dia G.I Rod having an overall length of 450 mm. One end of the rod to be threaded up to 300 mm length with a pitch of 4 threads per cm. The 20 mm dia bolt so made shall be provided with two G.I Hexagonal nuts of suitable size conforming to IS: 1363:1967 & IS: 1367:1967. The other end of the rod shall be rounded into a circular eye of 40mm inner dia with proper and good quality of welding. Welding details are to be indicated by the bidder separately for approval.

##### **22.0.5 BOW WITH WELDED CHANNEL:**

To be made out of 16mm dia G.I Rod. The finished bow shall have an overall length of 995 mm and height of 450 mm. The apex or top of the bow shall be bent at an angle of 10R. he

other end shall be welded with proper and good quality welding to a G.I Channel 200 mm long having a dimension of 100x50x4.7 mm. The Channel shall have 2 holes of 18 mm dia and 22 dia hole at its centre as per drawing No.3 enclosed herewith.

#### **22.0.6 THIMBLE 2 NOS.**

To be made of 1.5 mm thick G.I sheet into a size of 75x22x40mm and shape as per standard.

#### **22.0.7 GALVANIZING**

The complete assembly shall be hot dip galvanized.

#### **22.0.8 WELDING**

The minimum strength of welding provided on various components of 16mm and 20 mm dia stay sets shall be 3100 kg & 4900 kg respectively. Minimum 6mm fillet weld or its equivalent weld area should be deposited in all positions of the job i.e. at any point of the weld length. The welding shall be conforming to relevant IS: 823/1964 or its latest amendment.

#### **22.0.9 THREADING**

The threads on the Anchor Rods, Eye Bolts and Nuts shall be as per specification IS: 4218:1967 (ISO Metric Screw Threads). The Nuts shall be conforming to the requirements of IS: 1367:1967 and have dimension as per IS 1363:1967. The mechanical property requirement of fasteners shall conform to the properly clause 4.6 each for anchor rods and Eye bolt and property clause 4 for nuts as per IS: 1367:1967. Average weight of finished 20 mm Stays Set: 14.523 Kg.(Min) (Excluding Nuts Thimble & Washer) :15.569 Kg.(Max.)

#### **22.0.10 TESTS**

The contractor shall be required to conduct testing of materials at Govt./Recognized testing laboratory during pre-dispatch inspection for Tensile Load of 3100 Kg/4900Kg. applied for one minute on the welding and maintained for one minute for 16 mm and 20mm dia stay sets respectively.

#### **22.0.11 IDENTIFICATION MARK**

All stay sets should carry the identification mark of the Purchaser (CESU) applicable. This should be engraved on the body of stay rods to ensure proper identification of the materials. The nuts should be of a size compatible with threaded portion of rods and there should be not play or slippage of nuts.

Welding wherever required should be perfect and should not give way after erection.

#### **22.0.12 TOLERANCES**

The tolerances for various components of the stay sets are indicated below subject to the condition that the average weight of finished stay sets of 16mm dia excluding nuts, thimbles and washers shall not be less than the weight specified above:-

### **23.0 STAY WIRE (7/10 SWG)**

#### **23.0.1 APPLICATION STANDARDS**

Except when they conflict with the specific requirements of this specification, the G.I Stay Stranded Wires shall comply with the specific requirements of IS: 2141-1979, IS: 4826-1979 & IS: 6594-1974 or the latest versions thereof.

#### **23.0.2 APPLICATION AND SIZES**

The G.I. stranded wires covered in this Specification are intended for use on the overhead power line poles, distribution transformer structures etc.

The G.I stranded wires shall be 7/10 SWG (7/3.15mm for 11KV lines ).

#### **23.0.3 MATERIALS**

The wires shall be drawn from steel made by the open hearth basic oxygen or electric furnace process and of such quality that when drawn to the size of wire specified and coated with zinc, the finished strand and the individual wires shall be of uniform quality and have the properties and characteristics as specified in this specification. The wires shall not contain sulphur and phosphorus exceeding 0.060% each.

### **24.0 TENSILE GRADE**

The wires shall be of tensile grade 4, having minimum tensile strength of 700 N/mm<sup>2</sup> conforming to IS:2141.

### **25.0 GENERAL REQUIREMENTS**

The outer wire of strands shall have a right-hand lay.

The lay length of wire strands shall be 12 to 18 times the strand diameter.

### **26.0 MINIMUM BREAKING LOAD**

The minimum breaking load of the wires before and after stranding shall be as follows:

<b>NO. OF WIRES &amp; CONST.</b>	<b>WIRE DIA (MM)</b>	<b>MIN. BREAKING LOAD OF THE SINGLE WIRE BEFORE</b>	<b>MIN. BREAKING LOAD OF THE STANDAR WIRE (KN)</b>
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		<b>STRANDING (KN)</b>	
7 (6/1)	2.5	3.44	21.40
7 (6/1)	3.15	5.46	34.00
7 (6/1)	4.0	8.80	54.9

## **27.0 CONSTRUCTION**

The galvanized stay wire shall be of 7-wire construction. The wires shall be so stranded together that when an evenly distributed pull is applied at the ends of completed strand, each wire shall take an equal share of the pull. Joints are permitted in the individual wires during stranding but such joints shall not be less than 15 metres apart in the finished strands.

The wire shall be circular and free from scale, irregularities, imperfection, flaws, splits and other defects.

## **28.0 GI WIRE 6 SWG & GI WIRE 8 SWG**

This specification covers manufacture, testing and supply of hot dip galvanized MS solid wire of sizes 6 SWG (5 MM) & 8 SWG (4 MM) diameter.

## **29.0 APPLICABLE STANDARDS**

### **29.0.1 ZINC**

Zinc shall conform to grade Zen 98 specified in IS 209& IS: 4826-1979 with upto date amendments.

### **29.0.2 ZINC COATING**

Zinc coating shall be in accordance with IS: 4826-1979 for heavily coated hard quality.

### **29.0.3 GALVANISING**

Galvanizing shall be as per IS: 2629-1966, IS 4826-1979 with up to date amendments

### **29.0.4 UNIFORMITY OF ZINC COATING**

Uniformity of zinc coating shall be as per IS: 2633-1972 with up to date amendments

### **29.0.5 TENSILE PROPERTIES**

The tensile strength of the wire after galvanizing shall be between 55-95 Kg/sq.mm ensuring MS wire mechanical properties as per IS-28:1972 8.1 to 8.3.

## **29.0.6 FREEDOM FROM DEFECTS**

As per IS: 2629-1966 & 4826-1979 & with up to date amendments be ensured

## **30.0 MATERIAL**

The mild steel wire shall have chemical composition maximum sulphur- 0.055%, phosphorous - 0.055%, Carbon 0.25%.

## **31.0 EYE BOLT FOR GUARDING**

### **31.0.1 GENERAL REQUIREMENTS:**

M20 eye bolts (120 mm long) shall preferably be of drop forged manufacture and shall be supplied complete with full thread and two full nuts.

Eye bolt 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 manufacture, each eye bolt shall be individually proof tested by the manufacture in accordance with ISO 272, 885, 888, 4759/1 to 125% of its safe working tensile load that is to 48kN. 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 3mm 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 load of M20 eye bolts and eye nuts.

## **32.0 ALUMINIUM BINDING WIRE**

### **32.0.1 SCOPE:**

Scope covers manufacture, testing and supply of 3.53 mm dia Aluminium Binding Wire as per IS 398.

### **32.0.2 MATERIALS:**

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 sections shall closely approximate that of true circle.

### **32.0.3 CHARACTERISTICS OF ALUMINIUM BINDING WIRE**



DIAMETER OF WIRE			CROSS SECTIONAL AREA OF NOMINAL DIA. WIRES (MM)	WEIGHT OF WIRE KG/KM	BREAKING LOAD (KN)
MINIMUM	NOMINAL	MAXIMUM			
3.15	3.53	3.55	9.787	26.45	1.57

### 33.0 CROSS ARMS

Cross Arms should be made by using 100x50x6 mm GI. channel. For both 33 KV & 11KV system. Cross Arms made out of M.S. angle shall not be used. In tower type poles (GI) all the X-arms are part of the structure.

#### 33.0.1 11 KV "V" CROSS ARM, BACK CLAMP FOR "V" CROSS ARM & POLE TOP BRACKET (F CLAMP)

##### TECHNICAL SPECIFICATIONS

a) Hot Dip Galvanised Cross arms and Pole Top Brackets for 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 11 KV 'V' Cross arm shall be made out of 100x 50x5.6. mm MS Channel of (9.56 kg/mtr weight).

The Back Clamp for both 11 KV shall be made out of 75 x 10 MS Flat and shall be suitably designed to fit PSC Pole 9 Mtr x 300 Kg , 8 Mtr x 200 Kg.and 9mtrx415kg

c)The Pole Top Bracket (F Clamp) shall be made out of 75 x 10 MS Flat suitably designed to fit PSC Pole 9 Mtr x 300 Kg , 10X Mtr x 425 Kg.& 9mtrx415 kg for both 33 KV & 11 KV.

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.**

### **33.0.2 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 Specification IS 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.

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.

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.

### **33.0.3 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 should be followed.

### **34.0 INSTALLATION OF LINE MATERIALS**

**34.0.1 INSULATORS AND BINDINGS** - These materials are to be procured from the approved vendors only after type test subsequent to the design approval of CPIO, CESU

1. Suspension type H/W fittings (Single suspension normally to be used and in important X-ings double suspension fittings to be used) in all tangent locations. In S/S fittings 3 nos. 45 KN normal disc insulators, D/S fittings . In case of 11 KV line 2 nos 45 KN B&S normal insulators are to be used.
2. In angle locations single tension fittings to be used with 4 nos. 70 KN disc insulators. In all road X-ings and other important X-ings Double Tension H/W fittings 8 nos. 70KN disc insulators to be used in case of 11 KV line it should be 45 KN insulators 2 nos. are to be used.
3. Suitable pre formed armoured rods should be used in all suspension fittings in case of higher size Conductors.
4. Guarding / pilot insulators at the sharp angle points has to be provided.
5. Four pair bolted type (suitable for M-16 bolts) tension fittings for AAA conductors and compression type tension fittings for ACSR conductors has to be used.
6. The "distribution tie "meant for pin insulator binding should be of no. 6 size and that of soft annealed wire having a minimum length of 3 mtr.
7. Compression type jointing sleeves should be used for jointing of conductors only.

#### **34.0.2 CHECKING SUSPENSION FITTING**

- a) It shall be checked that there is no damage to any component of hardware fittings.
- b) It shall be verified that all nuts and bolts are tightened properly.
- c) It shall be made sure that all the necessary security pins (split pins) are fixed properly as per approved drawings.

#### **34.0.3 INSULATOR HOISTING**

- a) Insulators shall be completely cleaned with soft and clean cloth.
- b) It shall be verified that there is no crack or any other damage to insulators.
- c) It is very important to ensure that 'R'clips in insulator caps are fixed properly. This is a security measure to avoid disconnection of insulator discs.
- d) Both Arcing horns (both at top & bottom) of each insulators string has to be provided. **Where change of insulators** required, 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.

**34.0.4 Pin insulators** shall be used on all poles in straight line and disc 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.

**34.0.5 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.

## **35.0 HANDLING OF CONDUCTOR**

The Conductor will be supplied by the department from the designated stores of CESU which the contractor has to lift for the work at their cost. All cares should be taken not to damage conductor surface during transit. Necessary tools and plants for the same has to be effectively used by the agency.

### **35.0.1 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.

**35.0.2** 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.

### **35.0.3 MONITORING OF CONDUCTORS DURING STRINGING**

- a) 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. 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.
- b) Conductor shall be checked constantly as it is unwound from Conductor drum for any broken, damage or loose strand. If any major defect is noticed then the defective portion has to be removed and mid span joint provided. However if the defect is of

minor nature i.e. number of damaged strands is not more than 1/6th of the total strands in outer layer, a repair sleeve shall be provided.

- c) M.S. (mid span) Joint shall be provided at least 15 meters away from 33 KV line tower. All MS joints should be Compression type by providing suitable aluminium compression pipes. The compression joints should be continuous. In case of AAAC compression joints, minimum 25% over lapping with the previous compression should be done.
- d) There shall not be any Mid-Span joint over Rly / River / Main Road Crossing.
- e) Not more than one M.S. Joint shall be provided in one span for each conductor. Rough sagged conductors of one phase shall be simultaneously tightened by which machine fixed on tower till the desired final sag is achieved.

### 36.0 PIN INSULATORS

**36.0.1** 11 Kv Pin Insulators: - IS-731/77 (Porcelain Insulator for O/H power lines with nominal voltage greater than 1000 volts.

**36.0.2** 11 Kv GI Pin: - Confirming to IS-2486 Part-I/1971.

### 36.0.3 DISC –INSULATORS:

### 37.0 INSULATOR STRINGS

SL.NO	PARTICULARS	SINGLE SUSPENSION STRINGS	DOUBLE SUSPENSION STRINGS	SINGLE TENSION STRING	DOUBLE TENSION STRING
1	No. of standard discs (nos)	1X3	2X3	1X4	2X4
	11 KV	1X2	2X2	1X3	2X3
2	Size of Disc (33KV/11KV)	255X145	255X145	280x170	280x170

All the above materials must conform to the schedules at C2 and C3

### 37.0.1 PORCELAIN GLAZE:

Surfaces to come in contact with cement shall be made rough by stand glazing. All other exposed surfaces shall be glazed with ceramic materials having the same temperature coefficient of expansion as that of the insulator shell. The thickness of the glaze shall be uniform throughout and the colour of the glaze shall be brown. The glaze shall have a visible luster and smooth on surface and be capable of satisfactory performance under extreme tropical climatic weather conditions and prevent ageing of the porcelain. The glaze shall remain under compression on the porcelain body throughout the working temperature range.

### **37.0.2 METAL PARTS:**

### **37.0.3 CAP AND BALL PINS:**

Twin Ball pins shall be made with drop forged steel and caps with malleable cast iron. They shall be in one single piece and duly hot dip g galvanized. They shall not contain parts or pieces joined together, welded, shrink fitted or by any other process from more than one piece of material. The pins shall be of high tensile steel, drop forged and heat malleable cast iron and annealed. Galvanizing shall be by the hot dip process with a heavy coating of zinc of very high purity with minimum of 6 dips. The bidder shall specify the grade, composition and mechanical properties of steel used for caps and pins.

### **37.0.4 SECURITY CLIPS:**

The security clips shall be made of phosphor bronze or of stainless steel.

### **37.0.5 FILLER MATERIAL:**

Cement to be used as a filler material shall be quick setting, for curing Portland cement. It shall not cause fracture by expansion or loosening by contraction. Cement shall not react chemically with metal parts in contact with it and its thickness shall be as small and as uniform as possible.

### **38.0 MATERIAL DESIGN AND WORKMANSHIP:**

i) All raw materials to be used in the manufacture of these insulators shall be subject to strict raw materials quality control and to stage testing quality control during manufacturing stage to ensure the quality of the final end product. Manufacturing shall conform to the best engineering practices adopted in the field of extra high voltage transmission. Bidders shall therefore offer insulators as are guaranteed by them for satisfactory performance on Transmission lines.

ii) The design, manufacturing process and material control at various stages be such as to give maximum working load, highest mobility, best resistance to corrosion good finish, elimination of sharp edges and corners to limit corona and radio interference voltage

### **39.0 INSULATOR SHELL:**

The design of the insulator shell shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. Shells with cracks shall be eliminated by temperature cycle test followed by temperature cycle test followed by mallet test. Shells shall be dried under controlled conditions of humidity and temperature.

### 39.0.1 METAL PARTS:

a) The twin ball pin and cap shall be designed to transmit the mechanical stresses to the shell by compression and develop uniform mechanical strength in the insulator. The cap shall be circular with the inner and outer surfaces concentric and of such design that it will not yield or distort under loaded conditions. The head portion of the insulator or is under tension the stresses are uniformly distributed over the pinhole portion of the shell. The pinball shall move freely in the cap socket either during assembly of a string or during erection of a string or when a string is placed in position.

b) Metal caps shall be free from cracks, seams, shrinks, air holes, blowholes and rough edges. All metal surfaces shall be perfectly smooth with no projecting parts or irregularities which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly. Pins shall not show any macroscopically visible cracks, insulations and voids.

### 40.0 GALVANIZING:

All ferrous parts shall be hot dip galvanized six times in accordance with IS: 2629. The zinc to be used for galvanizing shall conform to grade Zn 99.5 as per IS: 209. The zinc coating shall be uniform, smoothly adherent, reasonably light, continuous and free from impurities such as flux ash, rust stains, bulky white deposits and blisters. Before ball fittings are galvanized, all die flashing on the shank and on the bearing surface of the ball shall be carefully removed without reducing the designed dimensional requirements.

### 41.0 CEMENTING:

The insulator design shall be such that the insulating medium shall not directly engage with hard metal. The surfaces of porcelain and coated with resilient paint to offset the effect of difference in thermal expansions of these materials.

### BOQ for 11 KV line with 9mtr. PSC poles and 100mmsqr. Insulated AAAC Conductor, span length 50mtr.

Sl.No.	Description of Materials	Unit	Qty	Unit Rate	Amount
1	PSC Pole (9 Mtr Long / 350 Kg Working Load, Bottom Thickness - 385 x 115 mm, Top Thickness - 190 x 115 mm, Total Weight of Pole - 700 Kg ( Single Pole- 110 Nos. & DP 10 Nos.)	No.	130		
2	MS Top Channels for Strain Insulators (ISMC 100 x 50)	Kg	525		



3	MS Angles for Cross Bracings (ISA 50 x 50 x 6 mm)	Kg	240		
4	MS Angles for Belt (ISA 65 x 65 x 6 mm)	Kg	350		
5	11KV 'V' Cross Arm ( GI)	No	110		
6	Back Clamp	Nos.	110		
7	100 mmsq AAAC Conductor (6 Kms- 3 Ph) including 10% for sag & Jumpering	KM	20		
8	11KV Disc Insulator, 70 KN(B&S), 2 Nos./Set with hardware Fitting	Set	60		
9	11KV Pin Insulator( 10KN, CD-320 mm) With Hardware Fitting	No	360		
10	Earthing Coil for support	Each	140		
11	Binding Wire	Lot	1		
12	Top F Clamp (GI), MS Angle,65x65x6 mm	Each	110		
13	HT Stay Set with Stay Insulator & Stay Clamp	Set	20		
14	7/10 GI Stay Wire	Kg	500		
15	Guarding Channel( Double) with Clamp, Eye Bolt, GI Earth Wire of 8 & 10 SWG for Guarding	Nos.	5		
16	Cement Concreting of Stay	Pit	20		
17	Cement Concreting of Pole including cooping	Each	130		
18	MS Nut-Bolt-Washer	LS	1		
19	Painting of MS Materials	LS	1		
20	Caution Plate	Each	11		
21	Anti Climbing Device	Nos.	130		
22	MS/RCC Base Plate 450 x 450 mm	Each	130		
23	<b>Cost of materials</b>				
24	Charges for erection ,Commissioning				
25	<b>Total Cost</b>				

Total Cost In words:

Sign of the bidder