

absconded (or is absconding) in order to avoid the service of the said warrant). Proclamation is hereby made that the said accused **Naresh** is required to appear before the court to answer the said complaint on or before **11.11.2019** By Order

DP/7068/ED/19
(Court Notice)

Ms. Harshita Vatsayan,
Metropolitan Magistrate
Room No. 14, Karkardooma Courts, Delhi

NORTHERN RAILWAY

OPEN E-TENDER NOTICE

The Sr. Divisional Engineer-IV, Northern Railway, Delhi Division for and on behalf of President of India invites E-Tender on prescribed form for the following work.

Invitation of tender through E-Tendering (E-Procurement Systems)

1. Name of work with its location	1. TRR (P) 30.0 km. on ROK-PNP section. (67-W-IV-19-20) 2. TRR (P) 59.293 km. on DLI-BTI section. (68-W-IV-19-20) 3. Hiring of multi-utility vehicle and truck for misc. work of track maintenance / renewal for a period of 02 years in the section of ADEN/MSZ. 4. Hiring of multi-utility vehicle, tractor and truck for leading of materials and machinery from station to station and other misc. casual work for day to day maintenance of track and colonies for a period of 02 years in the section of ADEN/JHI.
2. Approx. cost of work	(1) Rs. 1,39,00,770.00 (2) Rs. 2,35,00,363.75 (3) Rs. 1,00,20,089.66 (4) Rs. 1,34,03,976.67
3. Earnest money	(1) Rs. 2,19,500.00 (2) Rs. 2,67,500.00 (3) Rs. 2,00,100.00 (4) Rs. 2,17,000.00
4. Date and Time of submission of tender and opening of tender	Bidding Start date Up to 15:00 hrs. on 22.10.2019 opening of e-Tender at 15:00 hrs. on 05.11.2019
5. Website particulars, published e-tender, notice location etc. complete details of tender can be seen and website where the tender form can be downloaded	Above tender available on IREPS site i.e. www.ireps.gov.in

No.: 128-W/260/Tender Notice/67, 68, 70 & 71/19-20/W-IV
Date: 09.10.2019

3237/2019

Serving Customers with a Smile



REC Transmission Projects Company Limited

ECE House, 3rd Floor, Annex-II, 28A, KG Marg, New Delhi-110001
Tel: 011-4796 4796 Fax: 011-47964738, Website: www.rectpcl.in

DOMESTIC COMPETITIVE BIDDING (DCB) through e-Bidding for Transmission Line Package for Strengthening of Transmission System in J&K under PMDP-2015. Single Stage Two Envelope Bidding Procedure (Funding Domestic).

RECTPCL on behalf of Jammu and Kashmir Power Development Department (J&K PDD) invites online bids for the construction of following Transmission Lines packages:-

- 220kV S/C Phyang to Diskit Transmission Line on D/C Tower (Divided in 2 packages TL 01 & TL 02 as mentioned below)
- 220kV S/C Drass to Padum Transmission Line on D/C Tower (Divided in 3 packages TL 03, TL 04 & TL 05 as mentioned below)

Package No.	Detail/ Salient particular of packages	Downloading of bidding document	Deadline for bid submission
A. Phyang to Diskit		11.10.2019 to 25.11.2019	Soft Copy & Hard Copy Part
RECTPCL/PIA/JKPPD/TL-01	220 kV S/C Phyang-North Pullu T/L on D/C Tower		
RECTPCL/PIA/JKPPD/TL-02	220 kV S/C North Pullu – Diskit T/L on D/C Tower		
B. Drass to Padum		Document Fee: ₹ 25,000/- for each package	25.11.2019 upto 1500 Hrs
RECTPCL/PIA/JKPPD/TL-03	220 kV S/C Drass- Kochik T/L on D/C Tower		
RECTPCL/PIA/JKPPD/TL-04	220 kV S/C Kochik – Rangdum T/L on D/C Tower		
RECTPCL/PIA/JKPPD/TL-05	220 kV S/C Rangdum-Padum T/L on D/C Tower		

- Bidders who intend to participate for more than one package will be required to submit their bids separately for each package.
- For further details including addendum, changes in bidding program, if any please visit www.rectpcl.in & <http://www.mstcecommerce.com/eprochome/rectpcl>
- The cost of bidding documents for above NIT in the form of Demand Draft in favour of REC Transmission Projects Company Limited payable at New Delhi, shall be submitted along with the hard copy part of bid.
- The first envelope (Techno-Commercial Part) of the bid shall be opened on the same day of the deadline for bid submission on 16:00 Hrs. onwards.
- The complete bidding document are available on our website www.rectpcl.in & http://www.mstcecommerce.com/eprochome/rectpcl/buyer_login.jsp

कर्जा ही जीवन है, इसे बचाएँ।

Give a missed call on toll free number 18002003004 to get our Apps

1178-02418-10/10/19



Chie

NORTH CENTRAL RAILWAY

E-TENDERING TENDER

Divisional Railway Manager (Works) N.C. Railway, Jhansi for and behalf of President of India invites E-Tender on prescribed form for the following work.

Description of work	E-Tender No.	Approx. Cost
KID-BZM section - Carrying out various miscellaneous activities under jurisdiction of ADEN/CKTD.	JHS-Engg. E-2019-160	5498256.54
KID-MKP section - Carrying out various miscellaneous activities under jurisdiction of ADEN/CKTD.	JHS-Engg. E-2019-161	5533562.96

Note- Date of completion/period from issue acceptance letter : 06 Months. -Tender 30.10.2019. For full details and submission of bid please see the Indian Railways web

f North central railways

www.ncr.indianrailways.gov.in



ALL INDIA INSTITUTE OF MEDICAL SCIENCES ANSARI NAGAR, NEW DELHI EXAMINATION SE

CORRIGENDUM NO. 40/2

Ref. No. F. AIIMS/Exam.Sec./Advt./4-5/(PG-JAN-20)/2019

AIIMS-PG (POSTGRADUATE) COURSES - JA

In continuation to our Admission Notice No. 73/2019 dated 10.08.2019 and from Academic Section, AIIMS, New Delhi vide F.No. 4-1/2010-Acad.I dated 30.10.2019, completed their Internship period of 12 months compulsory rotating Interns January session and 31st July for July session are eligible for admission to

In this regard, those who will be completed their Internship period of 12 months Practical training on or before 31st January 2020 are eligible to fill the AIIMS PG courses for January 2020 session. Candidate must have Pr of MCI/DCI for **Online Final Registration**.

In view of the above, the date of Final Registration has been rescheduled

Online Registration for applications

The last date of Generation of Code and Final Registration for completion of other details: Qualification, City Choices, Payment.

Date for checking status of Final Registration: Accepted / Rejected with re

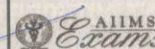
Last date of submission of required documents for Regularization of Rejected Ap

Last date for receiving of "No Objection" from the Ministry of Health & Welfare, Govt. of India for Foreign National candidate

Last date of submission of Sponsored Certificate

The rest of the contents/conditions as in the advt./addendum as above

*The closing time will be up to 05.00 PM



davp 17112/11/0055/1920

AS

REC TRANSMISSION PROJECTS COMPANY LIMITED



On Behalf of POWER DEVELOPMENT DEPARTMENT J&K GOVERNMENT

As Project Implementation Agency

(Invites bid through e-Tendering mode only)

FOR TURNKEY CONTRACT PACKAGE OF

“Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”.

**Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik
Package 04- RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum
Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum**

Dated: 11-10-2019

VOL-I

October 2019

REC Transmission Projects Company Limited
(A wholly owned subsidiary of REC, a 'Navratna CPSE'
Under the Ministry of Power, Govt of India)
ECE House, 3rd Floor, Annexe – II,
28 A, K G MARG, NEW DELHI – 110 001
Website: www.rectpcl.in

SECTION – I

INVITATION FOR BIDS (IFB)

**INVITATION FOR BIDS (IFB)
FOR**

Transmission Line Package: “Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”. i) Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik, ii) Package 04- RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum, iii) Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum

**(SINGLE STAGE TWO ENVELOPE BIDDING)
under e-procurement**

DATE OF ISSUANCE OF IFB : **11/10/2019**

SPECIFICATION NO(s) : RECTPCL/PIA/JKPDD/TL

FUNDING : DOMESTIC (PMDP Scheme-15)

- 1.0 This invitation for bids follows the e-procurement notice (Invitation for Bids) for the subject packages which appeared in National and Regional Newspapers on **10/10/2019**. The tender document is available at RECTPCL website (www.rectpcl.in), REC website (www.recindia.com), e-bidding portal (<http://www.mstcecommerce.com/eprchome/rectpcl>) and (www.eprocure.gov.in). Interested bidders may view, download the e-Bid document, seek clarification and submit their e-Bid online up to the date and time mentioned in the table at Clause no-5.0 of IFB:
- 2.0 **Power Development Department, Govt. of Jammu and Kashmir** (hereinafter referred to as ‘**J&K-PDD**’/‘Owner’) has decided to set up, “**Transmission Line of 220kV S/C Drass- Padum Transmission on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading)**”. For which tender by RECTPCL(Employer) is being floated in 3 packages.
- 2.1 The Project Implementing activities in respect of the aforesaid Project on behalf of JKPDD have been entrusted to **REC Transmission Projects Company Limited (RECTPCL)** is a wholly owned subsidiary of REC Limited, a Navaratna Public Sector Undertaking under Ministry of Power, and was incorporated on 8 January 2007 as Public Limited Company. RECTPCL's registered office is situated at Core-4, SCOPE Complex, 7, Lodhi Road, New Delhi-110003, India and Corporate office is at ECE, House, 3rd Floor, Annexe-II, 28A, KG Marg, New Delhi (hereinafter referred to as ‘**RECTPCL**’/ ‘**EMPLOYER**’/ ‘**PURCHASER**’) RECTPCL intends to use funds to be provided by JKPDD for eligible payments under the contracts for the Package as mentioned

above. The Ownership of the project shall, however, remain vested with JKPDD.

- 3.0 RECTPCL, on behalf of JKPDD therefore, invites bids from eligible bidders for the following package of Construction of 220 kV S/C Transmission Line on D/C Tower from Drass to Padum on Domestic Competitive Bidding basis under secured e-procurement procedure.

The entire Transmission Line is being divided in two packages listed below:-

S.No.	Package	Name of Package	Line Length (approx.)
1.	03	220 kV S/C Drass- Kochik T/L on D/C Tower	63.55 Kms.
2.	04	220 kV S/C Kochik – Rangdrum T/L on D/C Tower (upto 20 KMs from Rangdrum towards padum)	65.12 Kms
3.	05	220 kV S/C Rangdrum-Padum T/L on D/C Tower (start 20 KMs from Rangdrum towards padum)	66.63 Kms

This Bid Documents covers above packages. However, on e-Bidding portal i.e. (<http://www.mstcecommerce.com/eprochome/rectpcl>) all the three packages will be mapped separately. Therefore, the Bidders who are interested to participate in all the packages are required to submit their response separately for each package on e-Bidding portal. Bidder shall also be required to submit hard copies of Bid (as per requirement stipulated in subsequent sections of this document) separately for each Package.

Note: However, bidders (lead partner of Joint Venture) are permitted to participate in all the packages (i.e. TL-03, TL-04 & TL-05) but not more than one packages shall be awarded to a particular bidder

This Invitation for Bids extended through media, website or written communication or by any other means, shall not be construed to mean that the prospective bidders to whom the Invitation for Bids has been extended is deemed to be an eligible bidder. The eligibility of the bidders shall be determined as per the provisions of Bidding Documents.

TRANSMISSION LINE PACKAGE- : “Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”. i) Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik, ii) Package 04- RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to

**Rangdrum, iii) Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV
Rangdrum to Padum**

This Specification covers the following scope of works:

- i. Detailed survey including route alignment, profiling, tower spotting, optimisation of tower locations, soil resistivity measurement & geotechnical investigation (including special foundation locations, viz. pile/well foundation locations)
- ii. Check survey;
- iii. Fabrication and supply of all type of 220 kV transmission line towers, including River crossing towers (wherever applicable) as per Employer design/drawings including fasteners, step bolts, hangers, D-shackles etc.
- iv. All types of tower accessories like phase plate, circuit plate (where ever applicable), number plate, danger plate, anti-climbing device, Bird guard (where ever applicable)
- v. Supply of Conductor, OPGW/ Earth wire, Hardware Fittings and Conductor & Earth wire Accessories,
- vi. Classification of foundation for different type of tower and casting of foundation (excluding special foundation locations, viz. pile/well foundation locations) for tower footings as per Employer supplied foundations drawing;
- vii. Erection of towers, tack welding of bolts and nuts including supply and application of zinc rich primer & two coats of enamel paint, tower earthing, fixing of insulator strings, stringing of conductors and OPGW/ earth wires along with all necessary line accessories,

For Stringing in the tough terrain of hilly region and river crossing wherein, transmission Line is passing through the long span of nallas, rivers crossing or hills, in order to restore the transmission line in case of snapping of the first circuit Contractor is required to string the conductor in both circuit of the D/C tower.

Such Locations, where the stringing is required to be carried out on both the circuit of the D/C Tower shall be finalized jointly by RETPCL, JKPDD & Contractor finalized for the package.

- viii. Painting of towers & supply and erection of span markers, obstruction lights (wherever applicable) for aviation requirements (as required) Testing and commissioning of the erected transmission lines and
- ix. With the purpose to train the officials of JKPDD and getting them acquainted with the various activities for assessing performance, monitoring the Transmission Line during O&M period. Contractor is required to be provide the training to the JKPDD officials.

The training period envisaged will be as under:

Maximum 8 nos. of officers for 7 working days from NPTI or any other recognized training institute.

The entire cost for training including local transportation should be borne by the contractor. However, the other expenses like travel, accommodation, TA/DA etc of the trainee shall be borne by JKPDD.

Note 1: - As the above Transmission Lines are expected to pass through heavy avalanche prone area, provision of avalanche protection need to be taken care. Hence, after award of the contract the selected bidder is required to consult M/s Snow and Avalanche study Establishment (SASE), Chandigarh for the detail & check survey. In detail study, safety of individual Tower for Transmission Line from avalanche threat, required safety measures, improvisation of alignment & selection of more safe and economical alignment needs to be worked out. After detail study, if required, ground visit to be carried out jointly with SASE/RETPCL officials. Based on the joint report of the study, Necessary provision for avalanche protection will be finalized. **All the expenses towards detail study by SASE & ground visits of SASE official to be borne by contractor.**

- x. Based on the above detailed study, if required, the contractor is required to provide the 220 kV, XLPE Cable to overcome the problems due to snow and avalanches. The scope under this specifications shall cover Survey, planning, design, engineering, Supply, testing, transportation, insurance, delivery at site, unloading, handling, store, installation (including civil works), jointing, termination, testing, demonstration for acceptance, commissioning, including protection and documentation of underground 220 kV single core 800 sq.mm XLPE Copper cable complete with all materials.

The cable link shall transfer power at 220 kV through single circuit in trefoil formation with 1C x 800 sq.mm size copper conductor in each phase. In addition to this one (1) additional single core cable of identical size to the main circuit shall be laid along with the above for use as spare. The XLPE cable and its accessories shall be complete with all jointing and cable termination with air bushing and all fitting and components necessary for the satisfactory performance and ease of maintenance

The Locations of such patches where provision of cabling is required shall be finalized jointly by RETPCL, JKPDD & Contractor based on the detailed study report with SASE.

Anything requirement to complete the scope of work of above mentioned cabling work, but specifically not mentioned in this bid document shall be in the scope of successful bidder within the quoted price of cabling work in the BOQ.

- xi. Other items not specifically mentioned in this Specification and / or BPS but are required for the successful commissioning of the transmission line, unless specifically excluded in the Specification

3.1 The completion period for the subject Transmission Line Packages shall be the **18 Months**.

3.2 Bidding will be conducted through the **Domestic Competitive Bidding** procedures as per the provisions of ITB and the contract shall be executed as per the provisions of the Contract. The respective rights of the Employer and the Bidder/Contractor shall be governed by the Bidding Documents/Contract signed between the Employer and the Contractor for the package.

4.0 The detailed Qualification Requirements (QR) is given in the Section-III, Vol-I of Bidding Document.

Note:

- a) *In case, the bidder submitting their offer for single Package (TL-03 or TL-04 or TL-05) only. Bidder is required to meet the qualification for the same only as mentioned in the Section-III, Vol-I of Bidding Document*
- b) *In case, the bidder is submitting their offer for more than one Package. Bidder is required to meet the cumulative requirement of those packages as mentioned in Section-III, Vol-I of Bidding Document, except the requirement of transmission line in Hilly Area.*

5.0 The tender document is available at RECTPCL website (**www.rectpcl.in**), REC website (**www.recindia.com**), e-tendering portal (**<http://www.mstcecommerce.com/eprochome/rectpcl>**) and (**www.eprocure.gov.in**). However, in case of any contradiction the tender documents at e-tendering portal **<http://www.mstcecommerce.com/eprochome/rectpcl>** shall prevail. Interested bidders may view, download the e-Bid document, commence preparation of bids to gain time, seek clarification and submit their e-Bid online up to the date and time mentioned in the table below:

Important Dates	
Date of Release of Bid Document	11/10/2019
Last date of queries/ seeking Clarification	25/10/2019, up to 17:00 Hrs. (IST)
Pre bid Meeting	30/10/2019, at 11:00 Hrs. (IST)
Starting Date & Time of Bid submission	21/11/2019, 10:00 Hrs. onwards
Last Date & Time of submission of Bid	25/11/2019, till 15:00 Hrs. (IST)
Date of opening of Technical bid	25/11/2019, at 16:00 Hrs. (IST)

Important Dates	
Tender Document	The details can be downloaded free of cost from the websites www.rectpcl.in (or) www.recindia.com (or) http://www.mstcecommerce.com/eprocho me/rectpcl (or) www.eprocure.gov.in
Pre Bid Meeting Address	REC Transmission Projects Company Limited ECE House, 3 rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Tel: 011 – 47964705, Telefax : 011-47964747
Cost of Tender	For Package 03 : Rs 25000/- (Rs Twenty Five Thousand Only) For Package 04 : Rs 25000/- (Rs Twenty Five Thousand Only) For Package 05 : Rs 25000/- (Rs Twenty Five Thousand Only)
EMD #	For Package 03 : Rs. 25,72,500/- (Rs. Twenty Five Lakhs Seventy Two Thousand and Five Hundred only) For Package 04 : Rs. 26,25,600/- (Rs. Twenty Six Lakhs Twenty Five Thousand and Six Hundred only) For Package 05 : Rs. 26,76,100/- (Rs. Twenty Six Lakhs Seventy Six Thousand and One Hundred only)
Address for Bid submission/EMD/PBG	Shri. Bhupender Gupta , Addl. CEO REC Transmission Projects Company Limited ECE House, 3 rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Tel: 011 – 47964705, Fax : 011-47964704 Email- bgupta@recl.nic.in , bhupender.g@gmail.com
Contact Persons	Shri. Bhupender Gupta , Addl. CEO REC Transmission Projects Company Limited ECE House, 3 rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Tel: 011 – 47964705, Fax : 011-47964704 Email- bgupta@recl.nic.in , bhupender.g@gmail.com Shri. Arun Kumar Chaturvedi , Chief Manager

Important Dates	
	REC Transmission Projects Company Limited ECE House, 3 rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Tel: 011 – 47964714, Fax : 011-47964704 Mobile No.- 9650130505 Email-arun.k.chaturvedi78@gmail.com

The bidding documents are meant for the exclusive purpose of bidding against this specification and shall not be transferred to any parts or reproduced or used otherwise for any purpose other than for which they are specifically uploaded.

- 6.0 Interested bidders have to necessarily register themselves on the e-bidding portal of MSTC and are strongly recommended to go through the E-Tendering methodology & Tips for successful online Bid submission in the MSTC's e-procurement platform i.e <http://www.mstcecommerce.com/eprochome/rectpcl> provided in the Section-IIA (Annexure to ITB) of the Bidding Document.

Resolution to all general queries and system setting is given in the bidders guide. In case of any other issue please contact:

e-Bidding portal: <http://www.mstcecommerce.com/eprochome/rectpcl>

S.no	Name	Email	Contact number
1.	Mr. Shishupal Yadav	syadav@mstcindia.co.in	8826562675
2.	Mr. S D Sharma	sdsharma@mstcindia.co.in	7878055855
3.	Mr. Chirag Sindhu	chiragsindhu@mstcindia.co.in	9830336290

Even though the MSTC support team will be available from 1000 hrs to 1800 hrs on all working days, but in case Bidders are unable to reach MSTC then communications can also be done through e-mail or sms and MSTC team will respond to the queries within 24 hrs.

Bidder has to pay the transaction charges and bidders are requested to refer Section-IIA (Annexure-A to ITB) MSTC Registration for details.

Bidders are advised to deposit the transaction fee atleast two days before the last date of submission and to submit their bids least one day before the last day of submission to avoid any last minute issues.

Bidders may obtain further information regarding this IFB from the **office of Additional Chief Executive Officer, RECTPCL** at the address given at para 12.0 below from 15:00 hours to 17:00 hours on all working days.

- 7.0 For proper uploading of the bids on the portal namely <http://www.mstcecommerce.com/eprochome/rectpcl> (hereinafter referred to as the 'portal'), it shall be the sole responsibility of the bidders to apprise themselves adequately regarding all the relevant procedures and provisions as detailed at the portal as well as by contacting from M/s MSTC Limited, New Delhi directly, as and when required, for which contact details are mentioned above. The Employer in no case shall be responsible for any issues related to timely or properly uploading/submission of the bid in accordance with the relevant provisions of Section II – ITB of the Bidding Documents.
- 7.1 A pre-bid meeting will be held at the address mentioned in on **30.10.2019** at **11:00 Hrs** to clarify the bidders various issues raised in accordance with clause 6.4 of ITB.
- 8.0 A Single Stage Two Envelope Bidding Procedure will be adopted and will proceed as detailed in the Bidding Documents.
- 8.1 Soft Copy Part of the Bids must be uploaded under Single Stage Two Envelope Bidding Procedure on the portal at or before 15:00 hours on **25.11.2019**. The e-Procurement system would not allow any late submission of bids through the portal after due date & time as specified.

Hard Copy Part of the Bids must be submitted under Single Stage Two Envelope Bidding Procedure at the address given in Table at Clause no-5.0 of IFB at or before 15:00 hours on **25.11.2019**. In case Hard copy part of the bid is not received by the Employer till the deadline for submission of the same prescribed by the Employer, but the bidder has uploaded the soft copy part of the bid, the bid will be considered as late bid. Such bids will be rejected during preliminary examination.

First Envelope i.e. Techno -Commercial Part shall be opened on **25.11.2019** in the presence of the bidders' representatives who choose to attend in person at the address below at **16:00 hours**. Second Envelope i.e. Price Part of those bidders who qualify techno-commercially, shall be opened in the presence of the bidders' representatives who choose to attend at the time and date and at the address given in the intimation for opening of Second Envelope in accordance with Clause 25 of ITB or may be viewed by the bidders by logging in to the portal.

All bids must be accompanied by a bid security of as per detail provided in the table provide under clause no. 5 above.

Bid Security, Integrity Pact and Safety Pact must be submitted in physical form at the address given at para **12.0** below.

- 9.0 The Employer reserves the right to conduct e-Reverse Auction (e-RA) in accordance with clause 29.0 of ITB.
- 10.0 RECTPCL reserves the right to annul the bidding process at any time prior to award of contract including rejection of any or all bids after the same has been received, without assigning any reason and without their by incurring any liability to the effected bidder or bidders or any obligation to inform the effected bidder or bidders on the ground of RECTPCL's action.
- 11.0 The Integrity Pact Program (IPP) of RECTPCL will be applicable for the Package(s). **Shri P. V. Rao, IRS, shall be the Independent External Monitor for the : : "Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages". i) Package 03-RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik, ii) Package 04-RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum, iii) Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum**

Correspondence, if any, to the IEM be addressed to the following:

**Shri P. V. Rao, IRS
Ex-Chief Commissioner of Income Tax,
The IEMs' Secretariat,
Procurement and Contract Management (PCM) Division,
REC LIMITED (Formerly Rural Electrification Corporation Limited).,
Core-IV, SCOPE Complex, 7-Lodhi Road,
New Delhi- 110003
Email: [pasupuletirao\[at\]yahoo\[dot\]co\[dot\]in](mailto:pasupuletirao[at]yahoo[dot]co[dot]in)**

- 12.0 Bidders are also requested to visit our website <http://www.rectpcl.in/> / <http://www.mstcecommerce.com/eprochome/rectpcl> for any corrigendum/addendum /errata/clarification/amendment which shall be considered integral part of bidding document. No separate notifications shall be published in the Newspaper(s) or any media for these activities.
- 13.0 All correspondence with regard to the above shall be to the following address.
- (By Post/In Person)
Additional Chief Executive Officer,
REC Transmission Projects Company Limited
ECE House, 3rd Floor, Annexe – II,
28 A, K G MARG, NEW DELHI – 110 001
Tel: 011 – 47964705, Fax : 011-47964704
Email- bgupta@recl.nic.in
For more information on RECTPCL, visit our site at: <http://www.rectpcl.in>
For more information on the portal, visit on site of

M/s MSTC Limited, New Delhi at:

<http://www.mstcecommerce.com/eprochome/rectpcl>

---- End of Section-I (IFB) ----

SECTION – II
INSTRUCTION TO BIDDERS (ITB)

TABLE OF CLAUSES

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INSTRUCTION TO BIDDERS (ITB)

Preamble

This section (Section-II) of the Bidding Documents provides the information necessary for bidders to prepare responsive bids, in accordance with the requirements of the Employer. It also provides information on bid submission and uploading the bid on portal (<http://www.mstcecommerce.com/eprochome/rectpcl>) on line bid opening, evaluation and on contract award. This Section (Section II) contains provisions that are to be used unchanged

However, provisions governing the performance of the Contractor, payments under the contract or matters affecting the risks, rights and obligations of the parties under the contract are not included in this section but instead under Section – IV: General Conditions of Contract and/or Section – V: Special Conditions of Contract.

The respective rights of the Employer and Bidders/Contractors shall be governed by the Bidding Documents/Contracts signed between the Employer and the Contractor for the respective package(s).

A. Introduction

1. Source of Funds

- 1.1 The Employer named in the **IFB** intends to use funds to be provided by JKPDD for eligible payments under the contracts for the Package as mentioned above. The Ownership of the project shall, however, remain vested with JKPDD.

All eligible payments under the contract for the package for which this Invitation for Bids is issued shall be made by the Employer name in the **IFB**.

2. Eligible Bidders

- 2.1 This Invitation for Bids, issued by the Employer is open to all firms including company (ies), Government owned Enterprises registered and incorporated in India as per Companies Act, 1956/2013 (with amendment from time to time), barring Government Department as well as foreign bidders/MNCs not registered and incorporated in India and those bidders with whom business is banned by the Employer and Owner.

- 2.2 A Bidder shall not have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if:

- (a) they have a controlling partner in common; or
- (b) they receive or have received any direct or indirect subsidy from any of them; or
- (c) they have the same legal representative for purposes of this bid; or
- (d) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or
- (e) a Bidder submits more than one bid in this bidding process, either individually [including bid submitted as an authorized representative on behalf of one or more

manufacturer(s) or through Licensee – Licensor route, wherever permitted as per the provision of Qualification Requirement for the Bidders in Section-III, Volume-I or as a partner in a joint venture, except for alternative offers if permitted under ITB Clause 9.3. This will result in the disqualification of all such bids. However, this does not limit the participation of a Bidder as a subcontractor in another bid, or of a firm as a subcontractor in more than one bid; or

(f) a Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the Plant and Installation Services that are the subject of the bid; or

(g) A Bidder or any of its affiliates has been hired (or is proposed to be hired) by the Employer as Project Manager for the contract.

2.3 The Bidder, directly or indirectly shall not be a dependent agency of the Employer.

3. Eligible Plant, Equipment, and Services

3.1 For the purposes of these Bidding Documents, the words “facilities,” “plant and equipment,” “installation services,” etc., shall be construed in accordance with the respective definitions given to them in the General Conditions of Contract.

3.2 All plant and equipment to be supplied and installed and services carried out under the contract shall have their origin in any country barring those countries against whom sanction for conducting business is imposed by Government of India and barring those firms with whom business is banned by the Employer.

3.3 For purposes of this clause, “origin” means the place where the plant and equipment or component parts thereof are mined, grown, or produced. Plant and equipment are produced when, through manufacturing, processing or substantial and major assembling of components, a commercially recognized product results that is substantially different in basic characteristics or in purpose or utility from its components.

3.4 The origin of the plant, equipment, and services is distinct from the nationality of the Bidder.

4. Cost of Bidding

4.1 The Bidder shall bear all costs associated with the preparation and submission of its bid including post-bid discussions, technical and other presentations etc., and the Employer will in no case be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.

4.2 The bidder has to ensure their registration with M/s MSTC Limited, New Delhi on their portal <http://www.mstcecommerce.com/eprochome/rectpcl>. Bidder has to pay the transaction charges and the details are provided in Section-IIA (Annexure-A to ITB).

B. The Bidding Documents

5. Content of Bidding Documents

5.1 The facilities required, bidding procedures, contract terms and technical requirements are prescribed in the Bidding Documents. The Bidding Documents comprise of the following and shall include amendments, if any, thereto:

VOLUME – I:	Conditions of Contract
Section I	Invitation for Bids (IFB)
Section II	Instructions to Bidders (ITB)
Section III	Qualification Requirement
Section IV	General Conditions of Contract (GCC)
Section V	Special Conditions of Contract (SCC)
Section VI	Model Rule for Health and sanitary Arrangement
Section VII	Contractor's Labour Regulation
Section VIII	Safety Regulation
Section IX	Sample Form and Procedures
	1. Bid Form & price Schedule
	1.1 Bid Form
	1.2 Price Schedule
	2. Bid Security Form
	3. Form of Notification by the Employer to the Bank
	4. Form of Contract Agreement
	4.1 Appendix-1: Procedures of Payment
	4.2 Appendix-2: Price Adjustment
	4.3 Appendix-3: Insurance Requirements
	4.4 Appendix-4: Time Schedule
	4.5 Appendix-5: List of Approved Subcontractors
	4.6 Appendix-6: List of Document for Approval or Review
	4.7 Appendix-7: Guarantees, Liquidated Damages for Non-Performance
	4.8 Integrity Pact
	4.9 Safety Pact
	5. Performance Security Form
	6. Form of Taking Over Certificate
	7. Form of Indemnity Bond to be executed by the Contractor for the Equipment handed over in one lot by Employer for performance of its contract.
	8. Form of Indemnity Bond to be executed by the Contractor for the Equipment handed over in installments by Employer for performance of its contract.
	9. Form of Authorisation Letter
	10. Form of Trust Receipt for Plant, Equipment and Materials received
	11. Form of Extension of Bank Guarantee
	12. A) Form of Power of Attorney
	B) Form of Power of Attorney for Joint Venture
	13. Form of Undertaking by the Joint Venture Partners
	14. Format for Evidence of Access to or Availability of Credit/ Facilities
	15. Form of Operational Acceptance
	16. Form of Safety Plan to be submitted by the Contractor within sixty days of award of contract
	17. Form of Joint Deed Of Undertaking by the Tower Manufacturer Alongwith the Bidder/Contractor
	18. Form of Bank Guarantee for Contract Performance (To be Submitted By Tower Manufacturer)

Volume-II: Technical Specification

Volume-III: Bid Form, Price Schedules & Technical Data Sheets

5.2 The Bidder is expected to examine all instructions, forms, terms, specifications and other information in the Bidding Documents. Failure to furnish all information required by the Bidding Documents or submission of a bid not substantially responsive to the Bidding Documents in every respect will be at the Bidder's risk and may result in rejection of its bid.

5.3 Scope of Work is given in Volume-II of Bidding Documents titled "Technical Specifications".

Utmost care has been taken by the Employer in formulating the programmed Attachments and Price Schedules. Bidders are expected to thoroughly verify with trial run at their end and notify to the Employer Arithmetical, Logical, Formatting or any such error, if found in the same for suitable action. Irrespective of corrections made in this regard through amendment(s), if any, rectification of error for evaluation shall be carried out in accordance with stipulated provisions of Bidding Documents.

5.4 All the Bidders except those exempted pursuant to ITB Sub-Clause-5.5 shall submit along with the hard copy part of bid a non-refundable fee as mentioned below towards the cost of Bidding Documents in the form of demand draft in favour of **REC Transmission Projects Company Limited, payable at New Delhi.**

The non-refundable fee towards the cost of Bidding Documents shall be **INR 25,000/-**

Any bid not accompanied by an acceptable Demand Draft towards the cost of Bidding Documents, except as exempted in ITB Sub- Clause 5.5 below, shall be rejected by the Employer as being nonresponsive.

5.5 Micro and Small Enterprises (MSEs) registered with National Small Industries Corporation (NSIC) or with any other designated Authority of GoI under the Public Procurement Policy for MSEs are exempted from submission of fee towards the cost of Bidding Documents as per the Provisions of the Public Procurement Policy for Micro and Small Enterprises (MSEs) order 2012. This shall be subject to production of documentary evidence with regard to registration with authorities mentioned above.

6. Clarification of Bidding Documents; and Pre-Bid Meeting

6.1 A prospective Bidder requiring any clarification of the Bidding Documents may notify the Employer and may also seek clarification in writing or e-mail at the Employer's mailing address indicated in the **IFB**. Similarly, if a Bidder feels that any important provision in the documents, such as those listed in ITB Sub-Clause 22.3.1, will be unacceptable, such an issue should be raised as above. The Employer will respond through the portal <http://www.mstcecommerce.com/eprochome/rectpcl> and [http://www.rectpcl.in /](http://www.rectpcl.in/) to any request for clarification or modification of the Bidding Documents that it receives no later than fifteen (15) days prior to the original deadline for submission of bids prescribed by the Employer. The Employer shall not be obliged to respond to any request for clarification received later than the above period. Further, the mere request for clarification from the Bidders shall not be a ground for seeking extension in the deadline for submission of bids. Employer's response (including an explanation of the query but not identification of its source) will be uploaded on portal <http://www.mstcecommerce.com/eprochome/rectpcl> and [http://www.rectpcl.in /](http://www.rectpcl.in/) where all the bidders can see clarification/reply to query.

6.2 The Bidder is advised to visit and examine the site where the facilities are to be installed and its surroundings and obtain for itself on its own responsibility and cost all information that may be necessary for preparing the bid and entering into a contract for supply and

installation of the facilities. The costs of visiting the site shall be at the Bidder's own expense.

- 6.3** The Bidder and any of its personnel or agents will be granted permission by the Employer/Owner to enter upon its premises and lands for the purpose of such inspection, but only upon the express condition that the Bidder, its personnel and agents will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of the inspection.
- 6.4** The Bidder's designated representative(s) is/are invited to attend a pre-bid meeting, which, if convened, will take place at the venue and time stipulated in the **IFB**. The purpose of the meeting will be to clarify any issues regarding the e-procurement method, the Bidding Documents in general and the Technical Specifications in particular. The Bidder is requested, as far as possible, to submit any question in writing, to reach the Employer not later than one week before the meeting. It may not be practicable at the meeting to answer questions received late, but questions and responses will be transmitted as indicated hereafter. Minutes of the meeting, including the text of the questions raised (without identifying name of the bidders) and the responses given, together with any responses prepared after the meeting, will be transmitted without delay through the e-bidding portal only. Any modification of the Bidding Documents listed in ITB Sub-Clause 5.1, which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of clarification/Amendment/Addendum pursuant to ITB Clause-6 & 7 respectively and not through the minutes of the pre-bid meeting. During the pre-bid meeting, all the technical and commercial issues shall be discussed to ensure that the bid received subsequent to pre-bid meeting shall be without any deviations to terms and conditions.
- 6.5** Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder. In case any bidder does not attend the pre-bid meeting, it shall be understood that the bidder has a clear understanding of the scope & terms & conditions of the bidding document and does not have any comments/ deviations to the requirements of the bidding document.
- 6.6** Based on the pre-bid discussions, no-deviation form/techno-commercial compliance shall be signed and submitted in Attachment-6 of the Envelope-1, Vol-III as part of their offer. After pre-bid meeting, no deviation shall be accepted and if any deviation is found in the bid of such bidder, their offer may be liable to be rejected without raising any technical/commercial queries.

7. Amendment of Bidding Documents

- 7.1** At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at its own initiative, or in response to a clarification requested by a prospective Bidder, amend the Bidding Documents.
- 7.2** The amendment will be notified only through the portal <http://www.mstcecommerce.com/eprochome/rectpcl>. The clarifications /amendments /addendums to the Bidding Documents will be binding on the bidders and the notification of the clarifications/ amendments / addendums through e-bidding portal shall be deemed to be construed that such clarification(s)/ amendment(s)/addendum(s) to the Bidding Documents have been taken into account by the Bidder in its bid.
- 7.3** In order to afford reasonable time to the prospective Bidders to take the amendment into account in preparing their bid, the Employer may, at its discretion, extend the deadline for

the submission of bids, in which case, the Employer will notify through portal <http://www.mstcecommerce.com/eprochome/rectpcl> where all prospective bidders may see the extended deadline.

In case of extension of deadline for the submission of bids by the Employer for reasons inter-alia including the above, prospective bidders can download the Bidding Documents from the portal <http://www.mstcecommerce.com/eprochome/rectpcl>, as per the provisions available therein.

C. Preparation of Bids
8. Language of Bid

- 8.1** The bid prepared by the Bidder and all correspondence and documents exchanged by the Bidder and the Employer related to the bid shall be written in the English language, provided that any printed literature furnished by the Bidder may be written in another language, as long as such literature is accompanied by English translation of its pertinent passages, in which case, for purposes of interpretation of the bid, the English translation shall govern.

9. Documents Comprising the Bid

I. Hard Copy Part

Hard copy part of the bid shall comprise of following documents to be submitted in sealed envelope, as part of First Envelope

- i) DD towards Bidding Document fee of the amount as specified in the in accordance with clause 5.4 of ITB or documentary evidence in support of exemption of Bidding Document fee as per ITB 5.5
- ii) Bid Security (in Original) or documentary evidence in support of exemption of Bid Security, in separate envelope in accordance with clause 13 of ITB, Section-II
- iii) Integrity Pact (in Original) in accordance with clause 9.3 (o) of ITB, Section-II in separate envelope
- iv) Power of Attorney in the prescribed form no-12A of Section-IX, Vol-I as per Clause 9.3 (b).
- v) In case of Bid from Joint Venture, the Joint Venture Agreement & Power of Attorney of Joint Venture Agreement, both in original.
- vi) Safety Pact (in Original) in accordance with clause 9.3 (s) of ITB, Section-II in separate envelope.
- vii) Bidder shall also submit Joint Deed of Undertaking by the tower manufacturer along with the bidder/contractor, duly signed and stamped on each page in original, if applicable as per Qualification Requirement for the Bidders in Section-III.
- viii) Bidder shall submit signed & stamped copy of bidding document alongwith all clarifications/amendments/addendums thereof issued in the e-bidding portal.
- ix) Bidders shall submit an undertaking on company's letter head confirming the validity of bid submitted as per the provision of bidding document.

- x) Bidders shall submit duly signed and stamped in original, the Performance Guarantees of the Equipment's declared in Attachment-10 of Bid Forms (Envelope-1) in excel sheet.
- xi) Any other document further specified in the Bidding Document duly signed and stamped on each page

Bidder shall note that no document is required to be submitted as part of Second envelope in Hard Copy.

II. Soft Copy Part

Soft copy part of the bid shall comprise of following documents to be uploaded on the portal as per provisions therein.

- (a) As part of First Envelope (Cover-1 of the e-Bidding portal)
 - (i) Programmed file -Attachments (Attachment to Bid Form including attachment to QR) in MS Excel format & its revision covering various attachments, Integrity Pact and bid form for first envelope.
 - (ii) Scanned copies of all the documents mentioned at 15.4 of ITB as part of **Cover-2 of the e-Bidding portal.**
- (b) As part of Second Envelope (Cover-3 of the e-Bidding portal)
 - (i) Price Schedules in MS excel format & its revision covering various price schedules for Second Envelope.

9.1 The bid shall be submitted by the Bidder under "Single Stage – Two Envelope" procedure of bidding. Under this procedure, the bid submitted by the Bidder in two envelopes - First Envelope (also referred to as Techno - Commercial Part) and Second Envelope (also referred to as Price Part) shall comprise of the following documents:

First Envelope:

- (a) Bid Form (First Envelope) duly completed and signed by the Bidder, together with all Attachments & Technical Data Sheets (available in Volume-III) as uploaded on the portal <http://www.mstcecommerce.com/eprochome/rectpcl> and identified in ITB Sub-Clause 9.3 below.
- (b) Hard copy of the following documents to be submitted at the address mentioned in IFB:
 - (i) DD towards Bidding Document fee of the amount as specified in the in accordance with clause 5.4 of ITB or documentary evidence in support of exemption of Bidding Document fee as per ITB 5.5
 - (ii) Bid Security (in Original) or documentary evidence in support of exemption of Bid Security, in separate envelope in accordance with clause 13 of ITB, Section-II
 - (iii) Integrity Pact (in Original) in accordance with clause 9.3 (o) of ITB, Section-II in separate envelope;
 - (iv) Power of Attorney as per Clause 9.3 (b);

- (v) In case of Bid from Joint Venture, the Joint Venture Agreement & Power of Attorney of Joint Venture Agreement.
- (vi) Safety Pact (in Original) in accordance with clause 9.3 (s) of ITB, Section-II in separate envelope.
- (vii) Bidder shall also submit Joint Deed of Undertaking by the tower manufacturer along with the bidder/contractor, duly signed and stamped on each page in original, if applicable as per Qualification Requirement for the Bidders in Section-III.
- (viii) Bidders shall submit signed & stamped copy of bidding document alongwith all clarifications/amendments/addendums thereof issued in the e-bidding portal.
- (ix) Bidders shall submit an undertaking on company's letter head confirming the validity of bid submitted as per the provision of bidding document.
- (x) Bidders shall submit duly signed and stamped in original, the Performance Guarantees of the Equipments mentioned in Attachment-10 of Bid Forms (Envelope-1) in excel sheet.
- (xi) Any other document further specified in the Bidding Document duly signed and stamped on each page.

Second Envelope:

- (a) Bid Form (Second Envelope) together with Price Schedules (available in Volume-III), duly completed as uploaded on the portal <http://www.mstcecommerce.com/eprochome/rectpcl>.

9.2 Alternative bids shall not be permitted.

9.3 Bidder is required to provide complete and precise information in the bid along with supporting documentary evidences, as applicable. The bidder should attach separate sheet(s) in case space provided is not sufficient. RECTPCL will consider the bid solely on the basis of information/details/data/documentary evidences etc. provided by the bidder in the bid only without seeking further clarifications from the bidder in normal circumstances.

Incomplete, partially complete, not clearly filled bid giving incorrect information is liable to be rejected without any consideration.

Where the answer is a statement of fact it must be accurate and supported by documentary evidence wherever required. It is the bidder's responsibility to respond with such clarity that will ensure RECTPCL not to mis-interpret the bid.

Bidder shall submit soft copy of following documents by uploading on the portal <http://www.mstcecommerce.com/eprochome/rectpcl> and Hard copy of documents wherever stipulated in the manner specified in ITB Clause 9.1 above along with its Techno - Commercial Part (First Envelope):

- (a) Attachment 1: Bid Security (if required) or documentary evidence in support of exemption of Bid Security (*submission of Hard Copy in „Original for Bid Security and in Copy for documentary proof in support of exemption*)

A bid security or documentary evidence in support of exemption of Bid Security, in sealed separate envelope shall be furnished in accordance with ITB Clause 13 & ITB Clause 16.

Bidder shall submit the hard copy of the Bid Security or documentary evidence in support of exemption of Bid Security in original.

- (b) Attachment 2: Power of Attorney (*submission of Hard copy in "Original and uploading of Scanned Copy"*)

A power of attorney, duly notarized, indicating that the person(s) signing the bid has(ve) the authority to sign the bid and thus that the bid is binding upon the Bidder during full period of its validity, in accordance with ITB Clause 14.

Scanned copy of above documents shall be uploaded. (refer para 15.4 below)

- (c) Attachment 3: Bidders Eligibility and Qualifications (*Uploading of Scanned Copies of documentary evidence in support of Bidders qualification. In case of Joint Venture bid, submission of Hard Copy in "Original of the JV Agreement and POA for JV"*)

In the absence of prequalification, documentary evidence establishing that the Bidder is eligible to bid in accordance with ITB Clause 2 and is qualified to perform the contract in accordance with **Qualification Requirement Sec-III, Vol-I**, if its bid is accepted.

The documentary evidence of the Bidders eligibility to bid shall establish to the Employers satisfaction that the Bidder, at the time of submission of its bid, is eligible as defined in ITB Clause 2.

The documentary evidence of the Bidders qualifications to perform the contract, if its bid is accepted, shall establish to the Employers satisfaction that the Bidder has the financial, technical, production, procurement, shipping, installation and other capabilities necessary to perform the contract, and, in particular, meets the experience and other criteria outlined in the Qualification Requirement for the Bidders in Sec-III, Vol-I and shall also include: The documentary evidence defining i) the constitution or legal status; (ii) The principal place of business; (iii) The place of incorporation (for bidders who are corporations); or the place of registration and the nationality of the Owners (for applicants who are partnerships or individually-owned firms)

Declaration for anticipated change in legal structure/ ownership, if any.

The complete annual reports together with Audited statement of accounts of the company for last five years of its own (separate) immediately preceding the date of submission of bid. The Bidder shall also furnish documentary evidence/ declaration regarding Financial re-structuring of the company, if any.

Scanned copy of above documents shall be uploaded (refer para 15.4 below).

[**Note I.** In the event the Bidder is not able to furnish the above information of its own (i.e., separate), being a subsidiary company and its accounts are being consolidated with its Group/ Holding/ Parent company, the Bidder should submit the audited balance sheet, income statement, other information pertaining to it only (not of its Group/Holding/Parent company) duly certified by any one of the authority [(i) Statutory Auditor of the Bidder/(ii) Company Secretary of the Bidder a (iii) A certified

Public Accountant] certifying that such information/documents are based on the audited accounts as the case may be.

Note II. Similarly, if the Bidder happens to be a Group/Holding/ Parent company, the Bidder should submit the above documents/information of its own (i.e., exclusive of its subsidiaries) duly certified by any one of the authority mentioned in Note I above certifying that these information/documents are based on audited accounts, as the case may be.]

Unless otherwise mentioned in **bidding document**, bids submitted by a joint venture of two or more firms as partners, if allowed as per stipulated Qualification Requirements in SEC-III, Vol-I, shall comply with the following requirements:

- (i) The bid shall include all the information required for Attachment 3 as described above for each joint venture partner.
- (ii) The bid shall be signed so as to be legally binding on all partners.
- (iii) One of the partners responsible for performing a key component of the contract shall be designated as leader; this authorization shall be evidenced by submitting with the bid a power of attorney signed by legally authorized signatories as per Form-12 of Section-IX, Vol-I.
- (iv) The leader shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture, and the entire execution of the contract, including payment, shall be done exclusively with the leader, provided otherwise requested by the joint venture and agreed between the Employer and the leader.
- (v) All partners of the joint venture shall be liable jointly and severally for the execution of the contract in accordance with the contract terms.
- (vi) A copy of the agreement entered into by the joint venture partners shall be submitted with the bid as per Form-13 of Section-IX, Vol-I, including inter alia delineation of responsibilities and obligations of each partners appended thereto, notwithstanding the joint and several liability.
- (vii) The joint venture agreement should indicate precisely the responsibility of all members of JV in respect of planning, design, manufacturing, supply, installation, commissioning and training. All members of JV should have active participation in execution during the currency of the contract. This should not be varied/modified subsequently without prior approval of the Employer; and

In order for a joint venture to qualify, each of its partners or combination of partners must meet the minimum criteria listed in the Qualification Requirement for the Bidder as per Sec -III, Vol-I for an individual Bidder for the component of the contract they are designated to perform. Failure to comply with this requirement will result in rejection of the joint venture bid.

A firm can be a partner in only one joint venture; bids submitted by joint ventures or consortia including the same firm as partner will be rejected.

In the case of a Bidder who offers to supply and/or install plant and equipment under the contract that the Bidder did not manufacture or otherwise produce and/or install, the Bidder shall (i) have the financial and other capabilities necessary to perform the contract; (ii) have been duly authorized by the manufacturer or producer of the related plant and equipment or component as per proforma in attachment 8 to supply and/or install that item in the Employers country; and (iii) be responsible for ensuring that the manufacturer or producer complies with the requirements of ITB Sub-Clause 3.2 and meets the minimum criteria listed for an individual Bidder for that item.

(d) Attachment 4: Eligibility and Conformity of the Facilities (*uploading of Scanned Copy*)

Documentary evidence established in accordance with ITB Clause 3 that the facilities offered by the Bidder in its bid or in any alternative bid (if permitted pursuant to ITB Sub-Clause 9.2) are eligible and conform to the Bidding Documents.

The documentary evidence of the eligibility of the facilities shall consist of a statement on the country of origin of the plant and equipment offered, which shall be confirmed by a certificate of origin issued at the time of shipment.

The documentary evidence of the conformity of the facilities to the Bidding Documents may be in the form of literature, drawings and data, and shall furnish:

- (i) a detailed description of the essential technical and performance characteristics of the facilities;
- (ii) a list giving full particulars, including available sources, of all spare parts, special tools, etc., necessary for the proper and continuing functioning of the facilities for a period of Fifteen (15) years following completion of facilities in accordance with provisions of contract; and
- (iii) a commentary on the Employers Technical Specifications and adequate evidence demonstrating the substantial responsiveness of the facilities to those specifications. Bidders shall note that standards for workmanship, materials and equipment designated by the Employer in the Bidding Documents are intended to be descriptive (establishing standards of quality and performance) only and not restrictive. The Bidder may substitute alternative standards, brand names and/or catalog numbers in its bid, provided that it demonstrates to the Employers satisfaction that the substitutions are substantially equivalent or superior to the standards designated in the Technical Specifications.
- (iv) All details regarding after sale service support offered.
- (v) All details regarding proposed training for Employers personnel.
- (vi) Detailed answers to all the Questions in the Questionnaire, if prescribed in the Bidding Document.
- (vii) Details establishing the responsiveness of the offer in accordance with Technical Specification, Volume-II.

(e) Attachment 5: Subcontractors Proposed by the Bidder

The Bidder shall include in its bid details of all major items of supply or services that it proposes to purchase or sublet, and shall give details of the name and nationality of the proposed Subcontractor, including vendors, for each of those items. Bidders are free to list more than one Subcontractor against each item of the facilities. Their participation should be confirmed with a letter of intent between the parties, as needed, in Attachment 8. Quoted rates and prices will be deemed to apply to whichever Subcontractor is appointed, and no adjustment of the rates and prices will be permitted.

(f) Attachment 5A: (Items, Components, Raw Material, Services proposed to be sourced from Micro and Small Enterprises)

The Employer encourages the Contractor to source items, components, raw material, services from Micro and Small Enterprises for development of the Micro and Small Enterprises

The bidder shall furnish the details of the items, components, raw material, services which they propose to buy/avail from Micro and Small Enterprises for the purpose of completion of works.

(g) Attachment 6: Deviations

Bid should be submitted without any deviations, terms & conditions. However, in unavoidable circumstances, if any unresolved deviation remains; bidder shall submit the same only in Attachment 6 to the Envelope-1, Vol-III. Deviation written in other places other than in Attachment 6 to the Envelope-1 shall not be taken in to cognizance and such exceptions /deviations shall be treated as null & void.

However, the attention of the bidders is drawn to the provisions of ITB Sub-Clause 22.3 regarding the rejection of bids that are not substantially responsive to the requirements of the Bidding Documents. Bidders attention is also drawn to the provisions of ITB Sub- Clause 22.3.1.

(h) Attachment 7: Alternative Bids **(Not Applicable)**

(i) Attachment 8: Manufacturers Authorisation Form

Scanned copy of above documents shall be uploaded (refer para 15.4 below)

(j) Attachment 9: Work Completion Schedule.

Attach Bar Chart for Work Completion Schedule

Scanned copy of above documents shall be uploaded (refer para 15.4 below)

(k) Attachment 10: Guarantee Declaration.

Scanned copy of above documents shall be uploaded (refer para 15.4 below)

(l) Attachment 11: Not Applicable

(m) Attachment 12: Price Adjustment Data

(n) Attachment 13: Declaration regarding Social Accountability

(o) Attachment 14: Integrity Pact (*submission of Hard Copy in Original*)

The Bidder shall complete the accompanying Integrity Pact, which shall be applicable for bidding as well as contract execution, duly signed on each page by the person signing the bid and shall be submitted by the Bidder in two (2) originals alongwith the

Techno - Commercial Part in a separate envelope, duly superscripted with Integrity Pact. The Bidder shall submit the Integrity Pact on a non-judicial stamp paper of Rs. 100/-.

The required Integrity Pact is as Attachment 14-Integrity Pact in the file Attachment. Bidders shall take print out in two copies as explained in the Attachment 14-Integrity Pact.

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

Bidders failure to submit the Integrity Pact duly signed in Original alongwith the Bid or subsequently pursuant to ITB Sub-Clause 21 .1 shall lead to outright rejection of the Bid.

- (p) Attachment 15: Option for Initial Advance (either Interest Bearing Initial Advance or No Initial Advance) and Information for E-payment, PF details and declaration regarding Micro/Small & Medium Enterprises

Scanned copy of Sample Cheque (Cancelled) shall also be uploaded (refer para 15.4 below).

In this Attachment, the Bidder is required to clearly mention whether the Bidder would opt for Interest bearing initial advance in addition to providing the other information as above.

- (q) Attachment 16:Additional Information (*uploading of Scanned Copy, as applicable*)

- i. Certificate from their Banker(s) (as per prescribed formats in Form 14, Section-IX, Vol-I: Sample Forms and Procedures) indicating various fund based/non fund based limits sanctioned to the Bidder and the extent of utilization as on date. Such certificate should have been issued not earlier than three months prior to the date of bid opening. Wherever necessary the Employer may make queries with the Bidders Bankers.
- ii. Detailed information on any litigation or arbitration arising out of contracts completed or under execution by it over the last five years. A consistent history of awards involving litigation against the Bidder or any partner of JV may result in rejection of Bid.
- iii. Details of Provident Fund Code Number of the Bidder.
- iv. Any other information which the Bidder intends to furnish
- v. Bidder shall also furnish information/documentation in support that the Bidder have adequate sub-station design infrastructure and erection facilities and capacity and procedures including quality control.
- vi. The Bidder shall furnish the CV and experience details of a project manager with 15 years' experience in executing such contract of comparable nature including not less than five years as manager.
- vii. Any other information which the Bidder intends to furnish.

Scanned copy of above documents shall be uploaded (refer para 15.4 below).

(r) Attachment 17: Declaration for tax exemptions, reductions, allowances or benefits

(s) Attachment 18: Safety Pact (submission of Hard Copy in Original)

The Bidder shall complete the accompanying Safety Pact, which shall be applicable for bidding as well as contract execution, duly signed on each page by the person signing the bid and shall be submitted by the Bidder in two (2) originals along with the Techno - Commercial Part in a separate envelope, duly superscripted with Safety Pact. The Bidder shall submit the Safety Pact on a non-judicial stamp paper of Rs. 100/-.

Bidders shall take print out in two copies discussed above and as explained in the Attachment 18- Safety Pact.

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

Bidder failure to submit the Safety pact duly signed in Original along with the Bid or subsequently pursuant to ITB Sub-Clause 21.1 shall lead to outright rejection of the Bid.

(t) Attachment 19: Declaration

(u) Attachment – 20: Affidavit (submission of Hard Copy in 'Original')

Signed and stamped with company seal by a full time Director/ CEO/ Chairman-cum-Managing Director and attested/ notarized by a Magistrate/ Notary for correctness of all the information/details/data/documentary evidences etc. as submitted by the bidder are correct.

10. Bid Form and Price Schedules

10.1 The Bidder shall complete the Bid Form(s) and the appropriate Price Schedules furnished in the Bidding Documents as indicated therein, following the requirements of ITB Clauses 11 and 12.

11. Bid Prices

11.1 Unless otherwise specified in the Technical Specifications, bidders shall quote for the entire facilities on a "single point responsibility" basis such that the total bid price covers all the Contractors obligations mentioned in or to be reasonably inferred from the Bidding Documents in respect of the design, manufacture, including procurement and subcontracting (if any), delivery, construction, installation and completion of the facilities including supply of mandatory spares (if any). This includes all requirements under the Contractors responsibilities for testing, pre-commissioning and commissioning of the facilities and, where so required by the Bidding Documents, the acquisition of all permits, approvals and licenses, etc.; the operation, maintenance and training services and such other items and services as may be specified in the Bidding Documents, all in accordance with the requirements of the General Conditions of Contract. Items against which no price is entered by the Bidder will not be paid for by the Employer when executed and shall be deemed to be covered by the prices for other items.

11.2 Bidders are required to quote the price for the commercial, contractual and technical obligations outlined in the Bidding Documents. If a Bidder wishes to make a deviation, such deviation shall be listed in Attachment 6 of its bid.

11.3 Bidders shall give a breakdown of the prices in the manner and detail called for in the Price Schedules. Where no Price Schedules are included in the Bidding Documents, Bidders shall present their prices in the following manner:

Separate numbered Schedules shall be used for each of the following elements. The total amount from each Schedule 1 to 5 shall be summarized in a grand summary of Price Proposal (Schedule 6) giving the total bid price(s) to be entered in the Bid Form.

Schedule 1	Plant and Equipment (including mandatory Spares) to be supplied including Type Test Charges
Schedule 2	Local Transportation, In-Transit Insurance, loading and unloading
Schedule 3	Installation Services
Schedule 4	Charges for Training to be imparted
Schedule 5	Taxes and Duties not included in Schedule 1 to 4
Schedule 6	Grand Summary (Schedule Nos. 1 to 5)
Schedule 6	After Discount: Grand Summary (After Discount)
Schedule 7	Break-up of Type Test Charges (Not Applicable)

Bidders shall note that the plant and equipment included in Schedule No. 1 above exclude materials used for civil, and other construction works. All such materials shall be included and priced under Schedule No. 3, Installation Services.

11.3.1 The bid price for the items for which quantities have been estimated by the Employer shall be governed based on the unit price quoted by the bidder. In case additional quantities, over and above the quantities indicated in the respective Price Schedules, are required for successful completion of the Scope of Work by Employer, the Bidder shall execute additional quantities of these items for which payment based on the unit prices quoted by the bidder shall be made.

11.3.2 The bid price for which the quantities are to be estimated by the Bidder shall remain constant unless there is change made in the Scope of Work by Employer. The quantities and unit prices (i) subsequently arrived while approving the Bill of Quantities (BOQ) /Billing breakup of lumpsum quantities/lot/Set and/or (ii) estimated by the bidder shall be for on account payment purpose only. In case additional quantities, over and above the quantities BOQ/billing breakup and /or estimated by the bidder, are required for successful completion of the scope of work as per Technical Specification, the Bidder shall execute additional quantities of these items for which no additional payment shall be made over and above the lumpsum bid price. In case quantities of these items supplied at site are in excess of that required for successful completion of scope of work, such additional quantities shall be the property of the bidders and they shall be allowed to take back the same from the site for which no deduction from the lumpsum bid price shall be made. Further, in case actual requirement of quantities for successful completion of scope of work is less than the

quantities identified in the approved BOQ /billing breakup and/or estimated by the bidder, the lumpsum bid price shall remain unchanged and no deduction shall be made from the lumpsum price due to such reduction of quantities.

11.3.3 It shall be the responsibility of the bidders to pay all statutory taxes, duties and levies(including GST) and interest, if applicable on account of additional revised invoice issued for actual material supplied to the concerned authorities for such return/supply of surplus material, which would otherwise have been, lawfully payable. The bidders shall submit an indemnity bond to keep Employer harmless from any liability, before release of such material to the bidder by Employer.

11.3.4 Set/Lot/Lumpsum shall be governed as per the requirement of the corresponding item description read in conjunction with relevant provisions of Technical Specifications.

11.4 In the schedules, Bidder shall give the required details and a breakdown of their price **considering and taking into account the Input Tax Credit (ITC) as may be available under the Goods and Services Tax (GST) Laws and Regulations**, in the schedules as follows:

- a) Plant and equipment including mandatory spares, shall be quoted on an EX Works (ex-factory, ex-works, ex-warehouse or off-the-self, as applicable) basis and Type Test Charges (including the Type Test to be conducted abroad in case of an Indian Bidder), shall also be quoted in Schedule 1.

Further, in case of imported Equipments/items offered as 'Off the Shelf' or dispatched directly from the Indian Port of disembarkation, the price of such Equipment/items shall be inclusive of all cost **as well as any duties paid/payable in relation to import of such goods (viz., customs duties, GST & levies etc.) considering and taking into account the ITC as may be available under the applicable laws including GST.**

The price quoted in respect of all items in the above schedule shall be excluding GST applicable on transaction between the Employer and the Contractor.

- b) Local/inland transportation, **In-transit** insurance, **loading and unloading** of the Plant and Equipment including mandatory spares to be supplied shall be quoted separately in Schedule 2, **as composite supply of services, with local/inland transportation being the Principal Supply. It is the Employer's understanding that as per extant provisions, on the charges for supply of services related to Inland transportation, In-transit insurance, loading and unloading by the Bidder to the Employer, GST is not payable. The Bidder is, however, advised to check the position from their own sources. If payable, the same shall be to the Bidder's account and Employer shall not reimburse any GST on this account.**
- c) Installation Charges shall be quoted separately (Schedule 3) and shall include rates and prices for all labour, Contractor's equipment, temporary works, materials, consumables and all matters and things of whatsoever nature, provision of operations and maintenance manuals, etc. wherever identified in the Bidding Documents as necessary for the proper execution of all installation services except those priced in other Schedules. **The price quoted in respect of all items in the above schedule shall be excluding GST.**
- d) **The Training Charges is not applicable for this package (Schedule-4).**
- e) **The Type test charge (Schedule 7)- Not Applicable.**

- f) To take the confirmation of Tax Bracket (item wise), Bidder has to fill respective HSN/ SAC code and rate of GST in %age against each item in the Price Schedule. It shall entirely be the responsibility of the bidder to check and fill the HSN/SAC code and rate of GST given against each item. The bidders shall solely be responsible for HSN/SAC classification and the rate of GST for each item. Employer's liability for reimbursement of GST shall be lower of the GST applicable at the rate as confirmed/deemed confirmed in the bid or actual GST paid/payable by the bidder for that item.
- g) Total GST on Supply of goods and Services shall be indicated in Schedule -5
- h) The Input Tax Credit (ITC) available, if any, under the GST law as per the relevant Government policies wherever applicable shall be taken into account by the Bidder while quoting bid price.
- i) The Bidder shall include **In-transit** insurance charges in its bid prices as per insurance requirement mentioned in Section – IV: General Conditions of Contract (GCC) and Appendix-3: Insurance Requirements to Form of Contract Agreement as contained in Section IX: Sample Forms and Procedures (FORMS) of the Bidding Documents. Bidder shall further note that the Employer shall not be liable to make any payment/ reimbursement to the Contractor whatsoever for insurance of Contractor's Plant and Machinery.
- j) The bidder shall fill up only the marked cell (shaded in green colour) in the work sheets of Schedule 1 to 7 and Discount, Taxes & duties. Bidder shall not carry out any modification or changes in any other cell. Required calculations will be carried out automatically in the respective work sheets of Schedule-6(Grand Summary), Schedule-6 (After Discount) (Grand Summary after discount) and Bid Form.
- k) Bidders may like to ascertain availability of exemptions, reductions, allowances or benefits in case of goods and services to be supplied to the Employer. They shall solely be responsible for obtaining such benefits, and in case of failure to receive such benefits for any reasons whatsoever, the Employer will not compensate the Bidder. The Bidder shall furnish along with their bid, a declaration to this effect in Attachment 17 as per the format enclosed in the Bidding Documents.

Further, if issuance of the necessary certificate for availing such exemptions, reductions, allowances or benefits is permitted and is required to be issued by the Employer in line with the relevant policies, rules and procedures of Govt. of India in vogue, the same shall be considered for issuance by the Employer, provided the Bidder explicitly indicates in their bid that they have quoted prices after considering the applicable concessional duty/exemption. However, the Bidder alone shall be responsible for obtaining any benefits there from as may be admissible under Govt. policies/procedures and in case of their failure to receive such benefits, partly or fully, for any reason whatsoever, the Employer will neither be responsible nor be liable to compensate the Contractor, and the Employer shall have no financial liability on this account.

Where the Bidder has quoted taking into account such benefits, he must give all information required for issuance of such certificate in terms of the relevant notifications of the Govt. of India along with his bid in Attachment 17. In case bidder has not indicated such information or has indicated "to be furnished later on" in Attachment 17, the same shall be construed to mean that no benefit has been passed on by the bidder to the Employer, and the Employer shall not issue any certificate to the contractor for availing the same even if admissible.

- l) **Employer shall, deduct taxes at source as per the applicable laws/rules, if any, and issue Tax Deduction at Source (TDS) Certificate to the Contractor.**

11.5 The prices shall be in accordance with the following:

Adjustable Price: Prices quoted by the Bidder shall be subject to adjustment during performance of the contract to reflect changes in the cost elements such as labor, material, etc. in accordance with the procedures specified in the corresponding Appendix – 2 to the Form of Contract Agreement. A bid submitted with a fixed price quotation will not be rejected, but the price adjustment will be treated as zero. The price adjustment provision will not be taken into consideration in bid evaluation. Bidders are required to indicate the source of labour & materials indices in Attachment 12.

12. Bid Currencies

12.1 Prices shall be quoted in Indian Rupees Only.

13. Bid Security

13.1 The Bidder shall furnish, except as exempted herein below, as part of its bid, a bid security in the amount and currency as stipulated in the **IFB**. The bid security must be submitted in the form provided in the Bidding Documents.

Micro and Small Enterprises (MSEs) registered with National Small Industries Corporation (NSIC) or with any other designated Authority of GoI under the Public Procurement Policy for MSEs are exempted from submission of Bid Security as per the Provisions of the Public Procurement Policy for Micro and Small Enterprises (MSEs) order 2012. This shall be subject to production of documentary evidence with regard to registration with authorities mentioned above.

13.2 The bid security shall, at the bidders option, be in the form of a crossed bank draft/pay order /banker certified cheque in favour of Employer as stipulated in **IFB** or a bank guarantee from a scheduled bank selected by the bidder. The format of the bank guarantee shall be in accordance with the form of bid security included in the Bidding Documents. Bid security shall remain valid for a period of **thirty (30) days** beyond the original bid validity period, and beyond any extension subsequently requested under ITB Sub-Clause 14.2.

Bid security shall remain valid for a period of thirty (30) days beyond the original bid validity period i.e., for a period of **TEN (10)** months after the last date of bid submission, and beyond any extension subsequently requested under ITB Sub-Clause 14.2.

The Bid Security shall be in favour of **REC Transmission Projects Company Limited payable at New Delhi.**

13.3 Any bid not accompanied by an acceptable bid security, except as exempted at 13.1 above, shall be rejected by the Employer as being nonresponsive, pursuant to ITB Sub-Clause 22.4. The bid security of a joint venture must be in the name of all the partners in the joint venture submitting the bid.

13.4 The bid securities of unsuccessful bidders will be returned as promptly as possible, but not later than twenty-eight (28) days after the expiration of the bid validity period.

13.5 The successful Bidder shall be required to keep its bid security valid for a sufficient period till the performance security(ies) pursuant to ITB Clause 35 are furnished to the satisfaction of the Employer. The bid security of the successful Bidder will be returned when the Bidder has signed the Contract Agreement, pursuant to ITB Clause 34, and has furnished the required performance security, pursuant to ITB Clause 35.

13.6 The bid security may be forfeited

- (a) if the Bidder withdraws its bid during the period of bid validity specified by the Bidder in the Bid Form; or
- (b) In case the Bidder does not withdraw the deviations proposed by him, if any, at the cost of withdrawal stated by him in the bid and/or accept the withdrawals/rectifications pursuant to the declaration/confirmation made by him in Attachment – Declaration of the Bid; or
- (c) If a Bidder does not accept the corrections to arithmetical errors identified during preliminary evaluation of his bid pursuant to ITB Sub-Clause 27.2; or
- (d) If, as per the requirement of Qualification Requirements the Bidder is required to submit a Deed of Joint Undertaking and he fails to submit the same, duly attested by Notary Public of the place(s) of the respective executant(s) or registered with the Indian Embassy/High Commission in that Country, within ten days from the date of intimation of post – bid discussion; or
- (e) in the case of a successful Bidder, if the Bidder fails within the specified time limit
 - (i) to sign the Contract Agreement, in accordance with ITB Clause 34, or
 - (ii) to furnish the required performance security(ies), in accordance with ITB Clause 35 and/or to keep the bid security valid as per the requirement of ITB Sub-Clause 13.5.

13.7 No interest shall be payable by the Employer on the above Bid Security.

14. Period of Validity of Bid

14.1 Bids shall remain valid for the period of **Nine (09)** months after the last date of bid submission. A bid valid for a shorter period shall be rejected by the Employer as being non-responsive.

14.2 In exceptional circumstance, the Employer may solicit the Bidders consent to an extension of the bid validity period. The request and responses thereto shall be made in writing or by cable. If a Bidder accepts to prolong the period of validity, the bid security shall also be suitably extended. A Bidder may refuse the request without forfeiting its bid security. A Bidder granting the request will not be required or permitted to modify its bid.

15. Format and Signing of Bid

15.1 The bidder shall prepare the bid in the manner indicated in ITB Clause 9.0 and submit the bid in following manner:

First Envelope:

- (i) The soft copy of the bid consisting of the documents listed in ITB Clause 9 including relevant scanned documents (refer ITB Clause 15.4) shall be uploaded through the portal only. Submission of Soft Copy of any documents by any other means shall not be accepted by the Employer in any circumstances.
- (ii) Hard copy of followings:
- DD towards Bidding Document fee of the amount in accordance with clause 5.4 of ITB or documentary evidence in support of exemption of Bidding Document fee as per ITB 5.5;
 - Bid Security (in Original) or documentary evidence in support of exemption of Bid Security, in separate envelope in accordance with clause 13 of ITB, Section-II;
 - Integrity Pact (in Original) in accordance with clause 9.3 (o) of ITB, Section-II in separate envelope;
 - Power of Attorney as per Clause 9.3 (b);
 - In case of Bid from Joint Venture, the Joint Venture Agreement & Power of Attorney of Joint Venture Agreement;
 - Safety Pact (in Original) in accordance with clause 9.3 (s) of ITB, Section-II in separate envelope.
 - Affidavit signed and stamped with company seal by a full time Director/ CEO/ Chairman-cum-Managing Director and attested/ notarized by a Magistrate/ Notary for correctness of all the information/details/data/documentary evidences etc. as submitted by the bidder are correct.
 - Any other document further specified in the ITB duly signed and stamped on each page

Second Envelope:

The soft copy of the price schedules as per ITB Clause 11 to be uploaded on the portal. Submission of Soft Copy of any documents by any other means shall not be accepted by the Employer in any circumstances.

15.2 The bid shall contain no alterations, omissions or additions, unless such corrections are initialed by the person or persons signing the bid.

15.3 –deleted–.

15.4 The List of following documents shall be scanned & uploaded on the portal as per table given below:

S. No.	Description of Documents	Name of File to be uploaded on
1.	Power of Attorney	poa.pdf
2.	DD against Bidding Document fee	dd.pdf
3.	Constitution of legal status	legal.pdf
4.	Declaration for anticipated change in legal structure/ ownership	decl_legal.pdf
5.	The principal place of business	principal.pdf
6.	The place of Incorporation or the place of registration and the nationality of the owner	incorporation.pdf

S. No.	Description of Documents	Name of File to be uploaded on
7.	Technical Experience certificate issued by utility	techexp.pdf
8.	Financial Balance Sheets (for last five years)	balsheet.pdf
9.	Declaration in regard to Financial re-structuring	Decl_Fin_re_struc.pdf
10.	Technical GTP	gtp.pdf
11.	Type Test Report	ttreport.pdf
12.	Bank Certificate	bank.pdf
13.	Manufacturer Authorization	manuauth.pdf
14.	Work Schedule (BAR Chart)	barchart.pdf
15.	Guarantee Declaration	guarantee.pdf
16.	Documentary Evidence for Base Price Indices	pvinfos.pdf
17.	Cancelled Cheque	cheque.pdf
18.	Other Documents	other.pdf

1. The various documents are to be uploaded with the help of ATTACH button provided at relevant section of Attachment-QR sheet of Volume-III, Attachment.xls.
2. Bidder may put three (03) characters suffix for each file preceded by an underscore for their identification. (Example- poa_xyz.pdf)
3. In case more file are to be uploaded under the same head Numeric suffix may be put by the bidder. (Example - poa1_xyz.pdf, poa2_xyz.pdf, poa3_xyz.pdf.....).
4. For uploading any additional documents bidder may decide the name of file with prefix as „other' succeeded by „underscore" and suffix as name of document in short. (Example – other_ISO certificate1_xyz.pdf, other_ISO certificate2_xyz.pdf)
5. For other types of files supported on the portal, please refer the related provisions on the portal.

D. Submission of Hard Copy of Bids

16. Sealing and Marking of Bids

16.1 The Bidder shall upload the soft copy part of the bid as per the provisions of the portal (refer para 15.1& 15.4 above) and submit the hard copy of DD towards Bidding Document fee or documentary evidence in support of exemption of Document fee (as applicable), Bid Security or documentary evidence in support of exemption of Bid Security (as applicable), Integrity Pact, Safety Pact, Power of Attorney, Joint Venture Agreement (as applicable) and Power of Attorney of Joint Venture Agreement (as applicable) and Joint Deed of Undertaking (as applicable) (refer para 15.1 above), duly marked First Envelope (Techno – Commercial Part) in the following manner.

Envelope – 1: Bidding Document fee /documentary evidence in support of exemption of Bidding Document fee

Envelope – 2: Bid Security/ documentary evidence in support of exemption of Bid Security

Envelope – 3: Integrity Pact

Envelope – 4: Power of Attorney, Joint Venture Agreement (as applicable) and Power of Attorney of Joint Venture Agreement (as applicable) and Joint Deed of Undertaking (as applicable) and any other documents as required (refer para 15.1 above).

Envelope –5: Safety Pact

The Bidder shall upload the Excel files of Price Schedule and Attachments downloaded from the portal as part of the bid duly filled in the required cells. If the bid submitted by the bidder is found different from the files downloaded from the portal, as part of the bidding document or tampered/modified locked contents, the bidder may run with risk of rejection of bid.

16.2 The envelope shall

- (a) be addressed to the Employer at the address given in the **IFB**, and
- (b) bear the contract name & Tender Specification No. indicated in the **IFB**, and the statement “Do Not Open Before [date],” to be completed with the time and date specified in the **IFB**.

16.3 DD towards Bidding Document, Bid Securities, Integrity Pact and the Safety Pact in original shall be submitted in separate superscribed envelopes (one for DD towards Bidding Document, one for Bid Security, one for Integrity Pact and one for Safety Pact) alongwith First Envelope.

Bidder may upload Soft copy of the any other documents which they consider relevant along with First Envelope.

All the envelopes shall also indicate the name and address of the Bidder so that the bid can be returned unopened in case it is declared “late.”

In case, pursuant to Ministry of Finance, GOIs Circular dated 17th July, 2012, the Bank Guarantee is issued using SFMS Platform by the banks located in India, the copy of such Bank Guarantee shall be submitted by the bidder along with the First Envelope.

The Account details of RECTPCL for the purpose of Bank Guarantee (towards Bid Security) to be issued using SFMS Platform are as given below:

Name of the Bank and Address	IFSC Code	RECTPCL Current A/c No.
YES BANK, Ground and Mezzanine Floor, 56 Janpath, ALPS building, NEW DELHI-110001	YESB0000136	013681400001736

16.4 If the envelope is not sealed and marked as required by ITB Sub- Clause 16.2 above, the Employer will assume no responsibility for the bid’s misplacement or premature opening.

17. Deadline for Submission of Bids

17.1 Soft copy of the bid shall be uploaded through the portal

<http://www.mstcecommerce.com/eprochome/rectpcl> at or before the submission time and date as stipulated in the bidding document. Demand Draft, hard copy of Bid Security in accordance with clause 13 of ITB, Section-II in separate envelope, Integrity Pact, Safety Pact, Power of Attorney, Joint Venture Agreement & Power of Attorney of Joint Venture Agreement (in case bid from Joint Venture) (as applicable), JDUs (as applicable), and Affidavit for correctness must be received by the Employer at the address specified under ITB Sub-Clause 16.2 no later than the time and date stated in the IFB. In the event of the specified date for the submission of bids being declared a holiday for the Employer, the bids will be received/uploaded upto the appointed time on the next working day.

Hard copy of Joint Deed of Undertaking must be received by the Employer at the address specified under ITB Sub-Clause 16.2 not later than the time and date stated in the IFB.

17.2 Bidding timelines will be defined as per the e-Procurement server clock only.

17.3 The Employer may, at its discretion, extend this deadline for submission of bids any time prior to opening of bids, in which case all rights and obligations of Employer and bidders will thereafter be subject to the deadline as extended.

Further the Employer also reserves the right to extend bid submission timeline or recall the tender if e- Procurement server is down (i.e. inaccessible / inoperative) for a prolonged period of time within the last 24 hours of the bid submission due date.

18. Late Bids

18.1 The bidder shall not be permitted to submit the soft copy part of the bid by any mode other than uploading on the portal within the specified deadline for submission of bids. The e-Procurement system would not allow any late submission of bids through the portal after due date & time as specified in IFB. After electronic online proposal submission, the system shows **“Bid Submitted” and a system generated email will be sent to the registered email id regarding confirmation of bid submission.** This shall be treated as acknowledgement of the bid submission.

In case Hard copy part of the bid is received by the Employer after the deadline for submission of the same prescribed by the Employer in the IFB but the bidder has uploaded the soft copy part of the bid, the bid will be considered as late bid. Such bids will be rejected during preliminary examination.

19. Modification and Withdrawal of Bids

19.1 Bidder may modify its bids through the relevant provisions on the portal <http://www.mstcecommerce.com/eprochome/rectpcl>. The Bidder may modify or withdraw its bid after submission, provided that modification is done on the portal prior to the deadline prescribed for bid submission.

19.2 The Bidders modifications shall be done and submitted as follows:

(i) Soft copy of the entire bid if any modification is there.

19.3 Bidder may withdraw its bid through the relevant provisions of portal only.

19.4 No bid may be withdrawn in the interval between the bid submission deadline and the expiration of the bid validity period specified in ITB Clause 14. Withdrawal of a bid during this interval may result in the Bidders forfeiture of its bid security, pursuant to ITB Sub-

Clause 13.6.

E. Bid Opening and Evaluation

20. Opening of First Envelope by Employer

20.1 After receipt of Bids till last date of submission of Bids as per schedule, the First Envelope i.e., Techno – Commercial Part of Bids shall be kept unopened by the Employer.

The Employer will open the First Envelope i.e. Techno – Commercial Part in public, including withdrawals and modifications made pursuant to ITB Clause 19, in the presence of bidders designated representatives who choose to attend, at the time, date, and location stipulated in the **IFB**. The bidders representatives who are present shall sign a register evidencing their attendance. In the event of the specified date for the submission of bids being declared a holiday for the Employer, the bids (Hard Copy) will be received upto the appointed time on the next working day.

20.2 During the opening of bids, Envelopes marked “Withdrawal” shall be opened first. Bids withdrawn pursuant to ITB Clause 19 shall be not be opened.

20.3 For all other Bids, the bidders names, deviation if any, the presence of bid security, Integrity Pact, Safety Pact and any such other details as the Employer may consider appropriate, will be get declared by the Employer during bid opening. Subsequently, all envelopes marked “Modification” shall be opened. Opening of bid, whether or not accompanied with the Tender fee and/or bid security and/ or Integrity Pact and/or Safety Pact, shall not be construed to imply its acceptability which shall be examined in detail pursuant to the provisions contained in this Section-II.

On behalf of Employer, the Integrity Pact and Safety Pact will be signed by its representative at the time of Bid Opening. Both original of the Integrity Pact and Safety Pact will be retained by Employer.

20.4 The Employer shall prepare minutes of the bid opening in the form of Bid Opening Statement, including the information disclosed to those present in accordance with ITB Sub-Clause 20.3.

20.5 Bids not opened at bid opening shall not be considered further for evaluation, irrespective of the circumstances and shall be returned to the Bidder unopened/send to archive unopened.

21. Clarification of Bids

21.1 During bid evaluation, the Employer may, at its discretion, ask the Bidder for a clarification of its bid. In case of erroneous/non submission of documents related to/identified in ITB Sub-Clause 9.3 (b), (o), (s) and (t) or Deed of Joint Undertaking pursuant to ITB Sub- Clause 9.3 (c) & (e), 9.3 (u) required to be submitted by the Bidder as per the provisions of the Bidding Documents, the Employer may give the Bidder not more than 7 working days’ notice to rectify/furnish such documents, failing which the bid shall be rejected. The request for clarification and the response shall be in writing, and no change in the price or substance of the bid shall be sought, offered or permitted.

22. Preliminary Examination of First Envelope

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

In case of non-submission of bid in the portal (soft copy part of the bid) within the stipulated deadline, then even if the bidder has submitted the specific documents in hard copy part in original within the stipulated deadline pursuant to ITB 17.1, its bid shall be considered as incomplete bid, which shall be summarily rejected.

Similarly, in case of non-submission of Hard copy part of the bid, but the bidder has uploaded the soft copy part of the bid, the bid will be considered as incomplete bid. Such bids will be rejected during preliminary examination.

22.2 The Employer may waive any minor informality, nonconformity or irregularity in a bid that does not constitute a material deviation, whether or not identified by the Bidder in Attachment 6 to its bid, and that does not prejudice or affect the relative ranking of any Bidder as a result of the technical and commercial evaluation, pursuant to ITB Clause 24.

22.3 Prior to the detailed evaluation, the Employer will determine whether each bid is of acceptable quality, is complete and is substantially responsive to the Bidding Documents. Any deviations, conditionality or reservation introduced in Attachment-6 and/or in the Bid Form, Technical Data Sheets and covering letter, or in any other part of the bid will be reviewed to conduct a determination of the substantial responsiveness of the bidder's bid. For purposes of this determination, a substantially responsive bid is one that conforms to all the terms, conditions and specifications of the Bidding Documents without material deviations, objections, conditionalities or reservations. A material deviation, objection, conditionality or reservation is one (i) that affects in any substantial way the scope, quality or performance of the contract; (ii) that limits in any substantial way, inconsistent with the Bidding Documents, the Employer's rights or the successful Bidder's obligations under the contract; or (iii) whose rectification would unfairly affect the competitive position of other bidders who are presenting substantially responsive bids.

22.3.1 Bids containing deviations from critical provisions relating to GCC & SCC Clauses i.e Clause No-5(i)(b) of GCC (Governing Law), 7(i) of GCC (Contractor's Responsibilities), 9.0 of GCC (Performance Security), 27.0 of GCC (Liquidity Damage), 31 (i) (a) of GCC (Defect Liability Period), 33.0 of GCC (Payment Terms), 39.0 of GCC (Limitations of Liability), 47.0 of GCC (Settlement of Disputes), 48.0 of GCC (Arbitration), 12.0 of SCC (Taxes and Duties), and Appendix 2 to the Form of Contract Agreement (Price Adjustment) will be considered as non-responsive.

22.3.2 Regarding deviations, conditionality or reservations introduced in the bid, which will be reviewed to conduct a determination of substantial responsiveness of the Bidder's bid as stated in ITB Sub- Clause 22.3, the order of precedence of these documents to address contradictions, if any, in the contents of the bid, shall be as follows:

- I. Bid Form
- II. Attachment-6 : Deviations
- III. Technical Data Sheet
- IV. Any other part of the bid

Contents of the document at Sr. No. I above will have overriding precedence over other documents (Sr. No. II to IV above). Similarly, contents of document at Sr. No. II above will have overriding precedence over other documents (Sr. No. III to IV above), and so on.

22.4 If a bid is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by the Bidder by correction of the nonconformity. The Employer's determination of a bid's responsiveness is to be based on the contents of the bid

itself without recourse to extrinsic evidence.

23. Qualification

23.1 The Employer will ascertain to its satisfaction whether Bidders determined having submitted substantially responsive bids are qualified, as per the Qualification Requirement specified in Section-III of Vol-I to satisfactorily perform the contract. The Employer shall be the sole judge in this regard and the Employer's interpretation of the Qualification Requirement shall be final and binding.

23.2 The determination will take into account the Bidder's financial, technical capabilities including production capabilities, in particular the Bidder's contract work in hand, future commitments & current litigation and past performance including fatal accidents during execution of contracts. It will be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder in Attachment 3 to the bid, as well as such other information as the Employer deems necessary and appropriate. This shall, however, be subject to assessment that may be carried out, if required, by the Employer as per the provisions of Qualification Requirement.

23.3 The Employer may waive any minor informality, nonconformity or irregularity in a bid that does not constitute a material deviation, affecting the capability of the Bidder to perform the Contract.

23.4 An affirmative determination will be a prerequisite for the Employer to evaluate the Techno - Commercial Part and open the Second Envelope of the Bidder. A negative determination will result in rejection of the Bidder's bid.

24. Evaluation of Techno - Commercial Part (First Envelope)

24.1 The Employer will carry out a detailed evaluation of the bids of the qualified bidders in order to determine whether the technical aspects are in accordance with the requirements set forth in the Bidding Documents. In order to reach such a determination, the Employer will examine the information supplied by the bidders, pursuant to ITB Clause 9, and other requirements in the Bidding Documents, taking into account the following factors:

- (a) overall completeness and compliance with the Technical Specifications and Drawings; deviations from the Technical Specifications as identified in Attachment 6 to the bid and those deviations not so identified; suitability of the facilities offered in relation to the environmental and climatic conditions prevailing at the site; and quality, function and operation of any process control concept included in the bid. The bid that does not meet minimum acceptable standards of completeness, consistency and detail will be rejected for non-responsiveness.
- (b) achievement of specified performance criteria by the facilities
- (c) compliance with the time schedule called for in the corresponding Appendix to the Form of Contract Agreement and evidenced as needed in a milestone schedule provided in the bid;

Time schedule (program of performance)

The plant and equipment covered by this bidding shall have the "Taking Over" by the Employer after successful Completion within the period specified in **IFB**. Bidders are required to base their prices on the time schedule given in

Appendix 4 to the Form of Contract Agreement (Time Schedule) or, where no time schedule is given in Appendix 4, on the Completion date(s) given above. No credit will be given to earlier completion. Bids offering completion beyond the specified period are liable to be rejected.

- (d) type, quantity and long-term availability of mandatory and recommended spare parts and maintenance services
- (e) any other relevant technical factors that the Employer deems necessary or prudent to take into consideration.
- (f) any deviations to the commercial and contractual provisions stipulated in the Bidding Documents.
- (g) details furnished by the bidder in response to the requirements specified in Volume-II of the Bidding Documents.
- (h) The acceptability of the vendors and subcontractors proposed in Attachment 5 to be used by the Bidder will be evaluated. A vendor or subcontractor, for the items other than those covered under Section-III of Vol-I, be determined to be unacceptable, the bid will not be rejected, but the Bidder will be required to substitute an acceptable vendor or subcontractor without any change to the bid price.

24.2 Where alternative technical solutions have been permitted and offered in Attachment 7 to the bid, the Employer will make a similar evaluation of the alternatives, which will be treated in the technical and commercial evaluations as if they were base bids. Where alternatives are not permitted, but have in any event been offered, they shall be ignored.

25. Opening of Second Envelope by Employer

25.1 The Second Envelope i.e., Price Part of only those Bidders shall be opened who are determined as having submitted substantially responsive bids and are ascertained to be qualified to satisfactorily perform the Contract, pursuant to ITB Clause 23 and 24. A negative determination of the bids pursuant to ITB Clause 23 and 24, shall be notified by the Employer to such Bidders and the Second Envelope submitted by them shall be unopened and Bid Security shall be returned.

25.2 The Employer will open Second Envelope i.e., Price Part at the specified time and date in the presence of bid opening committee constituted by the employer at the time, date, and location stipulated in the intimation for opening of Second Envelope.

25.3 The bidder's names, the Bid Prices, including any discounts, and any such other details as per price schedule filled in by the bidder on the portal will become viewable at the time of opening of bids. The prices and details as filled up in Electronic Form/Template by the bidder and opened during the bid opening and recorded in the Bid Opening Statement would not be construed to determine the relative ranking amongst the Bidders, or the successful Bidder, and would not confer any right or claim whatsoever on any Bidder. The successful Bidder (also referred to as the L1 Bidder) shall be determined as per the provisions of this Section – II and considered for award of contract as provided in ITB Clause 31.

25.4 The Employer shall prepare minutes of the bid opening, including the information disclosed to those present in accordance with ITB Sub-Clause 25.3.

25.5 Bids not opened and read out at bid opening shall not be considered further for evaluation,

irrespective of the circumstances.

26. Conversion to Single Currency

26.1 This shall not be applicable as domestic firms are required to quote the prices in Indian Rupees only.

27. Evaluation of Second Envelope (Price Part)

27.1 The Employer will examine the Price Parts (Second Envelopes) to determine whether they are complete, whether any computational errors have been made, whether the documents have been properly signed, and whether the bids are generally in order.

The Price Part containing any deviations and omissions from the contractual and commercial conditions and the Technical Specifications which have not been identified in the First Envelope are liable to be rejected.

27.2 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price, which is obtained by multiplying the unit price and quantity specified by the Employer, or between subtotals and the total price, the unit or subtotal price shall prevail, and the quantity and the total price shall be corrected. However, in case of items quoted without indicating any quantity or the items for which the quantities are to be estimated by the Bidder, the total price quoted against such items shall prevail. If there is a discrepancy between words and figures, the amount in words will prevail.

If there is a discrepancy between the quantity specified by the Employer and the quantity indicated by the bidder in any price schedules, the quantity specified by the Employer shall prevail and shall be corrected accordingly.

The prices of all such item(s) against which the Bidder has not quoted rates/amount (viz., items left blank or against which „-“ is indicated) in the Price Schedules will be deemed to have been included in other item(s).

If the discount(s)/rebate(s) offered by the Bidder is a percentage discount and the price component(s) on which the said discount is not indicated in the bid, the same shall be considered on the total bid price [i.e. proportionately on each price component], in the event of award. However, if lump-sum discount is offered, the same shall be considered in full on the Ex-works price component (by proportionately reducing Ex-works price of individual items), in case of award. Further, Conditional discounts/rebates, if any, offered by the bidder shall not be taken into consideration for evaluation. It shall, however, be considered in case of award.

In respect of taxes, duties and other levies indicated by the Bidder in the Bid, which are reimbursable in line with the provisions of the Bidding Documents, the applicable rate and amount thereof shall be ascertained by the Employer based on which, if required, necessary rectification and arithmetical correction shall be carried out by the Employer. The rate and amount so ascertained by the Employer shall prevail.

The subtotal, total price or the total bid price to be identified in Bid Form for this purpose, irrespective of the discrepancy between the amounts for the same indicated in words or figures shall be rectified in line with the procedure explained above.

If the Bidder does not accept the correction of errors as per this clause, its bid will be rejected and the amount of Bid Security forfeited.

27.3 The comparison shall be on the total price in Price Schedule No. 6 (After Discount) and considering applicable discount offered by the bidder in different manner at s. no. 6 of "Letter of Discount", if applicable.

The comparison shall also include the applicable taxes, duties and other levies, which are reimbursable in line with the provisions of the Bidding Documents.

The Employer's comparison will also include the costs resulting from application of the evaluation procedures described in ITB Sub-Clause 27.4 & 27.5.

27.4 The Employer's evaluation of a bid will take into account, in addition to the bid prices indicated in Price Schedule Nos. 1 through 5 (Second Envelope), the following costs and factors that will be added to each Bidder's bid price in the evaluation using pricing information available to the Employer, in the manner and to the extent indicated in ITB Sub-Clause 27.5 and in the Technical Specifications:

(a) The cost of all quantifiable deviations and omissions from the contractual and commercial conditions and the Technical Specifications as identified in the evaluation of First Envelope, and other deviations and omissions not so identified;

(b) The functional guarantees of the facilities offered (not applicable); Bidders shall state the functional guarantees (e.g., performance, efficiency, consumption) of the proposed facilities in response to the Technical Specifications. Plant and equipment offered shall have a minimum (or a maximum, as the case may be) level of functional guarantees specified in the Technical Specifications to be considered responsive. Bids offering plant and equipment with functional guarantees less (or more) than the minimum (or maximum) specified shall be rejected.

(c) The performance of the equipment offered;

Bidder shall state the guaranteed performance or efficiency of the Equipment, in response to the Technical Specifications. Equipment offered shall have a minimum (or a maximum, as the case may be) level of guarantees specified in the Technical Specifications to be considered responsive. Bids offering plant and equipment with guarantees less (or more) than the minimum (or maximum) specified shall be rejected.

(d) the extra cost of work, services, facilities, etc., required to be provided by the Employer or third parties;

(e) any other relevant factors listed in **bidding document**

The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the contract, shall not be taken into account in bid evaluation.

27.5 Pursuant to ITB Sub-Clause 27.4, the following evaluation methods will be followed:

(a) Contractual and commercial deviations
(Not Applicable)

(b) Functional Guarantees of the facilities
(Not Applicable).

(c) Performance Guarantees of the Equipment

For the purpose of evaluation, no adjustment to the bid price towards performance guarantees of the Equipment is applicable. However, the provision of Technical Specification, Volume-II of the Bidding Documents and Clause ITB 27.4 (c) shall prevail.

- (d) Work, services, facilities, etc., to be provided by the Employer

Where bids include the undertaking of work or the provision of services or facilities by the Employer in excess of the provisions allowed for in the Bidding Documents, the Employer shall assess the costs of such additional work, services and/or facilities during the duration of the contract. Such costs shall be added to the bid price for evaluation.

- 27.6** Any adjustments in price that result from the above procedures shall be added, for purposes of comparative evaluation only, to arrive at an **“Evaluated Bid Price”**. Bid prices quoted by bidders and rectified as per ITB Sub Clause 27.2 shall remain unaltered.

28. Purchase/ Domestic Preference

- 28.1** No purchase preference is presently applicable for the Plant and Equipment to be supplied under the Contract.

No margin of domestic preference will be allowed in evaluation and comparison of bids.

29. e-Reverse Auction (e-RA)

- 29.1.** Employer shall conduct the electronic Reverse Auction (e-RA), The same shall be carried out in the manner as indicated herein below.
- 29.2.** Based on “Evaluated Bid Price” determined pursuant to ITB Sub Clause 27.6, the Bidders shall be ranked in an ascending order. Basis such ranking, the lowest ranked $N/2$ bidders (in case “N is even) or $(N+1)/2$ bidders (in case „N is odd), subject to minimum of three (03) bidders, shall be invited to participate in the e-Reverse Auction (e-RA), where “N” is the number of bidders whose bids have been found to be responsive and their “Evaluated Bid Price” has been determined in accordance with ITB Sub Clause 27.6.
- 29.3.** However, in case only bids of two bidders are found to be responsive whose “Evaluated Bid Price” has been determined in accordance with ITB Sub Clause 27.6, the e-RA would be carried out with both the parties.
- 29.4.** The Applicable Ceiling Price for e-RA for bidders shall be “Evaluated Bid Price” determined in accordance with ITB Sub Clause 27.6. During e-RA, these Bidders shall be permitted to place their prices lower than the Applicable Ceiling Price.
- 29.5.** The e-RA shall be conducted on a designated electronic platform of any Application Service Provider (hereinafter referred to as “ASP”), for and on behalf of the Employer.
- 29.6.** The Qualified Bidders shall be permitted to place their Final Offer on the electronic bidding platform, which is lower than zero point zero five (0.05) % of the prevailing bid price.
- 29.7.** The initial period for conducting the e-reverse bidding should be at least 30 minutes which will be extended by 10 minutes from the last received bid time, if the bid is received during the last 10 minutes of the scheduled or extended bid time. Subsequently, it will be extended again by 10

minutes from the latest received bid time.

- 29.8. Notwithstanding above, the bidder(s) who either do not submit the requisite compliances for e-RA do not participate in e-RA, their original price bid as opened, if valid, shall be considered for evaluation.
- 29.9. In the event of identical evaluated bid price from the Initial Offer having been arrived for one or more Bidders, all such Bidders shall be assigned the same rank for the purposes of determination of Qualified Bidders.
- 29.10. The Employer shall be the sole judge in this regard

30. Confidentiality and Contacting the Employer

- 30.1** After the public opening of bids, information relating to the examination, clarification, and evaluation of bids and recommendations concerning awards shall not be disclosed to Bidders or other persons not officially concerned with this process until the publication of contract award. From the time of bid opening to the time of contract award, if any Bidder wishes to contact the Employer on any matter related to its bid, it should do so in writing.
- 30.2** Any effort by a Bidder to influence the Employer in the Employer's bid evaluation, bid comparison or contract award decisions may result in rejection of the Bidder's bid. The Employer shall be the sole judge in this regard.

F. Award of Contract

31. Award Criteria

- 31.1** Subject to ITB Clause 32, the Employer will award the contract to the successful Bidder (also referred to as the L1 Bidder) whose bid has been determined to be substantially responsive and to be the lowest evaluated bid, further provided that the Bidder is determined to be qualified, as per the Qualification Requirement specified in Qualification Requirement, (Section-III of Vol-I) to perform the contract satisfactorily.
- 31.2** –Deleted–
- 31.3** The Employer reserves the right to vary the quantity of any of the spares and/or delete any items of spares altogether at the time of Award of Contract.
- 31.4** The mode of contracting with the successful bidder will be as per stipulation outlined in ITB Sub-Clause 31.4.1 which is briefly indicated below:
- 31.4.1 The Contracts to be entered into with the successful Bidder shall be as under:
- (i) First Contract: For Ex works supply of all equipment and materials including mandatory spares and Type Test (if applicable) to be conducted (whether in India or abroad) (**Supply of Goods** Contract).
 - (ii) Second Contract: For providing all services i.e. inland transportation for delivery at site, **In-transit** insurance, unloading, storage, handling at site, installation, Testing and Commissioning including performance testing in respect of all the equipment supplied under the "First Contract", and any other services specified in the Contract Documents (**Supply of Services** Contract).

- (iii) The award of two separate Contracts shall not in any way dilute the responsibility of the Contractor for the successful completion of the facilities as per Specification and a breach in one Contract shall automatically be construed as a breach of the other Contract(s) which will confer a right on the Employer to terminate the other Contract(s) also at the risk and the cost of the Contractor.
- (iv) The Contract will be signed in two originals and the Contractor shall be provided with one signed original and the rest will be retained by the Employer.
- (v) The Contractor shall provide free of cost to the Employer all the engineering data, drawing and descriptive materials submitted with the bid, in at least two (2) copies to form a part of the Contract immediately after Notification of Award.

Both contracts will contain a cross fall breach clause specifying that breach of one will constitute breach of the other.

32. Employer's Right to Accept any Bid and to Reject any or all Bids

- 32.1** The Employer reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to award of contract, without thereby incurring any liability to the affected Bidder or bidders or any obligation to inform the affected Bidder or bidders of the grounds for the Employer's action.

33. Notification of Award

- 33.1** Prior to the expiration of the period of bid validity, the Employer will notify the successful Bidder in writing, that its bid has been accepted. The notification of award will constitute the formation of the contract.
- 33.2** The Employer shall publish the results on its website, identifying the bid and Specification numbers and the following information: (i) name of each Bidder who submitted a Bid; (ii) bid prices displayed as per e-form at bid opening; (iii) name and evaluated prices of each Bid that was evaluated; (iv) name of bidders whose bids were rejected and the reasons for their rejection; and (v) name of the winning Bidder, and the price it offered, as well as the duration and summary scope of the contract awarded.

The Employer shall promptly respond in writing to any unsuccessful Bidder who, after notification of award in accordance with above, requests in writing the grounds on which its bid was not selected.

- 33.3** Upon the successful Bidder's furnishing of the performance security pursuant to ITB Clause 35, the Employer will promptly discharge the bid securities, pursuant to ITB Sub-Clause 13.4 & 13.5.

34. Signing the Contract Agreement

- 34.1** At the same time as the Employer notifies the successful Bidder that its bid has been accepted, the Employer in consultation with the Bidder will prepare the Contract Agreement provided in the Bidding Documents, incorporating all agreements between the parties.
- 34.2** The Contract Agreement shall be executed within Fifteen (15) days of the Notification of Award and the successful Bidder and the Employer shall sign and date the Contract Agreement immediately thereafter.

35. Performance Security

35.1 Within Fifteen (15) days from the issuance of Notification of Award, the successful Bidder shall furnish the performance security for 10% (Ten percent) of the contract price plus additional performance securities, if any, in line with the requirement of Qualification Requirements, in the amount given in the bidding document and in the form provided in Section IX, Sample Forms and Procedures, of the Bidding Documents. The performance security of a joint venture shall be in the name of joint venture.

35.2 Failure of the successful Bidder to comply with the requirements of ITB Clause 34 or Clause 35 shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security, in which event the Employer may make the award to the next lowest evaluated Bidder or call for new bids.

36. Fraud and Corruption

It is the Employer's policy that requires the Bidders, suppliers and contractors and their subcontractors under the contracts to observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, the Employer:

(a) defines, for the purpose of this provision, the terms set forth below as follows:

- i) "corrupt practice" is the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;
- ii) "fraudulent practice" is any act or omission, including a misrepresentation, that knowingly or recklessly misleads or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;
- iii) "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;
- iv) "coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;
- v) "obstructive practice" is

(aa) deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Employer's investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation;

or

(bb) acts intended to materially impede the exercise of the Employer's inspection and audit rights.

(b) will reject a proposal for award if it determines that the bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for the contract in question;

- (c) will sanction a firm or individual, including declaring ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for, or in executing, a contract; and
- (d) will have the right to require that the provision be included in Bidding Documents and in contracts, requiring Bidders, suppliers, and contractors and their sub-contractors to permit the Employer to inspect their accounts and records and other documents relating to bid submission and contract performance and to have them audited by auditors appointed by the Employer.

-- End of Section-II (ITB) --

Bidder's guide for Bidding through excel based uploading in RECTPCL portal:

1. Use Internet Explorer to go to https://www.mstcecommerce.com/eprochome/rectpcl/buyer_login.jsp

The screenshot displays the RECTPCL portal homepage. At the top, there are logos for REC, MSTC Limited, and IBM. Below the logos is a navigation bar with links: Home, About Us, Terms of Use, Notices, Privacy Policy, Corporate site, and Contact Us. The main content area is divided into three sections. On the left is the 'RECTPCL Login' section with fields for Username and Password, and buttons for Login, Reset, Reset Password?, and Reset Password without. In the center is the 'Bulletin Board' section with a 'Live Tenders' list (1. Tender No. RECTPCL/17-18/ET/3 for RECTPCL TEST 3) and a 'Forthcoming Tenders' section. On the right is the 'Vendor Login' section with fields for Username and Password, and buttons for Login, Reset, Reset Password?, and Register as Vendor. Below the login sections are links for Vendor Guide, Java Download, FAQ, and Download NIT/Corr. At the bottom, there is a copyright notice: copyright©MSTC Limited 2014.

2. On the right side of the page click on Register as a Vendor:

The screenshot shows the 'Vendor Login' section of the portal. It features a teal background with a yellow header. There are input fields for Username and Password, and buttons for Login and Reset. Below these are links for Reset Password? and Register as Vendor.

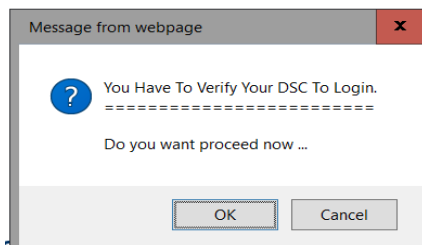
3. Fill the form that appears to create username and password.

The screenshot shows the 'MSTC Limited' e-Procurement portal. The breadcrumb trail is 'e-Procurement > Vendor > New Registration'. The form is divided into several sections: 'Personal Information' (Company Name, Contact Person, Company Type), 'User Preferences' (Choose a Username, Choose a Password, Retype Password), 'Your Contact Details' (Email Id, Mobile Phone No, Day Phone, Fax No), and 'Your Contact Address' (Street, City, Pin, District, Country, State). A red asterisk indicates mandatory fields. A link 'Click here to check availability of your User Id' is provided next to the username field.

4. Once the registration is done, login with your user name and password:

The screenshot shows the 'Vendor Login' page. It has a teal background. The 'Username' field contains 'rectplvendor1'. The 'Password' field is masked with dots. There are 'Login' and 'Reset' buttons. Below the login fields, there are links for 'Reset Password?' and 'Register as Vendor'.

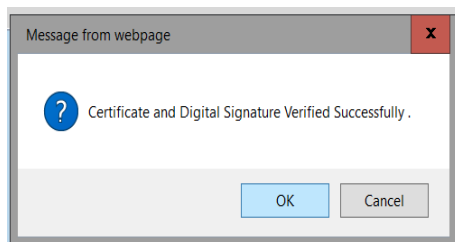
5. System will ask you to verify your digital signature



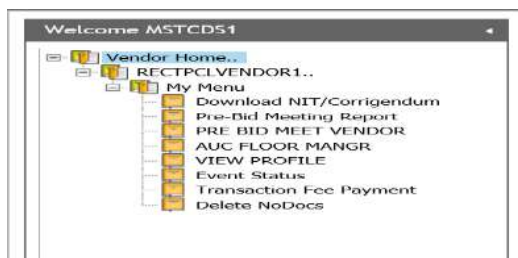
6. Press Ok and select your digital signature from the List:



7. Your digital signature will be verified



8. Once login is complete, a bidder can access My Menu through the left side of the page:



9. Here click on Download NIT/Corrigendum button to download the NIT/Corrigendums. Select Event number and click on download to download the files:



10. After going through NIT, a bidder will be required to submit the transaction fee before submitting the bid. To submit transaction fee click on transaction fee payment and select tender number. The transaction fee amount will be input by the system automatically. A bidder can deposit the transaction fee through Debit Card/Credit card/Net Banking by selecting the online payment option or through NETF/RTGS. Payment through online mode is authorized immediately while through NEft/RTGS is authorized by the system upon receipt of payment (this can take approx. 1 working day).

Select a Event :	RECTPCL/17-18/ET/3
Transaction fee :	5750.0
Select Payment Type:	☐ NEFT/RTGS ☒ Online Payment
Proceed To Payment	

11. After the transaction fee is paid a bidder can proceed to Auc-Floor Manager through the left side My menu. In Auc floor manager click on live events to view a list of Live events. In live events select the tender number where you wish to submit a bid. (tenders have the denotation ET while e-Reverse Auctions have denotation RA).

Welcome MSTCDS1

Vendor Home...
RECTPCLVENDORL...
My Menu
Download NIT/Corrigendum
Pre-Bid Meeting Report
PRE BID MEET VENDOR
AUC FLOOR MANGR
VIEW PROFILE
Event Status
Transaction Fee Payment
Delete NoDocs

Welcome MSTCDS1
Log Out

Hi MSTCDS1

e-Procurement Event Info
Server Time : 2017/5/16 11:34:37

Select Buyer : REC Transmission Projects Company Ltd

Live e-Procurement Events :

Forthcoming e-Procurement Events :

e-Procurement Event Listing For Live e-Procurement Events

e-Procurement Event No.	e-Procurement Event Start Date	e-Procurement Event Close Date
MSTC/17-18/RA/1	2017-05-16 10:12	2017-05-19 14:30
RECTPCL/17-18/ET/3	2017-05-16 10:05	2017-05-19 13:00

12. On clicking the tender number following screen will appear:

Hi MSTCDS1

EVENT INFO

Events Details
Current Server Time: 7.11.2017 12:11:23 IST

Event No	Event Type	Event Start Time	Event Close Time
RECTPCL/17-18/ET/19	3Cover_Price_Bid_Upload_in_Excel	30.10.2017 16:30:00	10.11.2017 17:00:00

ITEM NO	ITEM Name	Cover 3	Final Submission	Withdraw Bid	Delete Bid	Bid Status
1	1	Download Upload Price	Final Submission	Withdraw Bid Submit regret letter with	Delete Bid	Qualification part Bid Saved
2	2	Download Upload Price	Final Submission	Withdraw Bid Submit regret letter with	Delete Bid	Technical Saved

13. The first step towards submitting the bid is Cover 1 on the left side. Click on Cover 1 and fill the form given therein. Conditions with agree have to be necessarily agreed, while in the conditions with empty remarks field bidder can give their comments.

(PLEASE ENTER ALL VALUES AND CLICK ON SAVE BUTTON TO SAVE YOUR OPINIONS)		
Purchaser's Specification		Agree
1 Technical Terms		
1.1	a	Agree Agree with remarks
1.2	a	Remarks
1.3	a	AGREE
1.4	a	Agree Agree
1.5	a	AGREE

14. After the common terms are saved, a bidder can proceed to saving the Cover 2. To fill Cover 2 form click on cover 2 and fill the form therein.

(PLEASE ENTER ALL VALUES AND CLICK ON SAVE BUTTON TO SAVE YOUR QUOTE)		
ITEM INFO : Dismantling of both end terminations of existing oil filled cables as per scope of work mentioned in Technical Specification		
Purchaser's Specification		Agree
1 Commercial Terms		
1.1	a	AGREE
1.2	a	AGREE
1.3	a	AGREE
1.4	a	AGREE
1.5	a	AGREE

15. Once Cover 2 are saved, proceed with submitting the price bid. Click on Download button to download the Excel sheet for Price Bid.

Do you want to open or save 17-18-ET-19-5312-38840-Book2.xls (19.0 KB) from mstcauction.com?	Open	Save	Cancel	X

16. Fill up the excel sheet as per the details given therein and tender document.

17. To upload the filled up excel click on Upload Price Button, click on browse to select the file and then click on Upload and Save encrypt file.

18. Once all the covers are saved, click on upload documents on the top to upload documents for the said tender. Select the cover for which document are being uploaded. A list of previously uploaded files will be visible at the bottom of the screen:

19. After the documents have been uploaded, click on final submit to finally submit the bid. In case of any amendments after final submit, click on delete bid button to delete the techno-commercial and price bids and resubmit the same. Please note that at the end the bid must be final submit, otherwise the same will not be considered.

E-Reverse Auction:

20. The Financial Bid will comprise of two rounds. In the first round, the total Initial Price Offer (submitted online along with the Cover 1 and 2) of the Technically Qualified bidders shall be opened and total Initial Price Offer shall be ranked on the basis of ascending order for determination of the L-1 bid. This L-1 Bid shall become the ceiling price for start of e-reverse auction. The qualified bidders shall be permitted to place their Final Price Offer on the electronic bidding platform which must be lower than 0.05% of prevailing L-1 Price. Prevailing L-1 price will be displayed to all the bidders up to the point no other bidder out bids that offer by quoting a lower price. All bidders may reduce their bids by any amount in the multiples of 0.05% of prevailing L-1 bid (rounded to the nearest whole number) by bidding any number of times for the duration of the auction. The initial period for conducting e-reverse auction shall be 30 minutes which will be extended by 10 minutes from the last received bid time if the bid is received during the last 10 minutes of the scheduled or extended bid time. Subsequently, it will be extended again by 10 minutes from the latest received bid time.

21. At the close of the e-Reverse auction the successful bidder will be notified by email that their bid amount _____ received in the system is the lowest amount in the system. They will be required to give a break up of the bid quoted by them. The break up should be pro rata reduced (without disturbing amount of taxes) from their initial price offer at Tender stage.
-

SECTION-III, VOL-I
QUALIFICATION REQUIREMENT

Qualification Requirement of the Bidder

Transmission Line Package: : “Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”. i) Package 03-RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik, ii) Package 04-RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum, iii) Package 05-RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum

QUALIFICATION OF THE BIDDER

Qualification of bidder will be based on meeting the minimum pass/fail criteria specified below regarding the Bidder’s Technical Experience, Manufacturing Facilities, Equipment Capabilities and Financial Position as demonstrated by the Bidder’s responses in the corresponding Bid Schedules. Subcontractors’ technical experience and financial resources shall not be taken into account in determining the Bidder’s compliance with the qualifying criteria. The bid can be submitted by an individual firm or a Joint Venture of two or more firms. (Specific requirements for Joint Ventures are given under Para 1.4 below).

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

RECTPCL reserves the right to waive minor deviations if they do not materially affect the capability of the Bidder to perform the contract.

1.1 Technical Experience

- (i) The bidder shall have completed physical construction of transmission line project(s) involving tower foundation, erection and stringing of not less than following cumulative route length of 220 kV or higher voltage class transmission line as a prime contractor or as a partner in a joint venture+ within the last seven (07) years as on the originally scheduled date of bid opening.

For Package: RECTPCL/PIA/JKPDD/TL-03: 51 kms

For Package: RECTPCL/PIA/JKPDD/TL-04: 52 kms

For Package: RECTPCL/PIA/JKPDD/TL-05: 53 kms

+Note: In case of works executed under a contract that had been awarded on a Joint Venture, the experience of individual Joint Venture partner shall be considered limited to the scope of that partner under the said contract.

- (i) The bidder should have completed physical construction involving tower foundation, erection and stringing of following cumulative route length of 220 kV or above voltage level line in mountainous region as on the originally scheduled date of bid opening– **50 km.**

“In case bidder is a holding company, the technical experience referred to in clause 1.1

Qualification Requirement of the Bidder

Transmission Line Package: : “Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”. i) Package 03-RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik, ii) Package 04-RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum, iii) Package 05-RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum

above shall be of that holding company only (i.e. excluding its subsidiary/group companies). In case bidder is a subsidiary of a holding company, the technical experience referred to in clause 1.1 above shall be of that subsidiary company only (i.e. excluding its holding companies).”

1.2 Manufacturing Facilities

a) The Bidder should have its own manufacturing facilities for the Transmission Line towers and tower parts having the following minimum manufacturing capacities and manufacturing experience :-

i) Manufacturing capacity per financial year

For Package: RECTPCL/PIA/JKPDD/TL-03: 12012 MT

For Package: RECTPCL/PIA/JKPDD/TL-04: 11506 MT

For Package: RECTPCL/PIA/JKPDD/TL-05: 10814 MT

ii) Manufacturing experience: Average quantity of latticed steel structures(transmission line tower parts, microwave tower parts, substation structures etc.) manufactured per financial year, during the last three financial years should not be less than :

For Package: RECTPCL/PIA/JKPDD/TL-03: 6006 MT

For Package: RECTPCL/PIA/JKPDD/TL-04: 5753 MT

For Package: RECTPCL/PIA/JKPDD/TL-05: 5407 MT

b) Alternatively, the Bidder should have assured access from tower manufacturer(s) **(one or two for each package)** meeting **collectively** the requirement of para 1.2(a) (i) & (ii) above. In such a case, the bidder shall furnish Joint Deed of Undertaking (Format Enclosed) alongwith the manufacturer(s) in the bid to guarantee quality & timely supply of tower parts and confirming to furnish a performance guarantee of **2%** of the cost of such tower parts from each of the manufacturer(s). This will be in addition to 10% contract performance guarantee to be submitted by the contractor on award of contract. However, one of the manufacturer including bidder (Manufacturer A) may be having established manufacturing facilities for tower parts but may not have manufacturing experience subject to the following conditions:

(i) the tower parts sourced from such manufacturer (Manufacturer A) shall not exceed 40% of the total tower parts requirement under the contract,

(ii) such manufacturer(Manufacturer A) should have established manufacturing, testing facilities & quality system for transmission line tower parts.

(iii) The Bidder/Contractor shall furnish an undertaking in the bid to source tower supply from an established manufacturer meeting the requirement of 1.2a (i) & (ii) above (to the extent of balance quantity to be supplied) in case of default of such

Qualification Requirement of the Bidder

Transmission Line Package: : “Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”. i) Package 03-RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik, ii) Package 04-RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum, iii) Package 05-RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum

manufacturer (Tower Manufacturer A).

For bidders to qualify for more than one package, the manufacturing capability shall not be less than the sum of the requirements stipulated for the packages he proposes to qualify for.

1.3 Financial Position

For the purpose of this particular bid, bidders shall meet the following minimum criteria

- (a) Net worth for last 3 financial years should be positive.**
- (b) Minimum Average Annual Turnover *(MAAT) for best three years i.e. 36 months out of last five financial years of the bidder should be**
 - For Package: RECTPCL/PIA/JKPDD/TL-03: Indian Rs. 212.25 Crore**
 - For Package: RECTPCL/PIA/JKPDD/TL-04: Indian Rs. 217.56 Crore**
 - For Package: RECTPCL/PIA/JKPDD/TL-05: Indian Rs. 222.61 Crore**

***Note-** Annual total income as incorporated in the profit & loss account excluding non-recurring income, i.e., sale of fixed assets

- (c) Bidder shall have liquid assets (L.A) or/and evidence of access to or availability of credit facilities of not less than**
 - For Package: RECTPCL/PIA/JKPDD/TL-03: Indian Rs. 35.37 Crore**
 - For Package: RECTPCL/PIA/JKPDD/TL-04: Indian Rs. 36.26 Crore**
 - For Package: RECTPCL/PIA/JKPDD/TL-05: Indian Rs. 37.10 Crore**

For Bidders to qualify for more than one package, their financial position shall not be less than the sum of the requirement for the packages they propose to qualify for.

In case bidder is a holding company, the **financial position criteria** referred to in clause 1.3 above shall be of that holding company only (i.e excluding its subsidiary/ group companies). In case bidder is a subsidiary of a holding company, the **financial position criteria** referred to in clause 1.3 above shall be of that subsidiary company only (i.e excluding its holding company)

Note: However, bidders (lead partner of Joint Venture) are permitted to participate in all the packages (i.e. TL-03, TL-04 & TL-05) but not more than one packages shall be awarded to a particular bidder

1.4 Joint Venture Bids

Qualification Requirement of the Bidder

Transmission Line Package: : “Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”. i) Package 03-RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik, ii) Package 04-RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum, iii) Package 05-RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum

- a) In case a bid is submitted by a Joint Venture(JV) of two or more firms as partners, joint venture must comply with the following minimum criteria:
 - (i) **All the partners of the JV shall meet individually the Financial Position criteria given at 1.3 (a) above.**
 - (ii) The lead partner of Joint Venture shall meet not less than 50% of the Technical Experience criteria given at Para 1.1(i) above and not less than 40% of the Financial Position criteria given at Para 1.3 **(b) & (c)** above.
 - (iii) Each of the other partner(s) shall meet individually not less than 25% of the Technical Experience criteria given at Para 1.1(i) above or not less than 50 % of Manufacturing Facilities criteria given in para 1.2 above and not less than 25 % of the Financial Position criteria given at Para 1.3 **(b) & (c)** above.
- b) In case the JV intend to participate in the package proposing supply of tower parts from a manufacturer(s) then the manufacturer(s) shall meet the Manufacturing Facilities criteria given at para 1.2 above.
- c) The joint venture must collectively meet the criteria given at para 1.1, 1.2 and 1.3 above for which purpose the relevant figure of Technical Experience, Manufacturing Facilities and Financial Position **(Para 1.3 (b) & (c))** for each of the partners of the JV shall be added together.
- d) In case of Joint Venture, the following conditions shall also apply:
 - i. the bid, and in case of successful bid, the specified Form of Agreement shall be signed so as to be legally binding on all partners. (Form enclosed).
 - ii. one of the partners shall be nominated as Lead Partner, and the Lead Partner shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the Joint Venture, and the entire execution of the Contract shall be done with the Lead Partner and payment under the contract shall be received by the Lead Partner on behalf of the Joint Venture as per power conferred to him in the Power of Attorney. The authorization shall be evidenced by submitting a Power of Attorney signed by legally authorized signatory of all the partners as per Performa in section-VI of the Conditions of Contract, Volume-1 of the Bidding Document. The payment under the Contract can also be received by other partner(s) based on authorization of Lead Partner.
 - iii. all partners of the Joint Venture shall be liable jointly and severally for the execution of the Contract in accordance with the Contract terms, and a statement to this effect shall be included in the authorization mentioned under (ii) above as well as in the Bid Form and in the Contract Form (in case of a successful bid).

Qualification Requirement of the Bidder

Transmission Line Package: : “Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”. i) Package 03-RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik, ii) Package 04-RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum, iii) Package 05-RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum

- iv. Agreement entered into by the Joint Venture partners shall be submitted with the bid.

SECTION-IV, VOL-I
GENERAL CONDITIONS OF CONTRACT (GCC)

SECTION - IV

GENERAL CONDITIONS OF CONTRACT

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SECTION-IV
GENERAL CONDITIONS OF CONTRACT

CLAUSE-1: DEFINITIONS:

In the Contract, as hereinafter defined, the following words and expressions shall have the meanings hereby assigned to them, except where the context otherwise requires:

- i) 'RECTPCL'/'Purchaser'/'Implementing Agency' means the REC Transmission Project Company Ltd. and the legal successor in title to the RECTPCL, who will employ the contractor. 'Owner' means the State Government of concerned state where the works are to be executed.
- ii) 'Contractor/Supplier' means the person or persons, firm or company, group of firms or Joint Venture, who has been awarded the work by the RECTPCL and includes the Contractor's personnel, representatives, successors and permitted assigns.
- iii) 'Engineer-in-Charge' means the Additional Chief Executive Officer of RECTPCL.
 - (a) 'Engineer-in-Charge's Representative' means the Chief Project Manager and Project Engineers of the project. The Site in-charge will assist the Engineer-in-charge's representatives to perform the duties set forth in Clause-2 hereof, whose authority shall be notified in writing to the Contractor by the Engineer-in-Charge.
 - (b) The responsibilities assigned herewith as above in iii (a) to various officers does not absolve them from taking the approval from the competent authority under various state laws/rules/regulations and book of financial powers.
- iv) "Works" shall include both permanent Works and Temporary Works or either of them as appropriate and shall mean supply of Goods and Services.
- v) "Temporary Works" means all temporary Works of every kind other than Contractor's plant, equipment and machinery required in or about the execution and completion of the Works and remedying of any defects --therein.
- vi) "Permanent Works" means the permanent Works to be executed in accordance with the Contract.
- vii) The 'Goods' means all the equipment, machinery and/or other materials which the Contractor is required to supply to RECTPCL under the Contract.
- viii) 'Services' means services ancillary to the supply of Goods such as but not limited to transportation and insurance from ex-works till defect liability period, handling, storage and preservation at store/site, erection, testing, painting, commissioning of goods, training and other such obligations of the Contractor covered under the Contract.
- ix) 'Contract' means the agreement entered into between RECTPCL and the Contractor as recorded in the Form of Agreement, signed by both the parties including all attachments and appendices thereto and all documents incorporated by reference there in. The Contracts to be entered into with the successful Bidder shall be as defined in **SCC**.

- x) 'Contract Price' means the sum as stated in the Letter of Award payable to the Contractor under the contract for full and proper performance of his contractual obligations i.e. providing goods and services and remedying any defects therein in accordance with the provisions of the Contract.
- xi) 'Plant' and 'Equipment' or 'Machinery' means and include plant, equipment, machinery, tools, appliances, other implements of all description or things of whatsoever nature other than the Temporary Works required in or about the execution and completion of the Works and remedying of any defects therein but does not include materials or other things intended to form or forming part of the Permanent Works.
- xii) 'Specifications' means the specifications of Works included in the Contract and any modification thereof or addition thereto or deduction there from as may, from time to time, decided by RECTPCL and/or submitted by the Contractor and approved in writing by the Additional Chief Executive Officer, RECTPCL.
- xiii) 'Drawings' means the drawings referred to in the Contract and any modification of such drawings approved in writing by the Engineer-in-Charge and such drawings, as may , from time to time, be furnished by RECTPCL and/or the Contractor and approved in writing by the Additional Chief Executive Officer, RECTPCL.
- xiv) 'Site' means the places where the Works are to be executed and any other places as may be specifically designated in the Contract as forming part of Site.
- xv) 'Store' means the place where the goods supplied under this Contract are stored by the Contractor near to the Project site. Such place will be treated as forming part of site.
- xvi) 'Approved' means approved in writing, including subsequent written confirmation of previous verbal approval and 'approval' means approval in writing, including as aforesaid.
- xvii) 'Consultant' means company/individual as appointed by owner/employer.
- xviii) Chief Engineer means Chief Manager (Technical), RECTPCL.
- xix) Development Commissioner (Power) means Representative of the Owner of the Project.
- xx) 'GoI' means The Government of India.
- xxi) 'Sub-Contractor' means the party or parties having direct contract with the Contractor and to whom any part of the Works has been sublet by the Contractor with the consent, in writing, of the Engineer-in-Charge and the legal successors in title to such person, but not any assignee of any such person.
- xxii) 'Manufacturer' means the party proposing to design and/or manufacture the Goods as specified, complete or in part.
- xxiii) 'Letter of Award' means the letter from RECTPCL conveying award of Works subject to such reservations as may have been stated therein.

- xxiv) 'Tests on Completion' means the tests specified in the Contract or otherwise agreed to by RECTPCL and the Contractor to be performed before the Works are taken over by RECTPCL.
- xxv) 'Day' means a day from midnight to midnight.
- xxvi) 'Month' means from the beginning of a given date of a calendar month to the end of the preceding date of the next calendar month.
- xxvii) 'Week' means seven consecutive days.
- xxviii) 'Quarter' means a period of three consecutive months starting from January, April, July and October i.e. January to March, April to June, July to September and October to December.
- xxix) 'C.E.A.' means Central Electricity Authority.
- xxx) 'Near Relative' means wife/husband, parents and grandparents, children, first cousins, brothers-in-law, sisters-in-law and parents-in-law.
- xxxi) 'Rupees' means Rupees in Indian Currency.
- xxxii) Words in singular number shall include the plural number and vice-versa where the context so requires. 'He' shall include 'She' and vice – versa.
- xxxiii) 'IS' Means Indian Standard specifications with latest amendments or revision as currently in force at the time of execution of the Works.
- xxxiv) 'Bill of Quantities'/ 'Price Schedule' means the priced and completed bill of quantities.
- xxxv) 'Project Manager' means the person appointed from time to time by the Contractor and notified in writing to the RECTPCL to act as the in-charge for the purpose of the Contract. The Project Manager shall have a minimum of 12 years' experience in the related field, out of which at least 5 years' experience shall be at executive level in "transmission works at 220 KV level"

CLAUSE-2 DUTIES AND POWERS OF ENGINEER-IN-CHARGE AND ENGINEER-IN-CHARGE'S REPRESENTATIVE:

- i) The Engineer-in-Charge shall carry out the duties specified in the Contract.
- ii) The Engineer-in-Charge may exercise the authority specified in or necessarily to be implied from the Contract, provided however, that if the Engineer-in-Charge is required to obtain the specific approval from a Competent Authority before exercising any such authority, he will do so and convey the decision to the Contractor.
- iii) The Engineer-in-Charge's Representative will be appointed by and be responsible to the Engineer-in-Charge and will carry out such duties and exercise such authority as may be delegated to him by the Engineer-in-Charge under Sub Clause (iv) of this Clause. He shall have no authority to relieve the Contractor of any of his duties or obligations under the Contract nor, except as expressly provided hereunder or elsewhere in the Contract, to order any work

involving delay or any extra payment by the RECTPCL, nor to make any variation in the Works.

- iv) The Engineer-in-Charge may, from time to time delegate to the Engineer-in-Charge's Representative any of the powers and authorities vested in the Engineer-in-Charge and he may at any time revoke such delegation. Any communication issued by the Engineer-in-Charge's Representative to the Contractor in accordance with such delegation shall have the same effect as though it had been issued by the Engineer-in-Charge. Provided that:
 - a. any failure of the Engineer-in-Charge's Representative to disapprove any work or materials shall not prejudice the authority of the Engineer-in-Charge thereafter to disapprove such work or materials and to give instructions for the removal or for the rectification thereof.
 - b. If the Contractor questions any communication of the Engineer-in-Charge's Representative, he may refer the matter to the Engineer-in-Charge who will confirm, reverse or vary the contents of such communication.
- v) The Engineer-in-Charge may have any number of persons to assist the Engineer-in-Charge's Representative in carrying out of his duties. Such assistants shall have no authority to issue any instructions to the Contractor, except in so far as such instructions may be necessary to enable them to carry out their duties and to secure their acceptance of materials, plant, equipment and machinery or workmanship as being in accordance with the Contract, and any instructions given by any of them for those purposes shall be deemed to have been given by the Engineer-in-Charge's Representative.
- vi) Instructions given by the Engineer-in-charge shall be in writing, provided that if for any reason the Engineer-in-charge considers it necessary to give any such instruction orally, the contractor shall comply with such instruction. Confirmation in writing of such oral instruction given by the Engineer-in-Charge, whether before or after carrying out of the instruction, shall be deemed to be an instruction within the meaning of this sub-clause. Provided further that if the Contractor, within seven days, confirms in writing to the Engineer-in-Charge any oral instructions of the Engineer-in-Charge and such confirmation is not contradicted in writing within seven days by the Engineer-in-Charge, it shall be deemed to be an instruction of the Engineer-in-Charge. The provisions of this sub-Clause shall equally apply to instructions given by the Engineer-in-Charge's Representative and any assistants of the Engineer-in-Charge or the Engineer-in-Charge's Representative pursuant to Sub-Clause (v).

CLAUSE-3 ASSIGNMENT OF CONTRACT

The Contractor shall not, without the prior consent of the RECTPCL, assign the Contract or any part thereof, or any benefit or interest therein or there under, otherwise than by:

- (i) A charge in favour of the Contractor's bankers of any monies due or to become due under the Contract, or

- (ii) Assignment to the Contractor's insurers (in cases where the insurers have discharged the Contractor's loss or liability) of the Contractor's right to obtain relief against any other party liable.

CLAUSE-4 SUBLETTING:

- (i) The Contractor shall not sublet the whole of the Works except where otherwise provided by the Contract, the Contractor shall not sublet any part of the Works without the prior written consent of the Engineer-in-charge. However, any such consent shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the acts, defaults and neglects of any sub-contractor, his agents, servants or workmen as fully as if they were the acts, defaults or neglects of the Contractor, his own agents, servants or workmen. Provided that the Contractor shall not be required to obtain such consent for:
 - a) The provision of labour, or
 - b) The purchase of materials which are in accordance with the standards specified in the Contract, or
 - c) The subletting of any part of the Works for which the sub-contractor is named in the Contract.
- (ii) The Contractor shall furnish un-priced copies of the major sub-contracts (costing more than Rs. 5.0 million) to RECTPCL wherever these are executed. This action would, however, not involve RECTPCL in any complications arising between the Contractor and his sub-contractor(s) or any other liabilities. This action would also be without prejudice to the provision under this Clause.
- (iii) In the event of a sub-contractor having under taken the Contract in respect of the work executed or the goods, materials, plant, equipment and machinery or services supplied by such sub-contractor, any continuing obligation extending for a period exceeding that of the Defects Liability Period or its extension under the Contract, the Contractor shall at any time, after the expiration of such period, assign to the RECTPCL, the benefit of such obligation for the unexpired duration thereof.

CLAUSE-5: LANGUAGE(S) AND LAW:

- i
 - a) The Contract Documents shall be drawn up in English. All correspondence and documents relating to the Contract, exchanged by the Contractor and RECTPCL shall be submitted in the prescribed form in English. All supporting documents and printed literature in connection with the Contract shall be in English. In case the supporting documents and printed literature are in any other language, these shall be accompanied by an appropriate translation in English and in that case, for the purpose of interpretation, the English translation shall govern.
 - b) **Governing Law & its Jurisdiction:**
The Contract shall be governed by and interpreted in accordance with laws of Union of India and the Courts of New Delhi shall have exclusive jurisdiction in all matters arising under this Contract.
- ii **Documents Mutually Explanatory**

Several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the documents shall

take precedence in the order in which they are set out in the proforma of Contract Agreement (attached in Sample Forms & Procedures, Section-IX, Vol-I).

CLAUSE-6: DRAWINGS:

- i) After the award of Contract, the supplier & purchaser will hold design co-ordination meetings to finalize steps to be taken to implement the Contract including procedure for submission of drawings, design details & approval thereof in such a manner & procedures which would bring out workable solution to step by step process. At least seven print copies of all the drawings for any part of the Work and seven copies of complete design calculations shall be submitted by the Contractor for approval, at least ninety days prior to the date on which such drawings are required to ensure that the work is carried out in accordance with the approved program Work. The Engineer-in-charge shall accord and convey the approval to the design calculation and drawings, if found in order, within 30(thirty) days from the receipt of the drawings from the Contractor. Otherwise he shall apprise the Contractor of his comments on such design calculations and drawings within the above mentioned period.
- ii) Where such comments are communicated to the Contractor, the Contractor shall be bound to ensure that 4 print copies of all the revised drawings and 4 copies of revised design calculations, in view of these comments, are submitted to the **Additional Chief Executive Officer, RECTPCL, New Delhi**. (Engineer-in-charge) within fifteen days of receipt of these comments. Similar course of action, as aforesaid, shall be taken by the **Additional Chief Executive Officer, RECTPCL, New Delhi** on the revised designs calculation and drawings. On receipt of approval of drawings/design processes/design calculation etc. The Contractor shall furnish four print copies (four copies of A1 or higher size) and two (2) nos. paper type reproducible copies of approved drawings and four copies of approved design calculation to **Additional Chief Executive Officer, RECTPCL, New Delhi** within 30 days of such approval. In addition, 2 sets of CDs of computer/AutoCAD drawings of such approved drawings shall also be supplied.
- iii) Notwithstanding the approval of the **Additional Chief Executive Officer, RECTPCL, New Delhi** to the Contractor's design and drawings, the Contractor shall be responsible for the stability of Works in accordance with the provisions of the Contract and the approval accorded shall not absolve him of his responsibility for meeting all requirements of specifications.
- iv) One copy of the approved drawings shall be kept by the Contractor on the site and the same shall, at all reasonable times, be available for inspection and use by the Engineer-in-Charge and the Engineer-in-Charge's Representative and by any other person authorized by the Engineer-in-Charge.
- v) **Additional Chief Executive Officer, RECTPCL, New Delhi** shall, however, have full power and authority to modify, from time to time, during the progress of Works, the drawings approved previously in consultation with the contractor, as shall be necessary for the purpose of proper and adequate execution and completion of Works. The Contractor, shall carry out and be bound by such modification.
- vi) Final Drawings

After completion of the erection work the Contractor shall furnish 5 copies (3 copies of A1 or higher size and 2 copies of A3 size duly bound in folder) and one copy on reproducible tracing cloth or velograph of final as built drawings of work. For computer/AutoCAD drawn drawings, two sets of CDs containing such drawings shall be supplied. Each set shall include an index showing the drawing number, Revision No. & titles.

vii) Record Drawings

Prior to shipment of the equipment, the Contractor shall furnish to Purchaser one complete set of full size permanent reproducible cloth or film copies of approved quality and type and one full size set of prints of all supplier's drawings of structures, foundations, material etc. as finally built, including any suggested modification. In addition, five (5) bound sets of half-size prints of all Contractor's drawings shall be furnished. Each set shall include an index showing the drawing numbers and titles and shall be bound for permanent reference.

viii) Instructions/ Procedures for Storage & Preservation, Installation/Erection, Testing & Commissioning at Site and Operation & Maintenance of Goods.

The Contractor shall submit 7 sets of written detailed Instructions/Procedures in English language, for Storage & Preservation, Installation/Erection, Testing & Commissioning at site and Operation and Maintenance manual for each component of Transmission Line. The instructions/procedures shall be submitted as early as possible so that final reviewed copies can be made available to the field for use in planning the work well in advance of actual installation and operation. After review, seven (7) durable bound copies of the final instructions shall be furnished. Each of these copies shall have a presentation similar to a hard-bound book resistant to wear and tear and firmly holding each of the pages. A book shall contain a maximum of approximately 240 pages to offer easy handling; if the material requires more space, the manual shall be divided into two (2) or more volumes. Each volume shall have its title, printed on the front of the binding and on the back of the book. The paper used, the reproduction technique, the binding, and the presentation shall be of an approved quality and type. 2 sets of CDs containing final Instructions/Procedures shall also be furnished.

ix) The RECTPCL specification drawings, specifications and other information to the Contractor shall remain the property of the RECTPCL. They shall not, without the consent of the RECTPCL, be used, copied or communicated to a third party by the Contractor unless necessary for the purposes of this Contract.

x) The Contractor shall be responsible for any errors or omissions in the Contractor's drawings unless they are due to incorrect RECTPCL specification drawings or other written information supplied by the RECTPCL. Errors, if any, noticed by the Contractor in the RECTPCL drawings, specification and other information shall, however, be promptly pointed out by the Contractor to the RECTPCL. Approval by the Additional Chief Executive Officer, RECTPCL, New Delhi of the Contractor's drawings shall not relieve the Contractor from any responsibility under this Sub-Clause.

xi) The Contractor shall bear all costs which he may incur as a result of delay in providing drawings and other information or as a result of errors or omissions therein, for which he is responsible.

- xii) The Contractor shall, at his own cost, carry out any alterations or remedial work necessitated by such errors or omissions for which he is responsible and modify the drawings and such other information accordingly.

CLAUSE-7: CONTRACTOR'S GENERAL RESPONSIBILITIES:

(i) Contractor to carry out Work with care and diligence.

The Contractor shall, in accordance with the Contract and with due care and diligence, design, manufacture, assemble, test at manufacturer's Works before dispatch, transport to site, store and preserve, assemble and erect, test and commission the Goods and carry out the Works within the Time for Completion. The Contractor shall also provide all necessary plant, equipment and machinery, superintendence, labor and all necessary facilities required for completion of works thereof.

(ii) Contractor Responsible for Stability and Safety of Site Operations.

The Contractor shall take full responsibility for the adequacy, stability and safety of all site operations and methods of execution, notwithstanding any approval by the Engineer-in-Charge. The Contractor shall provide, at his cost sufficient illumination, firefighting equipment in and around the place of work to the satisfaction of Engineer-in-Charge. Further, Contractor shall follow the safety precautions as covered in Section-8 of this Document.

(iii) Instructions and Orders in Site Order Book.

All instructions and orders given by the Engineer-in-Charge or his Representative at site are to be maintained in the Site Order Book and shall be taken to have been conveyed to the Contractor for his compliance.

(iv) Contractor's Site Office.

The Contractor must have a site office to receive normal correspondence between 10 AM and 5 PM on working days and urgent correspondence at any time on all days.

(v) Shift Works

To achieve the required progress, the Work, may be required to be carried out round the clock. The time for completion and number of working days shall not be affected by the number of shifts each day. No extra amount on account of any shift work is payable to the Contractor.

Whenever the work is carried out in shifts, notice to this effect shall be given by the Contractor to the Engineer-in-Charge regarding the details of Works he intends to carry out in shifts so that necessary supervision arrangements can be made.

(vi) Contractor to keep Site Clean

- a) During the progress of the Works, the Contractor shall keep the site reasonably free from all unnecessary obstructions and shall remove from site any of his plant, equipment and machinery, surplus material or temporary works, no longer required. The Contractor

shall also keep the site clean, tidy and orderly at all times and remove from site any wreckage, rubbish, scrap, packing material etc. promptly.

- b) In case the Contractor does not keep the area clean and if found necessary to get the area cleaned, the Engineer-in-Charge shall issue a notice of forty-eight hours to the Contractor. In the event of non-compliance by the Contractor, the Engineer-in-charge shall get the area cleaned by some other agency. The cost of such cleaning shall be borne by the Contractor. In case of rubbish, accumulating due to deposition by more than one Contractor, the share of charges to be borne by the Contractors as indicated by the Engineer-in-Charge shall be final.

(vii) Clearance of Site on Completion

On the completion of the Works, the contractor shall clear away and remove from the Site all his plant, equipment and machinery, surplus materials, rubbish and Temporary Works of every kind, and leave the whole of the Site and Works clean and in a workman like condition to the satisfaction of the Engineer-in-Charge

(viii) Giving of Notices, Payment of Fees and Compliance with Statutes and Regulations etc.

- a) Giving of Notices and Payment of Fees

The Contractor shall give all notices and pay all fees required to be given or paid under any National or State Statute, Ordinance, or other Law, or any regulation, or bye-law of any local or other duly constituted authority in relation to the execution of Works and by the rules and regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the Works.

- b) Compliance with Statutes, Regulations etc.

The Contractor shall conform, in all respects, with the provisions of any such Statute, Ordinance or Law as aforesaid and the regulation or bye-law of any local or other duly constituted authority which may be applicable to the Works and with such rules and regulations of public bodies and companies as aforesaid and shall keep the RECTPCL indemnified against all penalties and liability of every kind for breach of any such Statute, Ordinance or Law, regulation or bye-law.

- c) Statutory Obligations

If the cost to Contractor in the performance of the Contract shall be increased or reduced by reasons of the making, passing or promulgation of any law after 30 days prior to the latest date of submission of bids, any order, regulation or by-law having the force of the law, the amount of such an increase or reduction shall be added to or deducted from the Contract Price as the case may be.

(ix) Opportunities for Other Contractors

- (a) The Contractor shall, in accordance with the requirements of the Engineer-in-Charge, afford all reasonable opportunities for carrying out their Works to:
- any other Contractors employed by the RECTPCL, and workmen, and
 - the workmen of the RECTPCL, and
 - the workmen of any duly constituted authorities who may be employed in the execution on or near the Site of any work not included in the Contract or of any Contract which the RECTPCL may enter into in connection with or ancillary to the Works.

- (b) The Contractor shall jointly use with other Contractors and the RECTPCL, approach roads, access roads and adits, drainage and other facilities. The use of other Contractor's facilities shall be coordinated by the Engineer-in-Charge between the Contractors, if required, for execution of the Works connected with the project. (Cost, if any, on this account shall be settled between the Contractors concerned).

The use of common facilities shall be coordinated by the Engineer-in-Charge through meetings of various parties. In case of any conflict, the decision of the Engineer-in-Charge in the matter shall be binding on all the parties.

- (c) If any part of the Contractor's work depends, for proper execution or results, upon the work of any other Contractor, the Contractor shall inspect and promptly report in writing to the Engineer-in-Charge, any defects in such work that render it unsuitable for such proper execution and results. His failure to inspect and report shall constitute an acceptance of other Contractor's work as fit and proper for the reception of his own work, except as to defects, which may develop in the other Contractor's work after the proper execution of his own work.

(x) Patent Rights and Royalties.

- (a) The Contractor shall indemnify the RECTPCL from and against all claims and proceedings for or on account of infringement of any patent rights, designs, trademark or name or other protected rights in respect of any of his plant, equipment and machinery or materials used for or in connection with the Works or any of them and from and against all claims, proceedings, damages, costs, charges and expenses, whatsoever, in respect thereof or in relation thereto.

Except where otherwise specified, the Contractor shall pay all royalties, rent and other payments or compensation, if any, for getting any materials required for the Works.

- (b) In the event of any claims made under or action brought against RECTPCL in respect of any such matters, as aforesaid, the Contractor shall be immediately, notified thereof and the Contractor shall be at liberty, at his own expense, to settle any disputes or to conduct any litigation that may arise there from, provided that the Contractor

shall not be liable to indemnify the RECTPCL if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Engineer-in-Charge in this behalf.

(xi) Packing

- a) The Contractor shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit to the final destination as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, humid and salt laden climate (where applicable) and precipitation during transit and open storage. Packing case size and weights shall take into consideration, the remoteness of the Goods' final destination, the existing road condition and the absence of heavy handling facilities at all points in transit.

- b) **Project storage site**

The Contractor shall submit instructions for packing, handling, marking, storage code and documentation within and outside the package for approval by the Engineer-in-Charge. The packing, handling, marking, storage code and documentation within and outside the package shall comply strictly with such instructions. These instructions can be modified/changed at any time during the execution of works by the Engineer-in-Charge and Contractor shall comply with such instructions.

(xii) Delivery and Documents

- a) Delivery of the Goods shall be made by the Contractor in accordance with the terms specified in the Contract. The Contractor shall warrant that the goods supplied under the Contract are new, unused, of most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract. The Contractor further warrants that the goods supplied under this Contract shall have no defect arising from design, materials workmanship, installation or erection or from any act of omission of the supplier that may develop under normal use of supplied goods in conditions available at site.
- b) The Contractor shall carryout all the required tests at his works as per approved Quality Assurance Plan. No material/goods shall be dispatched unless required shop tests have been performed and Material Dispatch Clearance Certificate (MDCC) has been issued by the Engineer-in-Charge after witnessing the tests.
- c) The Contractor shall request the Engineer-in-Charge for issue of MDCC as under:
 - i) In case tests at works are not to be witnessed by RECTPCL, Contractor shall carryout these tests through reputed and recognized test houses of India and submit the test certificates to Engineer-in-Charge along with request for issue of MDCC for that component.

- ii) In case test at works are to be witnessed by RECTPCL, Contractor shall submit test certificates to the Engineer-in-Charge after such inspection along with a request for issue of MDCC for that component.
- iii) MDCC shall be issued within 15 (fifteen) days after the approval of test certificates.

The Contractor shall be responsible for arranging Import License and Customs clearance (wherever required). The RECTPCL will assist the Contractor where required, in arranging Import License and Import Duty exemption certificate and obtaining clearance through the Customs. Any assistance that the RECTPCL can give to the Contractor shall be provided on a “no responsibility basis”.

(xiii) Communication and Transport

Bidder may visit the site prior to bidding and make sure about Transportation of Material to site.

(xiv) Transportation and Storage/Preservation

- (a) The Contractor is required under the Contract to undertake transportation of goods from Ex-works to Project Site including clearing, forwarding and handling, storage and preservation at site, intermediate location (if any) and further transportation to work site, including handling wherever required. All necessary transportation equipment including lifting and handling equipment shall be provided and/or hired by the Contractor at his own cost.
- (b) Where the Contractor is required to effect delivery under any other terms, for example, by post or to another address, the Contractor shall be required to meet all the expenses until delivery on the site.

(xv) Spares

- (a) The Contractor shall carry sufficient inventories to assure ex-stock supply of spares and same shall be supplied as promptly as possible but in any case within six months of placement of order.
- (b) It shall be mandatory for the Contractor to specify the unit rates and prices for the spares as specified in the Schedule of Prices. The RECTPCL, however, reserve the right, during the execution of Contract, to vary the quantity of spares specified in the Schedule of Prices.

(xvi) Quality Assurance

In order to ensure that the Goods to be supplied under this Contract and the civil works to be executed meet the specification requirements, the Contractor shall prepare a comprehensive quality assurance plan and submit the same within 30 days after commencement date of the Contract to the Engineer-in-charge (**Additional Chief Executive Officer, RECTPCL, New Delhi**) for approval. Any national or International quality assurance certificates such as IS: 14000

series/ISO 9000 series obtained by the Contractor along with its validity period shall be stated.

CLAUSE-8: CONTRACT AGREEMENT:

The Contractor shall, when called upon to do so, enter into and execute a Contract Agreement in the Proforma (attached in Section-IX, VOL-I) of Bidding Document, with such modification as may be necessary.

CLAUSE-9: PERFORMANCE SECURITY:

- (i) For the due performance of the Contract, the Contractor shall, within 15 (fifteen) days of receipt of notification of award but not later than the date of signing of the Contract Agreement, furnish to the RECTPCL, a performance security for an amount equivalent to 10 (ten) percent of the Contract Price. The cost of complying with the requirements of this Clause shall be borne by the Contractor, unless the Contract otherwise provides.

Apart from the Contractor's performance security, the Contractor shall be required to arrange additional performance securities, as specified in SCC, within fifteen (15) days of the notification of award in favour of the Employer in the form acceptable to the Employer.

- (ii) The performance security shall be in the form of an irrevocable Bank Guarantee on the Proforma (attached in Section-IX, VOL-I). The Bank Guarantee shall be in favour of the Accounts Officer with **Additional Chief Executive Officer, RECTPCL, New Delhi**, issued by any Nationalized /Scheduled Indian Bank.
- (iii) The proceeds of the performance security shall be payable to RECTPCL as compensation for any loss, resulting from Contractor's failure to complete his obligation under the Contract.
- (iv) The performance security shall be valid until 30 days after the date of issue of Defects Liability Certificate. No claim shall be made against the performance security after the issue of the Defects Liability Certificate and the performance security will be discharged and returned to the Contractor thirty days after the Defects Liability Period.
- (v) If the completion of last Defects Liability Period is extended due to the delays attributable to the Contractor, he shall, at his own cost, get the validity period of Bank Guarantee extended. The Contractor shall furnish the extended revised Bank Guarantee one month before the expiry date of the Original Bank Guarantee or any extension thereof. In case the extended/revised Bank Guarantee is not received by RECTPCL within the specified period, the RECTPCL, entirely at its discretion, shall be at liberty to encash the aforesaid Bank Guarantee.

CLAUSE 10: INSPECTION OF SITE:

- (i) The Contractor shall be deemed to have inspected and examined the Site and its surroundings and information available in connection therewith and to have satisfied himself, as to
 - (a) the form and nature thereof

- (b) the hydrological and climatic conditions
 - (c) the extent and nature of work, materials and water for construction necessary for the execution and completion of the Works and remedying of any defects therein, and
 - (d) the means of access to the Site and the accommodation he may require and, in general, shall be deemed to have obtained all necessary information as to risks, contingencies and all other circumstances.
- (ii) The Contractor shall be responsible for the interpretation of any data supplied by the RECTPCL.

CLAUSE-11: SUFFICIENCY OF BID:

The Contractor shall be deemed to have satisfied himself as to the correctness of the rates and prices stated in the Schedule of Prices, all of which shall, except in so far as it is otherwise provided in the Contract, cover all his obligations under the Contract and all matters and things necessary for the proper execution and completion of the Works and remedying of any defects therein.

CLAUSE-12: WORK TO BE IN ACCORDANCE WITH THE CONTRACT:

The Contractor shall execute and complete the Works and remedy any defects therein in strict accordance with the Contract to the satisfaction of the Engineer-in-Charge and shall comply with and adhere strictly to the Engineer-in-Charge's instructions and directions on any matter whether mentioned in the Contract or not, touching or concerning the Works. The Contractor shall take instructions and directions only from the Engineer-in-Charge, or, subject to the limitations referred to in Clause-2 hereof, from the Engineer-in-charge's Representative.

CLAUSE-13: PROGRAMME TO BE FURNISHED:

- (i) The Contractor shall within 30 days after the Commencement Date, submit to the Engineer-in-Charge, for his approval a detailed work programme in Primavera along with 2 sets of CDs of same indicating the following:
- (a) The order in which the Contractor proposes to carry-out the Works (including design, manufacture, supply, erection, testing and commissioning) so as to complete the works within specified time schedule.
 - (b) The times when submission and approval of the Contractor's drawings are required (time frame for this shall conform to that set out under Clause-6 hereof).
 - (c) The times by which the Contractor requires the RECTPCL
 - to furnish data/specification drawings, if any
 - to have completed any other associated Works

The approval by the Engineer-in-charge of the programme shall not relieve the Contractor from any of his obligations under the Contract.

- (ii) The programme shall cover activities on the site and procurement and delivery activities and no material alteration to such programme shall be made without prior approval of Additional Chief Executive Officer, RECTPCL, New Delhi
- (iii) The programme shall be in the form of a network diagram which shall show in detail and in orderly sequence all activities, their descriptions, duration, and dependencies or precedencies, necessary to the completion of the Works.
- (iv) The Contractor shall base his programme on the completion times and periods and other relevant Contract requirements and shall co-ordinate his programme with information given to him by the Engineer-in-Charge concerning the project programme and programme of other Contractors to be engaged on the site to the extent that this can be done within the framework of the periods and information available at the time.
- (v) The Contractor shall, supply to the Engineer-in-Charge, at such times as he may direct during the progress of the Works, such written particulars, photographs and information as are reasonably required by the Engineer-in Charge to enable a progress record to be maintained in respect of the Works.
- (vi) The Contractor shall also submit a narrative report periodically with updated analysis which shall include but not be limited to the description of the problem areas, current and anticipated, delaying factors and their impact and an explanation of the corrective actions taken or proposed.

CLAUSE-14: CONTRACTOR'S SUPERINTENDENCE:

The Contractor shall provide all necessary superintendence during the execution of the Works and as long thereafter as the Engineer-in-Charge may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. The Contractor, or a competent and authorized representative approved of in writing by the Engineer-in-Charge, which approval may at any time be withdrawn, shall give his whole time to the superintendence of the Works. Such authorized representative shall receive on behalf of the Contractor, instructions from the Engineer-in-Charge or subject to the provisions of Clause-2 hereof the Engineer-in-Charge's Representative. If approval of the representative is withdrawn by the Engineer-in-Charge, the Contractor shall, as soon as is practicable, having regard to the requirement of replacing him as herein after mentioned, after receiving notice of such withdrawal, remove the representative from the Works and shall not thereafter employ him again on the Works in any capacity and shall replace him by another representative approved by the Engineer-in-Charge.

CLAUSE-15: CONTRACTOR'S EMPLOYEES:

- (i) The Contractor shall provide on the Site in connection with the execution and the completion of the Works and the remedying of any defects therein;
 - (a) only such technical assistants as are skilled and experienced in their respective trades and such foremen and leading hands as are competent to give proper superintendence of the Works; and
 - (b) such skilled, semi-skilled and unskilled labour as is necessary for the proper and timely fulfilling of the Contractor's obligations under the Contract.

- (ii) The Engineer-in-Charge shall be at liberty to object to and require the Contractor to remove forthwith from the Works any person provided by the Contractor who in the opinion of the Engineer-in-Charge, misconducts himself, or is incompetent or negligent in the proper performance of his duties, or whose presence on the site is otherwise considered by the Engineer-in-Charge to be undesirable and such persons shall not be again allowed upon the Works without the written consent of the Engineer-in-Charge. Any person so removed from the Works shall be replaced as soon as possible by a competent substitute approved by the Engineer-in-Charge.

CLAUSE-16: EXTRAORDINARY TRAFFIC:

Protection of Highways and Bridges

The Contractor shall use every reasonable means to prevent any of the highways or bridges communicating with or on the routes to the site from being damaged by any traffic of the Contractor or any of his subcontractors and, in particular, shall select routes, choose and use vehicles and restrict and distribute loads so that any such extraordinary traffic, as will inevitably arise from the moving of Goods or his plant, equipment and machinery and materials from and to the site, shall be limited, as far as reasonably possible, and so that no unnecessary damage may be occasioned to such highways and bridges. In case, however, highways and bridges are damaged on account of movement of any traffic of the Contractor, he shall be liable to restore the highways and bridges to their original condition at his expense.

CLAUSE-17: SAFETY, SECURITY AND PROTECTION OF THE ENVIRONMENT:

The Contractor shall, throughout the execution and completion of the Works and the remedying of any defects therein;

- (i) have all the regard for the safety of all persons entitled to be on the site and keep the site (so far as the same is under his control) and the Works (so far as the same are not completed or taken over by the RECTPCL) in an orderly state appropriate to the avoidance of danger to such persons, and
- (ii) provide and maintain, at his own cost all lights, guards, fencing, warning signs and watching, when and where necessary or required by the Engineer-in-Charge or his representative or by any duly constituted authority, for the protection of the machines, equipment, Works or for the safety and convenience of the public or others, and
- (iii) take all reasonable steps to protect the environment on and off the site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation, and shall preserve and protect all existing vegetation such as trees on or adjacent to the site which do not unreasonably interfere with the execution of the Works. The Contractor shall be held responsible for all unauthorized cutting of and damage to trees, by careless operation of his plant, equipment and machinery and stockpiling of materials etc. and the RECTPCL shall have no responsibility on this account.

CLAUSE-18: OBLIGATIONS OF THE RECTPCL:**Access to and Possession of the Site**

The RECTPCL shall, in reasonable time grant the Contractor access to and possession of the site, which may, however, not be exclusive to the Contractor.

CLAUSE-19: LABOUR:**(i) Engagement of Labour**

The Contractor shall make his own arrangements for the engagement of all labour, local or otherwise, for the transport, housing, food, medical care etc. at his own expenses. The contractor shall not employ in connection with the Works any person who has not completed 18 years of age. No female labour shall be employed in the night shift. The Contractor shall not recruit or attempt to recruit his staff and labour from amongst persons in the service of RECTPCL.

The labour force, technical, administrative and other personnel engaged by the Contractor shall be confined to the nationals of India.

(ii) Supply of Water

The Contractor shall, so far as is reasonably practicable, provide on the site, to the satisfaction of the Engineer-in-charge or Engineer-in-Charge's Representative, an adequate supply of drinking and other water for the use of his staff and workmen.

The contractor shall arrange, at his cost, water for construction purposes at site.

(iii) Alcohol Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Statutes, Ordinances and Govt. Regulations or Orders for the time being in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his subcontractors, agents or staff or labour.

(iv) Epidemics

In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulation, orders and requirements as may be made by the Government, or the local medical or sanitary authorities for the purpose of dealing with and overcoming the same.

(v) Disorderly Conduct etc.

The Contractor shall, at all times, take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his staff and labour and for the preservation of peace and protection, of persons and property in the neighborhood of the Works.

(vi) Contractor to follow Labour Laws

The Contractor shall, in respect of labour employed by him, comply with the provision of the various Labour Laws, Minimum Wages Act as per Rules and Regulation as applicable and shall indemnify the RECTPCL in respect of all claims that may be made against the RECTPCL for non-compliance thereof by the Contractor. In case of noncompliance by the contractor, the Engineer-in-Charge may take such actions as may be necessary for compliance of the various Labour Laws and recover the costs thereof from the Contractor.

(vii) Housing for Labour

So far as the Contract otherwise provides, the Contractor shall provide and maintain such accommodation and amenities as he may consider necessary for all his staff and labour, employed for the purpose of or in connection with the Contract, including all fencing, water supply (both for drinking and other purposes), electricity supply, sanitation, cook houses, fire prevention and firefighting equipment, and other requirements in connection with such accommodation or amenities. On completion of the Contract, unless otherwise agreed with the RECTPCL, the temporary camps/housing provided by the Contractor shall be removed and the Site reinstated to its original condition, to the satisfaction of the Engineer-in-Charge.

(viii) Accident Prevention Officer

The Contractor shall have on his staff on Site an officer dealing only with questions regarding the safety and protection against accidents of all staff and labour. This officer shall be qualified for this work and shall have the authority to issue instructions and shall take protective measures to prevent accidents.

(ix) Health and Safety

Due precautions shall be taken by the Contractor, and at his own cost, to ensure the safety of his staff and labour and, in collaboration with and to the requirements of the local health authorities, to ensure that medical staff, first aid equipment and stores, sick bay and suitable ambulance service are available at the camps, housing and on the Site at all times throughout the period of the Contract and that suitable arrangements are made for the prevention of epidemics and for all necessary welfare and hygiene requirements.

(x) Observance by Sub-Contractors

The Contractor shall be responsible for observance by his sub-contractors of the aforesaid provisions.

CLAUSE-20: RETURNS OF LABOUR:

The Contractor shall, deliver to the Engineer-in-Charge or Engineer-in-Charge's Representative or at his office, a return in detail in such form and at such intervals as the Engineer-in-Charge may prescribe showing the supervisory staff and the number of the several classes of labour from time to time employed by the Contractor on the site and such information in respect of the Contractor's plant, equipment and machinery as the Engineer-in-Charge may require.

CLAUSE-21: WORKMANSHIP AND MATERIALS:

(i) Manner of execution

The goods to be supplied shall be manufactured and all Works to be done shall be executed in the manner set out in the Contract.

Where the manner of manufacture and execution is not set out in the Contract, the Work shall be executed in a proper and workman like manner in accordance with recognised good practice and relevant standards.

(ii) Covering up work

The Contractor shall give the Engineer-in-Charge full opportunity to examine, measure and test any work on site which is about to be covered up or put out of view.

The Contractor shall give due notice to the Engineer-in-Charge whenever such work is ready for examination, measurement or testing.

The Engineer-in-Charge shall then, unless otherwise, notifies the Contractor that he considers it unnecessary, without unreasonable delay carry out the examination, measurement or testing

(iii) Uncovering work

If so instructed by the Engineer-in-Charge, the Contractor shall expose any parts of the works. The Contractor shall reinstate and make good such works to the satisfaction of the Engineer-in-Charge.

CLAUSE-22: INSPECTION AND TESTING:

(i) Independent Inspection

The Engineer-in-Charge shall have the right to inspect and/or to test the goods to confirm their conformity to the Contract specifications at no extra cost to the Purchaser. The Technical Specifications shall specify the inspection and tests required by Engineer-in-Charge. The Engineer-in-Charge may, delegate inspection and testing of contracted equipment or a part thereof to an independent Inspector and such independent Inspector shall be considered as the Engineer-in-Charge's Representative. Notice of such appointment shall be given by the Engineer-in-Charge to the Contractor.

(ii) Inspection and Testing During Fabrication/Manufacture

Any departmental representative or independent inspector nominated by Engineer-in-charge shall be entitled during fabrication/manufacture to inspect, examine and test the materials and workmanship and check the progress of fabrication/manufacture of the Goods to be supplied under the Contract. This shall take place on the Contractor's premises. If the Goods are being fabricated/manufactured on other premises, the Contractor shall obtain permission for the Engineer-in-charge to carry out such inspection, examination and testing on those premises.

The contractor shall certify that his persons conducting the tests are qualified specialist on the subject matter of relevant tests.

No such inspection, examination or testing shall release the Contractor from any obligation under the Contract.

(iii) Dates for Inspection and Testing

The Contractor shall give at least 15 days' notice to the Additional Chief Executive Officer, RECTPCL, New Delhi regarding his intention to carry out the tests. The Contractor shall agree with the Additional Chief Executive Officer, RECTPCL, New Delhi about the time and place for the testing of the Goods as provided in the Contract. The inspector nominated by Additional Chief Executive Officer, RECTPCL, New Delhi shall give the Contractor at least 24 hours' notice of his intention to attend the tests.

(iv) Facilities for Testing

Where the Contract provides for tests on the premises of the Contractor or of any sub-contractor, the Contractor shall provide such assistance, documents, labour, materials, electricity, fuel, apparatus and instruments as may be necessary to carry out the tests efficiently.

(v) Certificate of Testing

When the Goods have passed the tests referred to in this Contract, the Additional Chief Executive Officer, RECTPCL, New Delhi shall furnish to the Contractor a certificate within 15 days.

(vi) Rejection

If, as a result of the inspection, examination or testing, the Engineer-in-Charge decides that any work is defective or otherwise not in accordance with the Contract, he may reject such work and shall notify the Contractor thereof immediately. The notice shall state the Engineer-in-Charge's objections with reasons.

The Contractor shall then, with all speed, make good the defect or ensure that any rejected work complies with the Contract.

If the Engineer-in-Charge requires such Works to be re-tested, the tests shall be repeated under the same terms and conditions. All costs incurred for the repetition of the tests shall be borne by the Contractor.

CLAUSE-23: SUSPENSION OF WORKS, TRANSPORTATION OR ERECTION:

(i) Order to Suspend

The Engineer-in-Charge or his representative may, at any time instruct the Contractor to:

- (a) Suspend progress of the Works, or
- (b) Suspend transportation of the Goods, if fabricated/ manufactured at a place other than on the site, which are ready for transportation to the site at the time specified in the programme, or if no time is specified, at the time appropriate for it to be transported, or

- (c) Suspend the erection of the Goods which have been delivered to the site

The Contractor shall, during suspension, protect and secure the Works or Goods affected at the Contractor's Works or elsewhere or on the site, as the case may be, against any deterioration, loss or damage.

(ii) Cost of Suspension

The additional cost, if any, incurred by the Contractor in protecting, securing and insuring the Works or the Goods in following the Engineer-in-Charge or his representative's instructions under Sub-clause (i) of this Clause and in resumption of the Work, shall be added to the Contract Price.

The Contractor shall not be entitled to be paid any additional costs if such suspension is necessary by reason of some default on the part of Contractor.

The Contractor shall not be entitled to additional costs unless he notifies the Engineer-in-Charge or his representative of his intention to make such claim, within 30 days after receipt of the order to suspend progress or transportation or erection.

(iii) Suspension Lasting more than 90 days

If suspension under Sub-Clause (i) of this clause has continued for more than 90 days, and the suspension is not due to Contractor's default, the Contractor may, by written notice to the Engineer-in-Charge, request for permission within 30 days after the expiry of the above period to proceed with the Works.

If permission is not granted within that time, the Contractor may treat the suspension as an omission under Clause-32 hereof, of the section it affects or if the suspension affects the whole of the Works, as an abandonment of the Contract by the RECTPCL.

CLAUSE-24: TIME FOR COMPLETION, EFFECTIVE DATE AND COMMENCEMENT DATE:

The Contract shall become effective on the date of signing of Contract Agreement between RECTPCL & successful bidder. The effective date shall be considered as commencement date.

The time for completion shall be reckoned from Commencement Date i.e. the date of signing of Contract Agreement between RECTPCL & successful bidder. The work i.e. **Transmission Line Package: : "Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages". i) Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik, ii) Package 04- RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum, iii) Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum** is to be completed within **18 months** of date of Award of Contract. The bidder shall submit a bar chart along with the bid giving schedule for completion of entire works covering supply as well as services indicating commencement and completion of each activity and foundation work

considering zero date as the date of signing of Contract Agreement between RECTPCL & successful bidder.

The Works shall be completed and shall have passed the tests as per the prevalent Regulations/Act on completion within the time indicated above.

CLAUSE-25: EXTENSION OF TIME FOR COMPLETION:

The Contractor may claim an extension of the Time for Completion, if the completion of the Works is delayed by any of the following causes:

- (i) Extra or additional work ordered in writing under Clause-32 hereof.
- (ii) Delay by any other Contractor engaged by the RECTPCL, which affects this contract materially.
- (iii) Any suspension of the works under Clause-23 hereof except when due to the Contractor's default.
- (iv) Any force majeure conditions.

The Contractor shall give to the Engineer-in-charge, notice of his intention to make a claim for an extension of time within 14 days of the circumstances for becoming known to the Contractor for such an extension. The notice shall be followed as soon as possible with full supporting details.

The Engineer-in-charge will evaluate such details and grant the Contractor from time to time, either prospectively or retrospectively; such extension of Time for Completion as may be justified provided always that, the circumstances leading to the extension of Time for completion are other than through a default of the Contractor. The Engineer-in-charge shall notify the Contractor accordingly.

CLAUSE-26: RATE OF PROGRESS:

If for any reason, which does not entitle the Contractor to an extension of Time for Completion, the rate of progress of the Works or any section at any time is not commensurate with the time for completion set out under clause 24 hereof and in the opinion of the Engineer-in-Charge does not ensure completion by the prescribed Time or extended Time for Completion, the Engineer-in-Charge shall so notify the Contractor in writing and the Contractor shall thereupon take such steps as are necessary and the Engineer-in-Charge may approve to expedite progress so as to complete the Works or such section by the prescribed time or extended time. The Contractor shall not be entitled to any additional payment for taking such steps.

CLAUSE-27: LIQUIDATED DAMAGES FOR DELAY:

If the Contractor fails to complete the Work as specified in Clause 24 hereof, the purchaser shall, without prejudice to its other remedies under the Contract, deduct the amount from any monies in its hands, due or which may become due to the Contractor, as liquidated damages (which is a genuine pre-estimate agreed by the parties hereto of the loss or damage which the purchaser would have suffered on account of delay without giving any proof of the loss or damages) a sum equivalent to 0.5 % of the Contract price plus GST payable thereon per week of delay or part thereof subject to a maximum of 10% of the Contract price plus GST payable thereon.

The payment or deduction of such damages shall not relieve the Contractor from his obligations to complete the works or from any of his obligations and liabilities under the Contract.

CLAUSE-28: PROLONGED DELAY:

If at any time it appears to the Engineer-in-Charge that the Contractor is unable to adhere to the prescribed time schedule and the delay is not due to a cause for which the RECTPCL or some other Contractor employed by it is responsible or if the aggregate of the liquidated damages levied in terms of the provisions under Clause-27 hereof has reached a maximum of ten percent of the Contract Price, then the RECTPCL may at its discretion, by further notice to the Contractor either:

- i) require the Contractor to complete, or
- ii) may itself complete at the Contractor's risk and cost, provided that it does so in a reasonable manner, or
- iii) terminate the Contract.

If the RECTPCL terminates the Contract, it shall be entitled to recover from the Contractor any loss it has suffered.

CLAUSE-29: TESTS ON COMPLETION:

(i) Notice of Tests

The Contractor shall give to the Engineer-in-Charge, fifteen days' notice of the date after which he will be ready to make the Tests on completion hereinafter called the Tests. Unless otherwise agreed, the Tests shall take place within fifteen days after the said date, on such day or days as the Engineer-in-Charge notifies the Contractor.

(ii) Time for Tests

If the Engineer-in-Charge fails to notify a time after having been asked to do so, or does not attend at the time and place notified, the Contractor shall be entitled to proceed with the Test in his absence and such tests shall be deemed to have been carried out in the presence of Engineer-in-charge.

(iii) Delayed Tests

If the Tests are being unduly delayed by Contractor, the Engineer-in-Charge may, by a notice, require the Contractor to make the Tests within twenty-one days after the receipt of such notice. The Contractor shall make the Tests on such days within that period as the Contractor may fix and of which he shall give notice to the Engineer-in-charge.

If the Contractor fails to make the Tests within twenty-one days, the Engineer-in-Charge may himself proceed with the Tests. All Tests so made by the Engineer-in-Charge shall be at the risk and cost of the Contractor and the cost thereof shall be deducted from the Contract Price. The Tests shall then be deemed to have been made in the presence of the Contractor and the results of the Tests shall be accepted as accurate.

(iv) Facilities for Tests on Completion

Except where otherwise specified, the Contractor shall provide, at his cost, such labour, materials, electricity, fuel, apparatus, and other necessary equipment as may be required to carry out the Tests.

(v) Re-Testing

If the Works or any section fails to pass the Tests, the Engineer-in-Charge may require such Tests to be repeated on the same terms and conditions. The costs on account of repetition of the Tests under this Sub-Clause or under Sub-Clause-31 (vii) hereof shall be borne by the Contractor.

(vi) Disagreement as to Results of Tests

If the Engineer-in-Charge and the Contractor disagree on the interpretation of the Test results, each shall give a statement of his views to the other within fourteen days after such disagreement arises. The statement shall be accompanied by all relevant evidence. In case of such disagreement, the decision of Additional Chief Executive Officer, RECTPCL, New Delhi shall be final.

(vii) Consequences of Failure to Pass Tests on Completion

If the Works or any section fails to pass the Tests on the repetition thereof under Sub-Clause (v) of this Clause, the Engineer-in-Charge Shall be entitled to:

- (a) order one further repetition of the Tests under the conditions of Sub-Clause (v) of this Clause, or
- (b) reject the Works or section in which event the contractor shall replace that part of work or section without any cost to the purchaser within reasonable time without affecting the completion schedule. Testing on this part of work or section shall be performed in the presence of Engineer-in charge or his representative as per procedure specified above.

(viii) Test Certificate

As soon as the Works or any section thereof has passed the Tests, a joint protocol shall be signed based upon which the Engineer-in-Charge shall issue a Certificate to the Contractor to that effect within seven days of signing the protocol and submission of all relevant documents.

CLAUSE-30: TAKING OVER:

(i) Taking over

- a) Upon successful tests/Trial – Operation of the Facilities or any part thereof, pursuant to GCC Clause 29, the Engineer-in-Charge shall issue to the Contractor a Taking Over Certificate as a proof of the acceptance of the Facilities or any part thereof. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of Contract after issue of such certificate.
- b) If within thirty one (31) days after receipt of the Contractor's notice, the Project Manager fails to issue the Taking Over Certificate or fails to inform the Contractor in writing of the justifiable reasons why the Project Manager has not issued the Taking Over Certificate, the Facilities

or the relevant part thereof shall be deemed to have been Taken Over as at the date of the Contractor's said notice.

- c) Upon Taking Over of the Facilities or any part thereof, the Employer shall be responsible for the care and custody of the Facilities or the relevant part thereof, together with the risk of loss or damage thereto, and shall thereafter take over the Facilities or the relevant part thereof.
- d) The Works shall be taken over by the RECTPCL when they have been completed in accordance with the Contract and duly inspected & cleared for energisation by **Electrical Inspection Agency of the employer/Owner**

(ii) Taking Over Certificate

The Contractor may apply to the Engineer-in-Charge for issue of a Taking Over Certificate not earlier than fourteen (14) days before he proposes to carry out commissioning and acceptance tests on each equipment of the facility.

The Engineer-in-Charge shall, within thirty (30) days after the receipt of the Contractor's application either:

- (a) Issue the Taking Over Certificate to the Contractor stating the date on which the Works were complete and ready for taking over, or
- (b) Reject the application giving his reasons and specifying the work required to be done by the Contractor to enable the Taking Over Certificate to be issued.
- (c) The Works shall not be deemed to have been taken over if they are not substantially in accordance with the Contract.

CLAUSE -31: DEFECTS AFTER TAKING OVER:

(i) Defects Liability Period

- a) The expression "Defects Liability Period" shall mean a period of Twelve months from the date the Works are taken over under Clause-30 (i) hereof and the Taking Over Certificate is issued in accordance with Clause-30 (ii) hereof.

Where any part of the Works is taken over separately, the Defects Liability Period for that part shall commence on the date it was taken over.

(ii) Notice of Defects

If any defect appears or damage occurs during the defect liability period, the Engineer-in-Charge shall forthwith notify the Contractor thereof. However, delay or failure of the Engineer-in-Charge in notifying shall not relieve the Contractor from his liability for remedying the defects at his own cost.

(iii) Making Good Defects

Upon the receipt of such notice the Contractor shall be responsible for making good any defect in or damage to any part of the Works which may appear or occur during the Defects Liability Period and which arises from either;

- (a) any defective materials, workmanship or design, or
- (b) any act or omission of the Contractor during the Defects Liability Period.

The Contractor shall make good the defect or damage as soon as practicable and at his own cost.

(iv) Extension of Defects Liability Period

The provisions of this Clause shall apply to all replacements or renewals carried out by the Contractor as if the replacement and renewals had been taken over on the date they were completed.

The Defects Liability Period for the Works shall be extended by a period equal to the period during which the Works cannot be used by reasons of a defect or damage. If only a part of the Works is affected, the Defect Liability Period shall be extended only for that part.

In neither case shall the Defects Liability Period be extended by more than twelve months.

(v) Failure to Remedy Defects

If the Contractor fails to remedy a defect or damage within a reasonable time, the Engineer-in-Charge may fix a final time for remedying the defect or damage.

- (a) If the Contractor fails to do so, the Engineer-in-Charge may carry out the work himself or by others at the Contractor's risk and cost. The costs actually incurred by the Engineer-in-Charge in remedying the defect or damage shall be recovered from any payments due or which may become due to the Contractor.

(vi) Removal of Defective Work

If the defect or damage is such that repairs cannot be expeditiously carried out on the site, the Contractor may, with the consent of the Engineer-in-Charge and after furnishing a proper security acceptable to the RECTPCL in case the item is paid for, remove from the site, for the purposes of repair, any part of the Works which is defective or damaged.

(vii) Further Tests on Completion

If the replacements or renewals are such that they may affect the performance of the Works, the Engineer-in-Charge may request that the Tests on Completion be repeated to the extent necessary. The request shall be made by notice **within thirty days** after the replacement or renewal. The Tests shall be carried out in accordance with Clause-29 hereof.

(viii) Right of Access

Until the Final Certificate of Payment has been issued, the Contractor shall have the right of access to all parts of the Works and to records of the working and performance of the Works.

Such right of access shall be during the RECTPCL normal working hours at the Contractor's risk and cost. Access shall also be granted to any duly authorised representative of the Contractor, whose name has been communicated in writing to the Engineer-in-Charge.

Subject to the Engineer-in-Charge's approval, the Contractor may also, at his own risk and cost, make any tests which he considers desirable.

(ix) Defects Liability Certificate

When the Defect, Liability Period for the Works or any part thereof has expired and the Contractor has fulfilled all his obligations under the Contract for defects in the Works or that part, the Engineer-in-Charge shall issue, within thirty days, to the Contractor, a Defects Liability Certificate to that effect.

No certificate other than the Defects Liability Certificate referred to herein above shall be deemed to constitute approval of the Works.

(x) Exclusive Remedies

The RECTPCL remedies under this Clause shall be in place of and to the exclusion of any other remedy in relation to defects whatsoever.

CLAUSE-32: VARIATIONS:

(i) The RECTPCL may make any variation in the form, quality or quantity of the Works or any part thereof or substitution for original specifications, design, drawings and instructions that may, in his opinion be necessary and for that purpose, or if for any other reason it shall, in his opinion be desirable, he shall have power to order the Contractor to do the following and the Contractor shall do the same;

- a) increase or decrease the quantity of any work included in the Contract,
- b) omit or substitute any such work,
- c) change the drawings, designs specifications, character or quality or kind of any such work,
- d) change the levels, lines, positions and dimensions of any part of the Works,
- e) execute additional work of any kind necessary for the completion of the Works,
- f) change any specified sequence, method or timing of construction of any part of the Works,
- g) change method of dispatch or packing, and

- h) change the place of delivery.

No such variations shall in any way vitiate or invalidate the Contract. Any altered, additional or substituted work which the Contractor may be directed to do in the manner above specified as part of the Work, shall be carried out by the Contractor on the same conditions in all respects on which he agreed to do the main Work.

The contractor may also at any time propose variations of the Works to the Engineer-in-Charge.

(ii) Procedure to order variation:

The Engineer-in-Charge shall notify the Contractor of the nature and form of the variation considered necessary. After having received such notice, the Contractor shall submit to the Engineer-in-Charge.

- a) a description of work, if any, to be performed and a programme for its execution, and
- b) the Contractor's proposal for any modifications to the programme, if considered necessary, according to Clause-25 hereof or to any of the Contractor's obligations under the Contract, and
- c) the Contractor's proposals for adjustment to the Contract Price.

Following the receipt of the Contractor's submission, the Engineer-in-Charge shall, decide as soon as possible whether or not the variation shall be carried out.

1. Changes Originating from Employer

- a. The pricing of any Change shall, as far as practicable, be calculated in accordance with the rates and prices included in the Contract. If such rates and prices are inequitable, the parties thereto shall agree on specific rates for the valuation of the Change.
- b. The Contract Price for (i) the items for which quantities have been indicated as lumpsum or lot or set and/or (ii) where the quantities are to be estimated by the Contractor shall remain constant unless there is change made in the Scope of Work by Employer. The quantities and unit prices (i) subsequently arrived while approving the Bill of Quantities (BOQ)/Billing breakup of lumpsum quantities/lot/Set and/or (ii) estimated by the Contractor shall be for on account payment purpose only. In case additional quantities, over and above the quantities in BOQ/billing breakup and /or estimated by the Contractor, are required for successful completion of the scope of work as per Technical Specification, the Contractor shall execute additional quantities of these items for which no additional payment shall be made over and above the lumpsum Contract Price. In case quantities of these items supplied at site are in excess of that required for successful completion of scope of work, such additional quantities shall be the property of the Contractor and they shall be allowed to take back the same from the site for which no deduction from the lumpsum Contract Price shall be made.

Further, in case actual requirement of quantities for successful completion of scope of work is less than the quantities identified in the approved BOQ/billing breakup and/or estimated by the Contractor, the lumpsum contract price shall remain unchanged and no deduction shall be made from the lumpsum price due to such reduction of quantities.

It shall be the responsibility of the Contractor to pay all statutory taxes, duties and levies to the concerned authorities for such surplus material which would otherwise have been, lawfully payable in case of non-deemed export contracts. The Contractor shall submit an indemnity bond to keep Employer harmless from any liability, before release of such material to the Contractor by Employer.

Set/Lot/Lumpsum shall be governed as per the requirement of the corresponding item description read in conjunction with relevant provisions of Technical Specifications and the Billing breakup referred to above shall be issued by the Employer based on Contractor's request, if and as may be required during the currency of the Contract.

- c. If before or during the preparation of the Change Proposal it becomes apparent that the aggregate effect of compliance therewith and with all other Change Orders that have already become binding upon the Contractor under this GCC Clause 32 would be to increase or decrease the Contract Price as originally set forth in Article 2 (Contract Price and Terms of Payment) of the Contract Agreement by more than the **30 %**, the Employer and the Contractor shall mutually agree on specific rates for valuation of the Change beyond the specified percentage.
- d. If rates and prices of any change are not available in the Contract, the parties thereto shall mutually agree on specific rates for the valuation of the change and all matters therein related to the change. Based on the same, the Employer shall, if it intends to proceed with the Change, issue the Contractor with a Change Order.
- e. The Employer shall issue the Contractor with a Change Order by way of amendment to the Contract or in any other manner deemed appropriate. Even if the Employer and the Contractor cannot reach agreement on the price for the Change, an equitable adjustment to the Time for Completion, or any other matters related to the Change Proposal, the Employer may nevertheless instruct the Contractor to proceed with the Change by issue of a "Pending Agreement Change Order" ("Pending Agreement Amendment").

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

If the parties cannot reach agreement within sixty (60) days from the date of issue of the Pending Agreement Change Order, then the matter may be referred to the Arbitrator in accordance with the provisions of GCC Clause 48.

If the Engineer-in-Charge decides that the variation shall be carried out, he shall notify the Contractor to proceed with the variations. If the Engineer-in-Charge and the Contractor are unable to agree the adjustment of the Contract Price, the provisions of Sub-Clause (iii) of this Clause shall apply.

(iii) Disagreement on Adjustment of the Contract Price

If the Contractor and the Engineer-in-Charge are unable to agree on the adjustment of the Contract Price, the adjustment shall be determined in accordance with the rates specified in the Schedule of Prices.

No payment shall be made for the items of Work ordered to be omitted.

Varied items and additional items of Work which are not provided in the Schedule of Prices, shall be paid on the basis of actual expenditure relating to that item including cost of materials, fabrication/machinery handling and installation at site plus 25% (twenty-five percent) towards overheads including profits.

The price of varied items determined by the Engineer-in-Charge and approved by Additional Chief Executive Officer, RECTPCL, New Delhi shall be final and binding on the Contractor. No claim of the Contractor shall be entertained by RECTPCL in this regard.

(iv) Contractor to Proceed

On receipt of the notification to proceed with the variations, the Contractor shall forthwith proceed to carry out the variation and be bound to these conditions in doing so as if such variation was stated in the Contract.

The work shall not be delayed pending the granting of an extension of the time for completion or an adjustment to the Contract Price under Sub-Clause (iii) of this Clause and the Contractor shall execute the varied work at the same terms and conditions provided in the Contract.

(v) Records of costs

In any case where the Contractor is instructed to proceed with a variation prior to the determination of the adjustment to the Contract Price in respect thereof, the Contractor shall keep records of the cost of undertaking the variation and of time expended thereon. Such records shall be open to inspection by the Engineer-in-Charge at all reasonable times.

(vi) Variations in price:

Variations by the employer: The employer will have the right to vary the contract price by $\pm 20\%$ without any ceiling to the variation of quantity of individual items. No compensation shall be applicable for reducing the quantity. The increased quantity executed shall be built on the same item rates as given in the price schedule. In case of unforeseen circumstances, the Employer reserves his right to delete any Activity Schedule or part thereof.

Variation during actual execution: There may be variation in the executed quantities as per the site conditions. Variation in actual number of quantity

required may be more or less than given in price schedule such variations shall be billed by the contractor on the item rates given in the price schedule for the actually executed quantities.

CLAUSE-33: PAYMENT TERMS AND MODE OF PAYMENT:

- a. The Contract Price shall be paid as specified in the corresponding Appendix - 1 (Terms and Procedures of Payment) to the Contract Agreement. The procedures to be followed in making application for and processing payments shall be those outlined in the same Appendix.
- b. Except otherwise stated in Appendix-1 (Terms and Procedure of Payment) to the Contract Agreement, the payments under the Contract shall be made in the currency or currencies in which the Contract Price has been stated in Contract Agreement, subject to the general principle that payments will be made in the currency or currencies in which the Contract Price has been stated in the Contractor's bid.

33.1 Securities

33.1.1 Issuance of Securities

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

33.1.2 Advance Payment Security

33.1.2.1 The Contractor shall, within fifteen (15) days of the notification of contract award, provide a security in an amount equal to 110% (one hundred ten percent) of the advance payment calculated in accordance with the corresponding Appendix - 1 (Terms and Procedures of Payment) to the Contract Agreement, and in the same currency(ies) with initial validity of up to ninety (90) days beyond the date of Completion of the Facilities in accordance with GCC Clause 30. The same shall be extended by the Contractor time to time till ninety (90) days beyond the actual date of Completion of the Facilities, as may be required under the Contract.

33.1.2.2 The security shall be in the Form of unconditional Bank Guarantee attached hereto in Section IX - Sample Forms and Procedures. The security shall be discharged after completion of the facilities or relevant part thereof.

- Procedure for effective reduction in the Advance Payment Security

The Advance Payment Security shall be allowed to be reduced every six (06) months after First Running Account Bill/Stage payment under the Contract if the validity of the Bank Guarantee is more than one year. The cumulative amount of reduction at any point of time shall not exceed seventy five percent (75%) of the advance corresponding to cumulative value of the Facilities completed as per a certificate to be issued by the Project Manager. It should be clearly understood that reduction in the value of advance Bank Guarantee shall not in any way dilute the Contractor's responsibility and liabilities under the Contract including in respect of the Facilities for which reduction in the value of security is allowed.

CLAUSE-34: CLAIMS

- i) Pursuant to the provisions under the Contract, the procedure for submitting claims by the Contractor shall be as under;
 - a) the Contractor shall give to the Engineer-in-Charge a notice of his intention to make such claim within thirty days after such claim arises stating the reasons for his claim and
 - b) as soon as reasonably practical after the date of such notice, submit to the Engineer-in-Charge full and detailed particulars of his claim, but not later than 90 days after such notice, unless otherwise agreed by the Engineer-in-Charge . The Contractor shall thereafter promptly submit such further particulars as the Engineer-in-Charge may require assessing the validity of the claim.

ii) Assessment

When the Engineer-in-Charge of project has received full and detailed particulars of the Contractor's claim in accordance with Sub-Clause (i) of this Clause and such further particulars as he may have required, he shall determine whether the Contractor is entitled to additional payment and notify him accordingly.

The Engineer-in-Charge project may reject any claim for additional payment which does not comply with the requirements of Sub-Clause (i) of this clause and the decision of the said Engineer-in-charge shall be final and binding on the Contractor.

CLAUSE-35: CURRENCIES FOR PAYMENTS:

The Payments shall be made in Indian Rupees.

CLAUSE-36: RISK AND RESPONSIBILITY:

i Allocation of Risks and Responsibility

The Risks of loss of or damage to physical property and of death and personal injury, which arise in consequence of the performance of the Contract shall be allocated between the RECTPCL and the Contractor as follows:

- (a) The RECTPCL: the RECTPCL Risks as specified in Sub-Clause (ii) below.
- (b) the contractor: The Contractor's Risks specified in Sub-Clause (iii) below.

ii RECTPCL's Risks

The RECTPCL's Risks are:

- (a) loss or damage due to the use or occupation of the Works or any part thereof by the RECTPCL; except as may be provided for in the Contract;

- (b) loss or damage to the extent that it is due to the design of any part of the Works by the RECTPCL or those for whom the RECTPCL is responsible.

iii Contractor's Risks:

The Contractor's Risks are all risks other than those identified as the RECTPCL's Risks.

CLAUSE-37: CARE OF THE WORKS AND PASSING OF RISK:

(i) Contractor's Responsibility for the Care of the Works.

The Contractor shall be responsible for the care of the Works or any section thereof from the Commencement Date until the Risk Transfer Date applicable thereto under Sub-Clause (ii) of this Clause.

The Contractor shall also be responsible for the care of any part of the Works upon which any outstanding work is being performed by the Contractor during the Defects Liability Period until completion of such outstanding work.

(ii) Risk Transfer Date

The Risk Transfer Date in relation to the Works or a section thereof is the earliest of either:

- (a) the date of issue of the Taking Over Certificate, or
- (b) the date when the Works are deemed to have been taken over in accordance with **Clause-30** hereof, or
- (c) the date of expiry of the notice of termination when the Contract is terminated by the RECTPCL in accordance with these Conditions.

(iii) Passing of Risk of Loss or of Damage to the Works

The risk of loss or of damage to the Works or any section thereof shall pass from the Contractor to the RECTPCL on the Risk Transfer Date applicable thereto.

(iv) Loss or Damage Before Risk Transfer Date

Loss of or damage to the Works or any section thereof occurring before the Risk Transfer Date shall:

- (a) to the extent caused by any of the Contractor's risks, be made good forthwith by the Contractor at his own cost, and
- (b) to the extent caused by any of the RECTPCL's Risks, be made good by the Contractor at the RECTPCL's expense if so required by the Engineer-in-Charge within thirty days of the occurrence of the loss or damage. The price for making good such loss and damage shall be in all circumstances reasonable and shall be agreed by the RECTPCL and the Contractor, or in the absence of agreement, the RECTPCL shall fix a reasonable price which shall be final and binding.

(v) Loss or Damage after Risk Transfer Date

After the Risk Transfer Date, the Contractor's liability in respect of loss of or damage to any part of the Works shall, except in the case of gross misconduct, be limited:

- (a) to the fulfillment of the Contractor's obligations under **Clause-31** hereof in respect of defects therein, and
- (b) to making good forthwith loss or damage caused by the Contractor during the Defects Liability Period.

CLAUSE-38: DAMAGE TO PROPERTY AND INJURY TO PERSONS:

(i) Contractor's Liability

Except as provided under Sub-Clause (iii) of this Clause, the Contractor shall be liable for and shall indemnify the RECTPCL against all losses, expenses and claims in respect of any loss of or damage to physical property, death or personal injury occurring before the issue of the last Defects Liability Certificate to the extent caused by;

- (a) defective design, material or workmanship of the Contractor.
- (b) negligence or breach of statutory duty of the Contractor, his sub-contractors or their respective employees and agents.

(ii) RECTPCL's Liability

The RECTPCL shall be liable for and shall indemnify the Contractor against all losses, expenses or claims in respect of loss of or damage to any physical property or of death or personal injury whenever occurring, to the extent caused by any of the RECTPCL's Risks.

(iii) Accidents

The Contractor shall be liable for and shall indemnify the RECTPCL against all losses, expenses or claims arising in connection with the death of or injury to any person employed by the Contractor or his sub-contractors for the purposes of the Works, unless caused by any defaults of the Engineer-in-Charge or other Contractors engaged by the RECTPCL or by their respective employees or agents and in such cases the RECTPCL shall be liable for and shall indemnify the Contractor against all losses, expenses and claims arising in connection therewith.

CLAUSE-39: LIMITATIONS OF LIABILITY:

- (i) Except in cases of gross negligence or willful misconduct,
 - (a) the Contractor and the Employer shall not be liable to the other party for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the Contractor to pay liquidated damages to the Employer and
 - (b) the aggregate liability of the Contractor to the Employer, whether under the Contract, in tort or otherwise, shall not exceed the total Contract Price, provided that this limitation shall not apply to the

cost of repairing or replacing defective equipment, or to any obligation of the Contractor to indemnify the Employer with respect to patent infringement.

(ii) Liability after expiration of Defects Liability Period

The Contractor shall have no liability to the RECTPCL for any loss of or damage to the RECTPCL's physical property which occurs after the expiration of the Defects Liability Period unless caused by gross misconduct of the Contractor.

(iii) Exclusive Remedies

The RECTPCL and the Contractor intend that their respective rights, obligations and liabilities as provided for in these conditions shall alone govern their rights under the Contract and in relation to the Works.

Accordingly, the remedies provided under the Contract in respect of or in consequence of:

- a) any breach of Contract, or
- b) any negligent act or omission, or
- c) death or personal injury, or
- d) loss or damage to any property

are to be to the exclusion of any other remedy that either may have against the other under the law governing the Contract or otherwise.

(iv) Mitigation of Loss or Damage

In all cases the party claiming a breach of contract or a right to be indemnified in accordance with the contract shall be obliged to take all reasonable measures to mitigate the loss or damage.

CLAUSE-40: INSURANCE

Refer Appendix-III, Insurance Requirement, Section-IX, Vol-I,

CLAUSE-41: FORCE MAJEURE:

(i) Definition of Force Majeure

Force Majeure means any circumstances beyond the control of the parties, including but not limited to:

- a) war and other hostilities, (whether war be declared or not), invasion, act of foreign enemies, requisition or embargo;
- b) rebellion, revolution, insurrection, military or usurped power and civil war;
- c) ionising radiation or contamination by radio activity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosives, or other hazardous properties of any explosive nuclear assembly or nuclear components thereof;

- d) riot, commotion or disorder, except where solely restricted to employees of the Contractor or of his sub-contractors.
- e) Earthquake affecting Contractor's work.

(ii) Effect of Force Majeure

Neither party shall be considered to be in default or in breach of his obligations under the Contract to the extent that performance of such obligations is prevented by any circumstances of Force Majeure which arise after the date of the Letter of Award or the date when the Contract becomes effective, whichever is the earlier.

(iii) Notice of Occurrence

If either party considers that any circumstances of Force Majeure have occurred which may affect performance of his obligations, he shall promptly notify the other party.

(iv) Performance to Continue

Upon the occurrence of any situation of Force Majeure, the Contractor shall endeavor to continue to perform his obligations under the Contract so far as reasonably practicable. The Contractor shall notify the Engineer-in-Charge of the steps he proposes to take including any reasonable alternative means for performance which is not prevented by Force Majeure. The Contractor shall not take any such steps unless directed so to do by the Engineer-in-Charge.

(v) Additional Costs caused by Force Majeure

If the Force Majeure events exceed a period of six months and if the Contractor incurs additional costs in complying with the Engineer-in-Charge's directions under Sub-Clause (iv) of this Clause then, the Contractor shall be compensated for the additional costs and expenses during the period of Force Majeure exceeding six months and for the costs and expenses to be incurred for the continuation of execution of the Contract.

(vi) Termination in Consequence of Force Majeure

If circumstances of Forces Majeure have occurred and shall continue for a **period of twelve months** then, notwithstanding that the Contractor may by reason thereof has been granted an extension of Time for Completion of the Works, either party shall be entitled to serve upon the other 30 days' notice to terminate the Contract. If at the expiry of the period of 30 days, Force Majeure shall still continue, the Contract shall be terminated.

(vii) Payment on Termination for Force Majeure

If the Contract is terminated under Sub-Clause (vi) of this Clause, the Contractor shall be paid the value of the work done.

The Contractor shall also be entitled to receive;

- a) the amounts payable in respect of any preliminary items so far as the work or service comprised therein has been carried out and a proper proportion, as certified by the Engineer-in-Charge, of any such item in which the work or service comprised has only been partially carried out,
- b) the cost of materials or goods reasonably ordered for the Works or for use in connection with the Works which have been delivered to the Contractor or of which the Contractor is legally liable to accept delivery. Such materials or goods shall become the property of RECTPCL when paid for by it and the Contractor shall place the same at the RECTPCL's disposal,
- c) the amount certified by the Engineer-in-Charge, being the amount of any expenditures which in the circumstances was reasonably incurred by the Contractor in the expectation of completing the whole of the Works insofar as such expenditure shall not have been covered by any other payments referred to in this Sub-Clause.

CLAUSE-42: DEFAULT:

(i) Notice of Default

If the Contractor is not executing the Works in accordance with the Contract or is neglecting to perform his obligations there under so as to seriously affect the carrying out of the Works, the Engineer-in-Charge or his representative may give notice to the Contractor requiring him to make good such failure or neglect.

(ii) Contractor's Default

If the Contractor;

- (a) has failed to comply, within a reasonable time, with a notice under Sub-Clause (i) of this Clause, or
- (b) assigns the Contract or subcontracts the whole or part of the Works without the RECTPCL's written consent, or
- (c) becomes bankrupt or insolvent, has a receiving order made against him or compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors or goes into liquidation.

The RECTPCL may, after having given seven days' notice to the Contractor, terminate the Contract and expel the Contractor from the site. Any such expulsion and termination shall be without prejudice to any other rights or powers of the RECTPCL under the Contract. The RECTPCL may upon such termination, complete the Works itself or by any other Contractor.

(iii) Valuation at Date of Termination

The Engineer-in-Charge shall, as soon as possible after such termination, certify the value of the Works and all sums then due to the Contractor as at the date of termination in accordance with Clause-33 hereof.

(iv) Payment after Termination

The RECTPCL shall not be liable to make any further payments to the Contractor until the Works have been completed and the Defects Liability Period is over. The RECTPCL shall be entitled to recover from the Contractor the extra costs, if any, of completing the Works after allowing for any sum due to the Contractor under Sub-Clause (iii) of this Clause. If there is no such extra cost, the RECTPCL shall pay any balance due to the Contractor.

(v) Effect on Liability for Delay

The Contractor's liability under Clauses-27 and 28 hereof shall immediately cease when the RECTPCL expels him from the site without prejudice to any liability thereunder that may have already occurred.

CLAUSE 43- INCREASE OR DECREASE OF COSTS

The Contract Price shall be subject to adjustment in accordance with the provisions of Appendix 2 (Price Adjustment) to the Contract Agreement. Apart from this, The Contract Price shall also be subjected to increased or reduced on account of variation in accordance with Clause 32 of GCC.

CLAUSE-44: TAXES AND DUTIES:

(i) For Supply of Goods:

The prices shall include all duties, levies and taxes in India that may be levied according to the Laws and regulation, save, as provided under para 1.13 of 'Information & Instructions' and clause 33 (ii) of the General Conditions of the Contract. Nothing in the contract shall relieve the contractor from his responsibility to pay any tax that may be levied in India on profits made by him in respect of the Contract.

(ii) Income Taxes on Staff

The Contractor's staff, personnel and labour will be liable to pay personal income tax in respect of such of their salaries and wages as are chargeable under the laws and regulations for the time being in force and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws and regulations.

CLAUSE-45: OWNERSHIP:

Ownership of goods shall pass from the Contractor to the RECTPCL on arrival of the goods at site. However, such passing of ownership shall not in any way dilute the responsibility of the Contractor to insure the goods as per Clause-40 hereof and shall not absolve the Contractor of his obligations and liabilities under the Contract. The goods shall be handed over back to the Contractor for performance of services under the Contract for which Contractor shall submit an Indemnity Bond to the purchaser as per proforma attached at SECTION-IX, VOLUME-I.

CLAUSE-46: NOTICES:

(i) Service of Notices on Contractor

All notices or written orders to be given by the RECTPCL or by the Engineer-in-Charge or his representative to the Contractor under the terms of the Contract shall be served either by sending by post to or delivering the same to the Contractor's office on site or his principal place of business, or such other address as the Contractor shall nominate for this purpose.

(ii) Service of Notices

All notices to be given to the Engineer-in-Charge under the terms of Contract shall be served by sending by post or delivering the same to the respective address given below.

Additional Chief Executive Officer

RECTPCL, ECE House, 3rd Floor, Annexe - II, 28A, KG Marg, New Delhi – 110001

(iii) Change of Address

Either party may change a nominated address to another address by prior written notice to the other party.

CLAUSE-47: SETTLEMENT OF DISPUTE:

- i. If any dispute of any kind whatsoever shall arise between the Employer and the Contractor in connection with or arising out of the Contract, including without prejudice to the generality of the foregoing, any question regarding its existence, validity or termination, or the execution of the Facilities, whether during the progress of the Facilities or after their completion and whether before or after the termination, abandonment or breach of the Contract, the parties shall seek to resolve any such dispute or difference, to the extent possible, amicably by mutual consultation.
- ii. If the parties fail to resolve such a dispute or difference by mutual consultation at the execution site level, then the dispute shall be referred by the Contractor to the Project Manager, who, within a period of thirty (30) days after being requested by Contractor to do so, shall give written notice of his decision.
 - a. The decision/instruction of the Project Manager shall be deemed to have been accepted by the Contractor unless notified by the Contractor of his intention to refer the matter for Arbitration within thirty (30) days of such decision/instruction.
 - b. In the event the Project Manager fails to notify his decision as aforesaid within thirty (30) days, the Contractor, if he intends to go for Arbitration, shall notify his intention to the Project Manager within 30 days of expiry of the first mentioned period of thirty days failing which it shall be deemed that there are no dispute or difference between the Employer and the Contractor.
- iii. In case of dispute or difference between the Employer and the Contractor, if the Employer intends to go for Arbitration, he shall notify such intention to the Contractor.

CLAUSE-48: ARBITRATION:

- i. All disputes or differences in respect of which the decision, if any, of the Project Manager and/or the Head of the Implementing Authority has not become final or binding as aforesaid shall be settled by arbitration in the manner provided herein below:
- ii. The arbitration shall be conducted by three arbitrators, one each to be nominated by the Contractor and the Employer and the third to be appointed by both the arbitrators in accordance with the Indian Arbitration Act. If either of the parties fails to appoint its

arbitrator within sixty (60) days after receipt of a notice from the other party invoking the Arbitration clause, the arbitrator appointed by the party invoking the arbitration clause shall become the sole arbitrator to conduct the arbitration.

- iii. The language of the arbitration proceedings and that of the documents and communications between the parties shall be English. The arbitration shall be conducted in accordance with the provisions of the Indian Arbitration and Conciliation Act, 1996 or any statutory modification thereof. The venue of arbitration shall be New Delhi.
- iv. The decision of the majority of the arbitrators shall be final and binding upon the parties. In the event of any of the aforesaid arbitrators dying, neglecting, resigning or being unable to act for any reason, it will be lawful for the party concerned to nominate another arbitrator in place of the outgoing arbitrator.
- v. During settlement of disputes and arbitration proceedings, both parties shall be obliged to carry out their respective obligations under the Contract.

CLAUSE-49: TERMINATION OF CONTRACT FOR RECTPCL's CONVENIENCE:

- (i) The Engineer-in-Charge of RECTPCL shall be entitled to terminate this Contract at any time for the RECTPCL's convenience after recording sufficient reasons and getting approval from the relevant contract committee after providing the contractor an opportunity of being heard for which 30 days' prior notice shall be given to the contractor by the Executive Engineer, in-charge project with a copy to the Engineer, in-charge.
- (ii) In the event of such termination, the Contractor shall be paid by the RECTPCL as provided in Sub-Clause – 41 (vii) hereof.

CLAUSE-50: JOINT VENTURES:

If the Contractor is a joint venture or consortium, all partners of the joint venture shall be jointly and severally liable to the RECTPCL for the execution of the entire Contract in accordance with its terms.

SECTION-V, VOL-I
SPECIAL CONDITIONS OF CONTRACT (SCC)

SPECIAL CONDCTIONS OF CONTRACT

Preamble

This Section of the Bidding Documents shall be named as Special Conditions of Contract (SCC). If there is a conflict between the Section of the bid document namely General Terms & Conditions for Supply and Services, the provisions of this section shall prevail.

SCC Clause No	GCC Clause Ref No	Amendment/Supplement to RECTPCL GCC
1	GCC 1 (x)	Addition of following new Sub-Clauses after GCC 1 (x) GCC 1 (x) (a) The Contracts to be entered into with the successful Bidder shall be as under : - First Contract: For Ex-Works supply of all equipment and materials including mandatory spares and Type Test to be conducted (whether in India or abroad) (Ex-Works Supply Contract) - Second Contract: For providing all services i.e. inland transportation for delivery at site, insurance, unloading, storage, handling at site, installation, Testing and Commissioning including performance testing in respect of all the equipment supplied under the "First Contract", Training to be imparted (whether in India or abroad) and any other services specified in the Contract Documents (Services Contract). GCC 1 (x) (b) The award of two separate Contracts shall not in any way dilute the responsibility of the Contractor for the successful completion of the facilities as per Specification and a breach in one Contract shall automatically be construed as a breach of the other Contract(s) which will confer a right on the Employer to terminate the other Contract(s) also at the risk and the cost of the Contractor. GCC 1 (x) (c) The Contract will be signed in two originals and the Contractor shall be provided with one signed original and the rest will be retained by the Employer. GCC 1 (x) (d) The Contractor shall provide free of cost to the Employer all the engineering data, drawing and descriptive materials submitted with the bid, in at least two (2) copies to form a part of the Contract immediately after Notification of Award.
2	Clause no. 9 (i)	Supplementing Sub-Clause GCC 9 (i) The Contractor shall arrange additional Performance Security (ies), if applicable, as per Clause no. 4 of Joint Deed of Undertaking provided

SCC Clause No	GCC Clause Ref No	Amendment/Supplement to RECTPCL GCC
		at Sl. No. 17 of Section – IX : Sample Forms and Procedures. The said security(ies) shall be required to be extended time to time till thirty (30) days beyond the actual Defect Liability Period, as may be required under the Contract. The Performance Security(ies) to be furnished by the Contractor under the Contract shall be in favour of the Employer. The Owner shall also be entitled to enforce these performance security(ies).
3	Clause Ref No-17	Supplementary Clauses may be read out with GCC Clause no-17 for SAFETY, SECURITY and PROTECTION OF THE ENVIRONMENT: The Employer and the Contractor shall establish Site regulations setting out the rules to be observed in the execution of the Contract at the Site and shall comply therewith. The Contractor shall prepare and submit to the Employer, with a copy to the Project Manager, proposed Site regulations for the Employers approval, which approval shall not be unreasonably withheld. Such Site regulations shall include, but shall not be limited to, rules in respect of security, safety of the Facilities, gate control, sanitation, medical care, and fire prevention. Compliance with Labour Regulations: • During continuance of the contract, the Contractor and his sub-contractors shall abide at all times by all applicable existing labour enactments and rules made there under, regulations notifications and byelaws of the State or Central Government or local authority and any other labour law (including rules), regulations bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. The employees of the Contractor and the Sub-contractor in no case shall be treated as the employees of the Employer at any point of time. • The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. • If the Employer is caused to pay under any law as principal employer such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/ byelaws/Acts/ Rules/regulations including amendments, if any, on the part of the Contractor, the Employer shall have the right to deduct any money due to the Contractor under this contract or any other contract with the employer including his amount of performance security for adjusting the aforesaid payment. The Employer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer. Notwithstanding the above, the Contractor shall furnish to the Employer the details/documents evidencing the Contractors compliance to the laws applicable to establishments engaged in

SCC Clause No	GCC Clause Ref No	Amendment/Supplement to RECTPCL GCC
		building and other construction works, as may be sought by the Employer. In particular the Contractor shall submit quarterly certificate regarding compliance in respect of provisions of Employees' Provident Fund and Misc. Provisions Act 1952 to the Employer. For this purpose, the Contractor as well as its Sub-Contractor(s) should have Provident Fund Code Number and all the workers deployed by the Contractor or Sub-Contractor must be enrolled as members of Provident Fund having an Universal Account Number (UAN). Salient features of some major laws applicable to establishments engaged in building and other construction works: ● Workmen Compensation Act 1923: The Act provides for compensation in case of injury by accident arising out of and during the course of employment. ● Payment of Gratuity Act 1972: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees. ● Employee P.F. and Miscellaneous Provision Act 1952: The Act provides for monthly contribution by the employer plus workers @10% or 8.33%. The benefits under the Act are: ✓ Pension or family pension on retirement or death, as the case may be. ✓ Deposit linked insurance on death in harness of the worker. ✓ Payment of P.F. accumulation on retirement/death etc. ● Maternity Benefit Act 1951: The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc. ● Contract Labour (Regulation & Abolition) Act 1970: The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by law. The Principal Employer is required to take Certification of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more labour contract labour. ● Minimum Wages Act 1948: The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provision of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments. ● Payment of Wages Act 1936: It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers. ● Equal Remuneration Act 1979: The Act provides for payment of equal wages for work of equal nature to Male and Female workers

SCC Clause No	GCC Clause Ref No	Amendment/Supplement to RECTPCL GCC
		and for not making discrimination against Female employees in the matters of transfers, training and promotions etc. • Payment of Bonus Act 1965: The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing Rs. 3500/- per month or less. The bonus is to be paid to employees getting Rs. 2500/- per month or above upto Rs. 3500/- per month shall be worked out by taking wages as Rs. 2500/- per month only. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act. • Industrial Dispute Act 1947: the Act lays down the machinery the procedure for resolution of Industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment. • Industrial Employment (Standing Orders) Act 1946: It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority. • Trade Unions Act 1926: The Act lays down the procedure for registration of trade unions of workmen and employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities. • Child Labour (Prohibition & Regulation) Act 1986: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry. • Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979: The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home upto the establishment and back, etc. • The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996 : All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay cess at

SCC Clause No	GCC Clause Ref No	Amendment/Supplement to RECTPCL GCC
		the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the Building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the government. • Factories Act 1948: The Act lays down the procedure for approval at plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process. Following law be added against Environment Protection: Salient features of some of the major laws that are applicable are given below: • The Water (Prevention and Control of Pollution) Act, 1974, this provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. „Pollution“ means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms. • The Air (Prevention and Control of Pollution) Act, 1981, This provides for prevention, control and abatement of air pollution. „Air Pollution“ means the presence in the atmosphere of any „air pollutant“, which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment. • The Environment (Protection) Act, 1986, This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. „Environment“ includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property. • The Public Liability Insurance Act, 1991, This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or

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		preparation which is defined as hazardous substance under Environment (Protection) Act, 1986, and exceeding such quantity as may be specified by notification by the Central Government. Safety Precautions • The Contractor shall observe all applicable regulations regarding safety on the Site. Unless otherwise agreed, the Contractor shall, from the commencement of work on Site until Taking Over, provide: • fencing, lighting, guarding and watching of the Works, and • Temporary roadways, footways, guards and fences which may be necessary for the accommodation and protection of Employer / his representatives and occupiers of adjacent property, the public and others. • The Contractor shall ensure proper safety of all the workmen, materials, plant and equipment belonging to him or to Employer or to others, working at the Site. The Contractor shall also be responsible for provision of all safety notices and safety equipment required both by the relevant legislations and the Project Manager, as he may deem necessary. • The Contractor will notify well in advance to the Project Manager of his intention to bring to the Site any container filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals which may involve hazards. The Project Manager shall have the right to prescribe the conditions, under which such container is to be stored, handled and used during the performance of the works and the Contractor shall strictly adhere to and comply with such instructions. The Project Manager shall have the right at his sole discretion to inspect any such container or such construction plant/equipment for which material in the container is required to be used and if in his opinion, its use is not safe, he may forbid its use. No claim due to such prohibition shall be entertained by the Employer and the Employer shall not entertain any claim of the Contractor towards additional safety provisions/conditions to be provided for/constructed as per the Project Manager's instructions. Further, any such decision of the Project Manager shall not, in any way, absolve the Contractor of his responsibilities and in case, use of such a container or entry thereof into the Site area is forbidden by the Project Manager, the Contractor shall use alternative methods with the approval of the Project Manager without any cost implication to the Employer or extension of work schedule. • Where it is necessary to provide and/or store petroleum products or petroleum mixtures and explosives, the Contractor shall be responsible for carrying-out such provision and/or storage in accordance with the rules and regulations laid down in Petroleum Act 1934, Explosives Act, 1948 and Petroleum and Carbide of Calcium Manual published by the Chief Inspector of Explosives of India. All such storage shall have prior approval of the Project Manager. In case, any approvals are necessary from the Chief Inspector (Explosives) or any statutory authorities, the Contractor shall be responsible for obtaining the same.

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		• All equipment used in construction and erection by Contractor shall meet Indian/International Standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipment shall be strictly operated and maintained by the Contractor in accordance with manufacturer's Operation Manual and safety instructions and as per Guidelines/rules of Employer in this regard. • Periodical examinations and all tests for all lifting/hoisting equipment & tackles shall be carried-out in accordance with the relevant provisions of Factories Act 1948, Indian Electricity Act 1910 and associated Laws/Rules in force from time to time. A register of such examinations and tests shall be properly maintained by the Contractor and will be promptly produced as and when desired by the Project Manager or by the person authorised by him. • The Contractor shall be fully responsible for the safe storage of his and his Sub-Contractors radioactive sources in accordance with BARC/DAE Rules and other applicable provisions. All precautionary measures stipulated by BARC/DAE in connection with use, storage and handling of such material will be taken by the Contractor. • The Contractor shall provide suitable safety equipment of prescribed standard to all employees and workmen according to the need, as may be directed by the Project Manager who will also have right to examine these safety equipment to determine their suitability, reliability, acceptability and adaptability. The Contractor shall also provide Reflective Jackets to all workmen working on the site including different coloured such Jackets to the persons working at height. • Where explosives are to be used, the same shall be used under the direct control and supervision of an expert, experienced, qualified and competent person strictly in accordance with the Code of Practice/Rules framed under Indian Explosives Act pertaining to handling, storage and use of explosives. • The Contractor shall provide safe working conditions to all workmen and employees at the Site including safe means of access, railings, stairs, ladders, scaffoldings etc. The scaffoldings shall be erected under the control and supervision of an experienced and competent person. For erection, good and standard quality of material only shall be used by the Contractor. • The Contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to the Employer or other Contractors under any circumstances, whatsoever, unless expressly permitted in writing by Employer to handle such fuses, wiring or electrical equipment • Before the Contractor connects any electrical appliances to any plug or socket belonging to the other Contractor or Employer, he shall: a. Satisfy the Project Manager that the appliance is in good working condition; b. Inform the Project Manager of the maximum current rating, voltage and phases of the appliances;

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		c. Obtain permission of the Project Manager detailing the sockets to which the appliances may be connected. The Project Manager will not grant permission to connect until he is satisfied that; - The appliance is in good condition and is fitted with suitable plug; - The appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores. - No electric cable in use by the Contractor/Employer will be disturbed without prior permission. No weight of any description will be imposed on any cable and no ladder or similar equipment will rest against or attached to it. - No repair work shall be carried out on any live equipment. The equipment must be declared safe by the Project Manager and a permit to work shall be issued by the Project Manager before any repair work is carried out by the Contractor. While working on electric lines/equipment, whether live or dead, suitable type and sufficient quantity of tools will have to be provided by the Contractor to electricians/workmen/officers. - The Contractors shall employ necessary number of qualified, full time electricians/electrical supervisors to maintain his temporary electrical installation. - The Contractor employing more than 250 workmen whether temporary, casual, probationer, regular or permanent or on contract, shall employ at least one full time officer exclusively as safety officer to supervise safety aspects of the equipment and workmen, who will coordinate with the Project Safety Officer. In case of work being carried out through Sub-Contractors, the Sub-Contractor's workmen/employees will also be considered as the Contractor's employees/workmen for the above purpose. The Contractor shall deploy one dedicated Safety Staff(s) for every 200 kms of a Transmission Line Project. In case, the Contractor fails to deploy Qualified Safety Officer(s)/Safety Staff(s) under each Contract, as specified, then the Contractor shall be responsible for payment of a sum of Rs. 15,00,000/- per quarter till the Safety Officer(s)/Safety Staff(s) is deployed, to be deposited with the Employer, which will be retained in the Safety Corpus Fund. - The name and address of such Safety Officers of the Contractor will be promptly informed in writing to Project Manager with a copy to Safety Officer-In charge before he starts work or immediately after any change of the incumbent is made during currency of the Contract. In case any accident occurs during the construction/ erection or other associated activities undertaken by the Contractor thereby causing any minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be the responsibility of the

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		Contractor to promptly inform but no later than 24 hrs. of the occurrence of the same, to the Project Manager in prescribed form and also to all the authorities envisaged under the applicable laws. Notwithstanding above, in case of any fatal accident, the Board of Directors of Contractor shall review the incidence and a copy of Board's resolution signed by the Director/Company Secretary of the firm along with action plan for avoidance of such incidences in future shall be furnished promptly but no later than 60 days, to the Employer. Besides above, the CEO of the Contractor shall meet and apprise RECTPCL along with the Board's resolution of the cause of the fatal accident occurred and their future action plan/safety preparedness to prevent recurrence of such accidents in future within 60 days of the occurrence of the fatal accident. • The Project Manager shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and/or property, and/or equipment. In such cases, the Contractor shall be informed in writing about the nature of hazards and possible injury/accident and he shall comply to remove shortcomings promptly. The Contractor after stopping the specific work can, if felt necessary, appeal against the order of stoppage of work to the Project Manager within 3 days of such stoppage of work and decision of the Project Manager in this respect shall be conclusive and binding on the Contractor. • The Contractor shall not be entitled for any damages/compensation for stoppage of work due to safety reasons as provided above and the period of such stoppage of work will not be taken as an extension of time for completion of work and will not be the ground for waiver of levy of liquidated damages. • It is mandatory for the Contractor to observe during the execution of the works, requirements of Safety Rules which would generally include but not limited to following: • Safety Rules a. Each employee shall be provided with initial indoctrination regarding safety by the Contractor, so as to enable him to conduct his work in a safe manner. b. No employee shall be given a new assignment of work unfamiliar to him without proper introduction as to the hazards incident thereto, both to himself and his fellow employees. c. Under no circumstances shall an employee hurry or take unnecessary chance when working under hazardous conditions. d. Employees must not leave naked fires unattended. Smoking shall not be permitted around fire prone areas and adequate fire fighting equipment shall be provided at crucial location. e. Employees under the influence of any intoxicating beverage, even to the slightest degree shall not be permitted to remain at work. f. There shall be a suitable arrangement at every work site for rendering prompt and sufficient first aid to the injured. g. The staircases and passageways shall be adequately lighted.

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		h. The employees when working around moving machinery, must not be permitted to wear loose garments. Safety shoes are recommended when working in shops or places where materials or tools are likely to fall. Only experienced workers shall be permitted to go behind guard rails or to clean around energized or moving equipment. i. The employees must use the standard protection equipment intended for each job. Each piece of equipment shall be inspected before and after it is used. j. Requirements of ventilation in underwater working to licensed and experienced divers, use of gum boots for working in slushy or in inundated conditions are essential requirements to be fulfilled. k. In case of rock excavation, blasting shall invariably be done through licensed blasters and other precautions during blasting and storage/transport of charge material shall be observed strictly. • The Contractor shall follow and comply with all Employer Safety Rules, relevant provisions of applicable laws pertaining to the safety of workmen, employees, plant and equipment as may be prescribed from time to time without any demur, protest or contest or reservations. In case of any discrepancy between statutory requirement and Employer Safety Rules referred above, the latter shall be binding on the Contractor unless the statutory provisions are more stringent. • If the Contractor fails in providing safe working environment as per Employer Safety Rules or continues the work even after being instructed to stop work by the Project Manager as provided above, the Contractor shall promptly pay to Employer, on demand by the Employer, compensation at the rate of Rs. 10,000/- per day or part thereof to be deposited in Safety Corpus Fund pursuant to clause below, till the instructions are complied with and so certified by the Project Manager. However, in case of accident taking place causing injury to any individual, the provisions contained in Clause below shall also apply in addition to compensation mentioned in this Clause. • If the Contractor does not take adequate safety precautions and/or fails to comply with the Safety Rules as prescribed by the Employer or under the applicable law for the safety of the equipment and plant <table border="1"> <tr> <td>a</td><td>Fatal injury or accident causing death</td><td>Rs. 15,00,000/- per person</td></tr> <tr> <td>b</td><td>Major injuries or accident causing 25% or more permanent disablement</td><td>Rs. 5,00,000/- per person</td></tr> </table> • The amount paid/ recovered from the Contractor on account of non-compliance to Safety measures shall be deposited in the „Safety Corpus Fund“, if not specified otherwise, established by the Employer. The „Safety Corpus Fund“ shall be used for augmentation	a	Fatal injury or accident causing death	Rs. 15,00,000/- per person	b	Major injuries or accident causing 25% or more permanent disablement	Rs. 5,00,000/- per person
a	Fatal injury or accident causing death	Rs. 15,00,000/- per person						
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		of Safety measures in construction works, capacity building of workers, development of working conditions of workers like providing tents/ mobile toilets/ caravans, safety tools & plants etc. and undertaking such other activities which will facilitate in reducing the accidents. However, the Contractor shall have no claim in this regard and the Employer shall be sole judge in this regard. • If the Contractor observes all the Safety Rules and Codes, Statutory Laws and Rules during the currency of Contract awarded by the Employer and no accident occurs then Employer may consider the performance of the Contractor and award suitable "ACCIDENT FREE SAFETY MERITORIOUS AWARD" as per scheme as may be announced separately from time to time. • The Contractor shall also submit "Safety Plan" as per proforma specified in Section-IX (Sample Forms and Procedures) of the Bidding Documents alongwith all the requisite documents mentioned therein and as per check-list contained therein to the Engineer In-Charge for its approval within 60 days of award of Contract. Further, one of the conditions for release of first progressive payment / subsequent payment towards Services Contract shall be submission of "Safety Plan" alongwith all requisite documents and approval of the same by the Engineer In-Charge.
4	Clause no. 44	Supplementary Clauses may be read out with GCC Clause no-44 for Taxes and Duties or any other clause of the document as applicable TAXES & DUTIES: • The Contractor shall be entirely responsible for payment of all taxes, duties, licence fees and other such levies legally payable/incurred until delivery of the contracted supplies to the Employer. • If it is statutory requirement to make deductions towards such taxes and duties or any other applicable taxes and duties, the same shall be made by the Employer and a certificate for the same shall be issued to the Contractor. • The Contractor shall be solely responsible for the taxes that may be levied on the Contractor's persons or on earnings of any of his employees and shall hold the Employer indemnified and harmless against any claims that may be made against the Employer. The Employer does not take any responsibility whatsoever regarding taxes under Indian Income Tax Act, for the Contractor or his personnel. If it is obligatory under the provisions of the Indian Income Tax Act, deduction of Income Tax at source shall be made by the Employer. • In respect of supply of goods to the Employer by the Contractor, the EXW price is inclusive of all cost as well as duties and tax (viz., custom duties & levies, duties, GST etc.) paid or payable on components, raw materials and any other items used for their consumption incorporated or to be incorporated in the Plant & Equipment. Further, the EXW price of (i) imported Equipments/items

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		offered as 'Off the Shelf' or dispatched directly from the Indian Port of disembarkation are inclusive of all cost as well as any duties paid/payable in relation to import of such goods (viz., Customs duties, GST & levies etc.) and no separate claim on this behalf will be entertained by the Employer. If any tax exemptions, reductions, allowances or privileges may be available to the Contractor in the Country where the site is located and the Contractor has declared the same in its bid, the Employer shall use its best endeavors to enable the Contractor to benefit from such tax savings to the maximum allowable extent. The Input Tax Credit (ITC) available, if any, under GST as per the relevant Government laws wherever applicable has been taken into account by the Contractor. • Ex-works price for the supply of goods viz. Equipment/items by the Contractor is excluding GST, if any, payable. The GST will be reimbursable (along with subsequent variation if any), by the Employer on the supplies made by the Contractor but limited to the tax liability on the transaction between the Employer and the Contractor. Type test charges, if applicable, are excluding GST, if any, payable. Type test shall be considered an incidental expense incurred prior to the supply of goods viz. Equipment/items and would be added to the value of goods viz. Equipment/items for GST purposes and GST for Type Test shall be reimbursed at the rate applicable for such Equipment/items. Further the price for supply of services viz. Installation and training are excluding GST, if any, payable. The GST will be reimbursable (along with subsequent variation if any), by the Employer on the supplies made by the Contractor but limited to the tax liability on the transaction between the Employer and the Contractor. It is the Employer's understanding that as per extant provisions, on the charges for supply of services related to Inland transportation, In-transit insurance, loading and unloading by the Contractor to the Employer, GST is not payable. The Contractor is, however, advised to check the position from their own sources. If payable, the same shall be to the Contractor's account and Employer shall not reimburse any GST on this account. • Employer would not bear any liability on account of any other taxes, duties, levies applicable locally. • Employer shall, deduct taxes at source as per the applicable laws/rules, if any, and issue Tax Deduction at Source (TDS) Certificate to the Contractor.

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		- Reimbursement of GST by the Employer shall be at the rate applicable on the HSN/SAC of the goods/ services supplied by the Contractor to the Employer. The reimbursement of GST shall be against Invoice/Debit Note containing particulars specified under the GST Act and related Rules, Notifications, etc as notified by the Government in this regard. In the event that the Contractor fails to provide the invoice in the form and manner prescribed under the GST Act and Rules, the Employer shall not be liable to make any payment against such invoice. If there is difference in HSN/SAC classification and corresponding rate of GST of an item as confirmed/deemed confirmed by the bidder in its bid and HSN/SAC and corresponding rate of GST as interpreted under any interpretation/ judgment/ Notification/ Circular issued under the GST law before or after the award of contract, GST reimbursable to the bidder/Contractor shall be lower of the GST applicable at the rate as confirmed/deemed confirmed in the bid or actual GST paid/payable by the bidder for that item. - The Contractor shall comply with all tax laws in force in India. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, interest, damages, claims, fines, penalties and expenses of whatever nature arising or resulting from the violation of such tax laws by the Contractor or its personnel, including the Subcontractors and their personnel. - Owner's GSTIN number will be provided to bidder on request. While raising invoice/proforma invoice for Supply of Goods, Contractor shall bill to and ship to the address of the Owner in the State/UT where the Goods or part thereof is to be Supplied and mention GSTIN of Owner in of the same state/UT. #In case of Supply of Services, the Contractor shall invoice the Owner using the GSTIN of Owner in the state/UT in which the service or part thereof is to be rendered. - Notwithstanding anything above or elsewhere in the Contract, in the event that the input tax credit of the GST charged by the Contractor is denied by the tax authorities to the Employer for reasons associated with non-compliance/ incorrect compliance by the Contractor, the Employer shall be entitled to recover such amount from the Contractor by way of adjustment from any of the subsequent invoices submitted by the Contractor to the

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		Employer. In addition to the amount of GST, the Employer shall also be entitled to recover interest and penalty, in case any interest and/or penalty are imposed by the tax authorities on the Employer for incorrect/wrong availment of Input Tax Credit. The Employer shall determine whether the denial of credit is linked to the non-compliance/incorrect compliance of the Contractor and the said determination shall be binding on the Contractor For the purpose of the Contract, it is agreed that the Contract Price specified in Article 2 (Contract Price and Terms of Payment) of the Contract Agreement is based on the taxes, duties, levies and charges prevailing at the date seven (07) days prior to the last date of bid submission (hereinafter called "Tax"). If any rates of Tax are increased or decreased, a new Tax is introduced, an existing Tax is abolished, or any change in interpretation except for classification related purpose, or application of any Tax occurs in the course of the performance of the Contract, which was or will be assessed on the Contractor in connection with performance of the Contract, an equitable adjustment of the Contract price shall be made to fully take into account any such change by addition to the Contract price or deduction therefrom, as the case may be, in accordance with GCC Clause 31 (Changes in Laws and Regulations) hereof. These adjustments shall be applicable for all transactions between the Employer and the Contractor for supply of goods and services under the Contract but shall not be applicable on procurement of raw materials, intermediary components etc. by the Contractor and on account of variation in taxes, duties & levies applicable locally. In respect of raw materials, intermediary components etc and the taxes, duties & levies applicable locally, neither the Employer nor the Contractor shall be entitled to any claim arising due to increase or decrease in the rate of Tax, introduction of a new Tax or abolition of an existing Tax in the course of the performance of the Contract.
5	New Clause	Addition of New Clause : Severability: If any provision or condition of the Contract is prohibited or rendered invalid or unenforceable, such prohibition, invalidity or unenforceability shall not affect the validity or enforceability of any other provisions and conditions of the Contract.
6	New Clause	Addition of New Clause : Country of Origin "Origin" means the place where the materials, equipment and other supplies for the Facilities are mined, grown, produced or manufactured, and from which the services are provided. Plant and equipment are produced when, through manufacturing, processing or substantial and major assembling of components, a commercially recognized product results that is substantially different in basic

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		characteristics or in purpose or utility from its components.
7	New Clause	Addition of New Clause : Indemnity: • For the equipment/material to be provided by the Contractor, it will be the responsibility of the Contractor to take delivery, unload and store the materials at Site and execute an Indemnity Bond and obtain authorisation letter from Employer as per proforma enclosed at Section-IX of Vol-I (Sample Forms and Procedures), in favour of the Employer against loss, damage and any risks involved for the full value of the materials. This Indemnity Bond shall be furnished by the Contractor before commencement of the supplies and shall be valid till the scheduled date of Taking Over of the equipment by the Employer. • In case of divisible Contracts, where the Employer hands over his equipment to the Contractor for executing the Contract, then the Contractor shall, at the time of taking delivery of the equipment through Bill of Lading or other despatch documents, furnish trust Receipt for Plant, Equipment and Materials and also execute an Indemnity Bond in favour of the Employer in the form acceptable to the Employer for keeping the equipment in safe custody and to utilize the same exclusively for the purpose of the said Contract. Samples of proforma for the Trust receipt and Indemnity Bond are enclosed under Section-IX of Vol-I (Sample Forms and Procedures). The Employer shall also issue a separate Authorization Letter to the Contractor to enable him to take physical delivery of plant, equipment and materials from the Employer as per proforma enclosed under Section IX of Vol-I (Sample Forms and Procedures).
8	New Clause	Addition of New Clause : Intellectual Property Copy Right • The copyright in all drawings, documents and other materials containing data and information furnished to the Employer by the Contractor herein shall remain vested in the Contractor or, if they are furnished to the Employer directly or through the Contractor by any third party, including supplies of materials, the copyright in such materials shall remain vested in such third party. The Employer shall however be free to reproduce all drawings, documents and other material furnished to the Employer for the purpose of the Contract including, if required, for operation and maintenance. • The copyright in all drawings, documents and other materials containing data and information furnished to the Contractor by the Employer herein shall remain vested in the Employer. Confidential Information • The Employer and the Contractor shall keep confidential and shall not, without the written consent of the other party hereto, divulge to any third party any documents, data or other information furnished directly or indirectly by the other party hereto in connection with the Contract, whether such information has been

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		furnished prior to, during or following termination of the Contract. Notwithstanding the above, the Contractor may furnish to its Subcontractor(s) such documents, data and other information it receives from the Employer to the extent required for the Subcontractor(s) to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor(s) an undertaking of confidentiality similar to that imposed on the Contractor under this Clause. • The Employer shall not use such documents, data and other information received from the Contractor for any purpose other than the operation and maintenance of the Facilities. Similarly, the Contractor shall not use such documents, data and other information received from the Employer for any purpose other than the design, procurement of Plant and Equipment, construction or such other work and services as are required for the performance of the Contract. • The above provisions of this Clause shall not in any way modify any undertaking of confidentiality given by either of the parties hereto prior to the date of the Contract in respect of the Facilities or any part thereof. • The provisions of this Clause shall survive termination, for whatever reason, of the Contract.
9	New Clause	Addition of New Clause : Contractor's Organization Chart: • The Contractor shall supply to the Employer and the Project Manager a chart showing the proposed organization to be established by the Contractor for carrying out work on the Facilities. The chart shall include the identities of the key personnel together with the curricular vitae of such key personnel to be employed within twenty-one (21) days of the Effective Date. The Contractor shall promptly inform the Employer and the Project Manager in writing of any revision or alteration of such an organization chart. In case of RECTPCL Project Manager is Engineer –in- Charge
10	New Clause	Addition of New Clause : Emergency Work • If, by reason of an emergency arising in connection with and during the execution of the Contract, any protective or remedial work is necessary as a matter of urgency to prevent damage to the Facilities, the Contractor shall immediately carry out such work. • If the Contractor is unable or unwilling to do such work immediately, the Employer may do or cause such work to be done as the Employer may determine is necessary in order to prevent damage to the Facilities. In such event the Employer shall, as soon as practicable after the occurrence of any such emergency, notify the Contractor in writing of such emergency, the work done and the reasons therefor. If the work done or caused to be done by the Employer is work that the Contractor was liable to do at its own expense under the Contract, the reasonable costs incurred by the Employer in connection therewith shall be paid by the Contractor to the Employer. In case such work is not in the scope of the

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		Contractor, the cost of such remedial work shall be borne by the Employer.
11	New Clause	Addition of New Clause : Equipment Performance Guarantees: • The Contractor guarantees that the Equipments, named in the Bid document, shall attain the rating and performance requirements specified in this document, subject to and upon the conditions therein specified. • If the guarantees specified are not established, then the Employer shall, at the Employer's discretion either (a) reject the equipment, or (b) accept the equipment after assessing liquidated damages in accordance with the provision in the bidding document against the Contractor and such amounts shall be deducted from the Contract Price or otherwise recovered from the Contractor. • In case the Employer exercises its option to reject the equipment, the Contractor shall at its cost and expense make such changes, modifications and/or additions to the equipment or any part thereof as may be necessary to meet the specified guarantees. The Contractor shall notify the Employer upon completion of the necessary changes, modifications and/or additions, and shall request the Employer to repeat the Test until the level of the specified guarantee has been met.
12	New Clause	Addition of New Clause : Termination Termination for Employer's Convenience • The Employer may at any time terminate the Contract for any reason by giving the Contractor a notice of termination that refers herein below. • Upon receipt of the notice of termination, the Contractor shall either immediately or upon the date specified in the notice of termination (a) cease all further work, except for such work as the Employer may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition (b) terminate all subcontracts, except those to be assigned to the Employer pursuant to paragraph (d) (ii) below (c) remove all Contractor's Equipment from the Site, repatriate the Contractor's and its Subcontractor personnel from the Site, remove from the Site any wreckage, rubbish and debris of any kind, and leave the whole of the Site in a clean and safe condition (d) In addition, the Contractor, subject to the payment specified below, shall (i) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination (ii) to the extent legally possible, assign to the Employer all right, title and benefit of the Contractor to the Facilities and to the

SCC Clause No	GCC Clause Ref No	Amendment/Supplement to RECTPCL GCC
		Plant and Equipment as of the date of termination, and, as may be required by the Employer, in any subcontracts concluded between the Contractor and its Subcontractors (iii) deliver to the Employer all non-proprietary drawings, specifications and other documents prepared by the Contractor or its Subcontractors as at the date of termination in connection with the Facilities. • In the event of termination of the Contract as specified above, the Employer shall pay to the Contractor the following amounts: (a) the Contract Price, properly attributable to the parts of the Facilities executed by the Contractor as of the date of termination (b) the costs reasonably incurred by the Contractor in the removal of the Contractor's Equipment from the Site and in the repatriation of the Contractor's and its Subcontractors personnel (c) any amounts to be paid by the Contractor to its Subcontractors in connection with the termination of any subcontracts, including any cancellation charges (d) costs incurred by the Contractor in protecting the Facilities and leaving the Site in a clean and safe condition (e) the cost of satisfying all other obligations, commitments and claims that the Contractor may in good faith have undertaken with third parties in connection with the Contract and that are not covered by paragraphs (a) through (d) above. Termination for Contractor's Default • The Employer, without prejudice to any other rights or remedies it may possess, may terminate the Contract forthwith in the following circumstances by giving a notice of termination and its reasons therefore to the Contractor: (a) if the Contractor becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, if the Contractor is a corporation, a resolution is passed or order is made for its winding up (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), a receiver is appointed over any part of its undertaking or assets, or if the Contractor takes or suffers any other analogous action in consequence of debt (b) if the Contractor assigns or transfers the Contract or any right or interest. (c) if the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract. For the purpose of this Sub-Clause: "corrupt practice" is the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party; "fraudulent practice" is any act or omission, including a misrepresentation, that knowingly or recklessly misleads or attempts

SCC Clause No	GCC Clause Ref No	Amendment/Supplement to RECTPCL GCC
		to mislead, a party to obtain a financial or other benefit or to avoid an obligation; “collusive practice” is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party; “coercive practice” is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party; “obstructive practice” is (a) deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Employer’s investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; (b) acts intended to materially impede the exercise of the Employer’s inspection and audit rights. In persuasions of its policy, the Employer will sanction a firm or individual, including declaring ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for, or in executing, a contract. • If the Contractor (a) has abandoned or repudiated the Contract (b) has without valid reason failed to commence work on the Facilities promptly or has suspended the progress of Contract performance for more than twenty-eight (28) days after receiving a written instruction from the Employer to proceed. (c) persistently fails to execute the Contract in accordance with the Contract or persistently neglects to carry out its obligations under the Contract without just cause (d) refuses or is unable to provide sufficient materials, services or labor to execute and complete the Facilities in the manner specified in the program furnished at rates of progress that give reasonable assurance to the Employer that the Contractor can attain Completion of the Facilities by the Time for Completion as extended, then the Employer may, without prejudice to any other rights it may possess under the Contract, give a notice to the Contractor stating the nature of the default and requiring the Contractor to remedy the same. If the Contractor fails to remedy or to take steps to remedy the same within fourteen (14) days of its receipt of such notice, then the Employer may terminate the Contract forthwith by giving a notice of termination to the Contractor. • Upon receipt of the notice of termination, the Contractor shall,

SCC Clause No	GCC Clause Ref No	Amendment/Supplement to RECTPCL GCC
		either immediately or upon such date as is specified in the notice of termination, (a) cease all further work, except for such work as the Employer may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition (b) terminate all subcontracts, except those to be assigned to the Employer pursuant to paragraph (d) below (c) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination (d) to the extent legally possible, assign to the Employer all right, title and benefit of the Contractor to the Facilities and to the Plant and Equipment as of the date of termination, and, as may be required by the Employer, in any subcontracts concluded between the Contractor and its Subcontractors (e) deliver to the Employer all drawings, specifications and other documents prepared by the Contractor or its Subcontractors as of the date of termination in connection with the Facilities. • The Employer may enter upon the Site, expel the Contractor, and complete the Facilities itself or by employing any third party. The Employer may, to the exclusion of any right of the Contractor over the same, take over and use with the payment of a fair rental rate to the Contractor, with all the maintenance costs to the account of the Employer and with an indemnification by the Employer for all liability including damage or injury to persons arising out of the Employer's use of such equipment, any Contractor's Equipment owned by the Contractor and on the Site in connection with the Facilities for such reasonable period as the Employer considers expedient for the supply and installation of the Facilities. Upon completion of the Facilities or at such earlier date as the Employer thinks appropriate, the Employer shall give notice to the Contractor that such Contractor's Equipment will be returned to the Contractor at or near the Site and shall return such Contractor's Equipment to the Contractor in accordance with such notice. The Contractor shall thereafter without delay and at its cost remove or arrange removal of the same from the Site. • Subject to provision provide below, the Contractor shall be entitled to be paid the Contract Price attributable to the Facilities executed as of the date of termination, the value of any unused or partially used Plant and Equipment on the Site, and the costs, if any, incurred in protecting the Facilities and in leaving the Site in a clean and safe condition pursuant to paragraph (a) above. Any sums due to the Employer from the Contractor accruing prior to the date of termination shall be deducted from the amount to be paid to the Contractor under this Contract. • If the Employer completes the Facilities, the cost of completing the Facilities by the Employer shall be determined. If the sum that the Contractor is entitled to be paid, pursuant to above, plus the reasonable costs incurred by the Employer in completing the

SCC Clause No	GCC Clause Ref No	Amendment/Supplement to RECTPCL GCC
		Facilities, exceeds the Contract Price or the entire Facilities if entire Facilities have been completed or the price for part of the Facilities if part of the Facilities have been completed, the Contractor shall be liable for such excess. If such excess is greater than the sums due the Contractor, the Contractor shall pay the balance to the Employer, and if such excess is less than the sums due, the Employer shall pay the balance to the Contractor. For facilitating such payment the Employer shall encash the Bank Guarantees of the Contractor available with the Employer and retain such other payments due to the Contractor under the Contract in question or any other Contract that the Employer may have with the Contractor. The Employer and the Contractor shall agree, in writing, on the computation described above and the manner in which any sums shall be paid. • In this clause , the expression “Facilities executed” shall include all work executed, Installation Services provided, and all Plant and Equipment acquired (or subject to a legally binding obligation to purchase) by the Contractor and used or intended to be used for the purpose of the Facilities, up to and including the date of termination.
13	New Clause	Addition of New Clause : Approach Roads Access to the Site of Works shall be available before commencement of works. While efforts will be made to keep the approach roads open through-out the year, REC Transmission Projects Company Limited(RECTPCL) shall not be responsible for any damage or loss suffered by the Contractor due to closure of the road(s) on account of landslides, weather conditions or any other reasons whatsoever
14	New Clause	Addition of New Clause : LAND The purchaser shall acquire only such piece of land as is actually required for each type of tower foundation. Any extra land required by the contractor for storage of tower material, conductor, line material etc. shall be the responsibility of the contractor.
15	New Clause	Addition of New Clause : Training of the RECTPCL's & Consultant's Personnel The Contractor shall in pursuance of provisions of technical specification or as specified elsewhere, provide free of charge adequate facilities for training any of employees of RECTPCL in the manufacturing works / at site.
16	New Clause	Addition of New Clause : SITE ORDER BOOK The Engineer-in-Charge shall maintain the site order book systematically and securely till completion of the Works. The site order book shall be available at the site during working hours. Orders regarding the Work as and when necessary shall be entered in this book by the Engineer-in-Charge or his representative with dated signatures in exercise of the powers vested in him, which orders shall be duly noted by the Contractor or his authorized agent with his dated

SCC Clause No	GCC Clause Ref No	Amendment/Supplement to RECTPCL GCC
		signature. Order entered in this book and noted by the Contractor's agent shall be considered to have been duly given to the Contractor.
17	New Clause	Addition of New Clause : FLOODS • In case of floods resulting in flooding of the work areas, the Contractor shall make his own arrangements, at his own cost, to shift goods, all his plant, equipment and machinery, materials including if any, supplied / issued by the RECTPCL and labour to safe place. The work shall be resumed after receding of floods and dewatering the area. • The RECTPCL shall not be liable for any loss of or damage to the men, Contractor's plant, equipment, machinery works or materials on account of these floods and no compensation whatsoever, in this regard shall be paid to the Contractor.
18	New Clause	Change in Laws and Regulations If, after the date seven (07) days prior to the date of Bid Opening, any law, regulation, ordinance, order or by-law having the force of law is enacted, promulgated, abrogated or changed in India (which shall be deemed to include any change in interpretation or application by the competent authorities) that subsequently affects the costs and expenses of the Contractor and/or the Time for Completion, the Contract Price shall be correspondingly increased or decreased, and/or the Time for Completion shall be reasonably adjusted to the extent that the Contractor has thereby been affected in the performance of any of its obligations under the Contract. These adjustments shall be applicable for all transactions between the employer and contractor for supply of goods & services under the contract but shall not be applicable on procurement of raw material, intermediary component etc. by the contractor for which employer shall be the sole judge. Notwithstanding the foregoing, such additional or reduced costs shall not be separately paid or credited if the same has already been accounted for in the price adjustment provisions where applicable.

SECTION-VI, VOL-I
MODEL RULE FOR HEALTH & SANITARY
ARRANGEMENTS FOR
CONTRACTOR'S WORKMEN

SECTION - VI
MODEL RULES FOR HEALTH AND SANITARY ARRANGEMENTS FOR
CONTRACTOR'S WORKMEN
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SECTION-VI

MODEL RULES FOR HEALTH AND SANITARY ARRANGEMENTS FOR CONTRACTOR'S WORKMEN

1 APPLICATION

These rules shall apply to all buildings and erection works of REC Transmission Projects Company Limited(RECTPCL).

2 DEFINITIONS

- (i) "Work place"/or work site means a place at which, at an average 50 or more workers are employed, in connection with construction work.
- (ii) "Large work place" or large work site means a place at which at an average 500 or more workers are employed in connection with construction work.

3 FIRST AID

- (i) At every work place, there shall be maintained in a readily accessible place first aid appliance including an adequate supply of sterilized dressings and sterilized cotton wool. The appliances shall be placed in good order and in a large work place. They shall be placed under the charge of a responsible person who shall be readily available during working hours.
- (ii) At large work places, where hospital facilities are not available within easy distance of the work, First Aid posts shall be established and run by trained compounders.
- (iii) Where large work places are remote from regular hospitals, an indoor ward shall be provided with one bed for every 250 employees.
- (iv) Where large work places are situated in cities/towns or in their suburbs and no beds are considered necessary owing to the proximity of city or town hospitals, suitable transport will be provided to facilitate removal of emergent cases to the hospitals. At other work places, some conveyance facilities such as car shall be kept readily available to take injured person(s) or person(s) suddenly taken seriously ill, to the nearest hospital.

4 DRINKING WATER

- (i) In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.
- (ii) Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.
- (iii) Every water supply storage shall be at distance of not less than 15 metres from latrine, drain or any other source of pollution. Where water has to be drawn from an existing

well which is within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with trap door which shall be dust and water proof.

- (iv) A reliable pump shall be fitted to each covered well, the trap door shall be kept locked and opened only for cleaning or inspection which shall be done at least once in a month.

5 WASHING AND BATHING PLACES

- i) Adequate washing and bathing places shall be provided, separately for men & women.
- ii) Such places shall be kept in a clean and drained condition.

6 LATRINES AND URINALS

There shall be provided within the precincts of every work place adequate number of latrines and urinals in an accessible place. If women are employed, separate urinals and latrines shall be provided for them. All these shall be cleaned regularly and kept in a sanitary condition.

7 DISPOSAL OF EXCRETA

Unless otherwise arranged for by the local sanitary authority, arrangements for proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator approved by the local health officer or Engineer-in-Charge. Alternatively, excreta may be disposed of by putting a layer of night soil at the bottom of pucca tank prepared for the purpose and covering it with a 150mm layer of waste or refuse and then covering it up with a layer of earth for a fortnight (when it will turn into manure).

8 PROVISION OF SHELTER DURING REST

At every work place there shall be provided free of cost for the use of labour, two suitable sheds, one for meals and the other for rest.

9 CRECHES

At every work place, at which 50 or more women workers are ordinarily employed, there shall be provided a crèche for the use of children, belonging to such women.

10 CANTEEN

A cooked food canteen on a moderate scale shall be provided for the benefit of workers wherever it is considered expedient.

The above rules shall form an integral part of the contract.

SECTION-VII, VOL-I
CONTRACTOR'S LABOUR REGULATION

SECTION –VII

CONTRACTOR’S LABOUR REGULATIONS

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SECTION - V

CONTRACTOR'S LABOUR REGULATIONS

1 SHORT TITLE

These regulations may be called the "REC Transmission Projects Company Limited", Contractor's Labour Regulations".

2 DEFINITIONS

In these regulations, unless otherwise expressed or indicated, the following words and expressions shall have the meaning hereby assigned to them respectively, that is to say:-

- (i) "Labour" means workers employed by RECTPCL Contractor directly or indirectly through a sub-contractor or other persons or by an agent on his behalf but will not include supervisory staff like section officers, etc.
- (ii) "Fair Wage" means wage whether for time or piece work notified at the time of inviting tenders for the work and where such wages have not been so notified, the wages prescribed by the RECTPCL for the area in which the work is done. Such wages will not be less than the minimum wages fixed by the Government of India for that class of employee engaged on the same type of work in the same area.
- (iii) "Contractor" shall include every person whether a sub-contractor or head-man or agent, employing labour on the work taken on contract.

Normally working hours of a worker should not exceed 9 (Nine) hours a day. The working day shall be so arranged that inclusive of interval for rest, if any, it shall not spread over more than 12 (twelve) hours on any day.

3 DISPLAY OF NOTICE REGARDING WAGES, ETC.

The Contractor shall

- (i) before he commences his work on Contract, display and correctly maintain and continue to display and correctly maintain in a clean and legible condition in conspicuous place on the work, notices in English and in Hindi and local language spoken by the majority of the workers, giving the rate of wages which have been certified by the Engineer-in-Charge as fair wage and the hours of work for which such wage are earned, and
- (ii) Send a copy of such notices to the certifying office.

4 PAYMENT OF WAGES

- (i) Wages due to every worker shall be paid to him direct.
- (ii) Arrears claimed after 3 months after the completion of the Work shall not be entertained.
- (iii) All wages shall be paid in current coin or currency or in both.

5 FIXATION OF WAGE PERIODS

- (i) The Contractor shall fix the wage periods in respect of which the wages shall be payable.
- (ii) No wage period shall exceed one month.

- (iii) Wages of every worker employed on the contract shall be paid; (a) in the case of establishment in which wage period is one week within 3 days from the end of the wage period and (b) in the case of other establishments before the expiry of the 7th day or 10th day from the end of the wage period for the number of workers employed in such establishment not exceeding 1000 and exceeding 1000 respectively.
- (iv) When the employment to any worker is terminated by or on behalf of the Contractor, the wages earned by him shall be paid before the expiry of the day succeeding the one on which his employment is terminated.
- (v) All payments of wages shall be made on a working day except when the work is completed before the expiry of the wage period in which case final payment shall be made within 48 hours of the last working day at work site and during the working time.

6 WAGE BOOK AND WAGE SLIPS ETC

- (i) The Contractor shall maintain a Wage Book of each worker in such forms as may be convenient at the place of works, but the same shall include the following particulars:
 - a Name of the worker.
 - b Rate of daily or monthly wages.
 - c Nature of work on which employed.
 - d Total number of days worked during each wage period.
 - e Dates and periods for which worked overtime.
 - f Gross wages payable for the work during each wage period.
 - g All deductions made from the wage with an indication in each case of the ground on account of which the deduction is made.
 - h Wages actually paid for each wage period
 - i Signature or thumb impression of the worker.
- (ii) The Contractor shall also issue a wage slip containing the aforesaid particulars to each worker employed by him on the work at least a day prior to the day of disbursement of wages.
- (iii) The Contractor shall also issue an "Employment Card" in the prescribed 'Form I' (attached) to each worker on the day of work or entry into his employment.
- (iv) The Contractor shall issue an 'Attendance cum Wage Card' as per 'Form II' to each worker on the day of entry into his employment.

7 REGISTER OF UNPAID WAGES

The Contractor shall maintain a register of unpaid wages in such form as may be convenient at the place of work but the same shall include the following particulars.

- i) Full particulars of the labourers whose wages have not been paid.
- ii) Reference number of the muster roll and wage register.
- iii) Rate of Wages.
- iv) Wage period.
- v) Total amount not paid.
- vi) Reasons for not making payment.
- vii) How the amount of unpaid wages was utilised.
- viii) Acquaintance with dates.

8 REGISTER OF ACCIDENTS

The Contractor shall maintain a register of accidents in such form as may be convenient at the work place, but the same should include the following particulars.

- i) Full particulars of the Worker(s) who met with accident.
- ii) Rate of wages.
- iii) Sex.
- iv) Age.
- v) Nature of accident and cause of accident.
- vi) Time and date of accident.
- vii) Date and time when admitted in hospital.
- viii) Date of discharge from the hospital.
- ix) Period of treatment and result of treatment.
- x) Percentage of loss of earning capacity and disability assessed by medical officer.
- xi) Compensation required to be paid.
- xii) Date of payment of compensation.
- xiii) Amount paid with details of the person to whom the same was paid.
- xiv) Authority by whom the compensation was assessed.
- xv) Remarks.

9 FINES AND DEDUCTIONS WHICH MAY BE MADE FROM WAGES

- i) The wages of a worker shall be paid to him without any deductions of any kind except the following:
 - a) Fines
 - b) Deductions for absence from duty i.e. from the place or the places where by the terms of his employment he is required to work. The amount of deduction shall be in proportion to the period for which he was absent.
 - c) Deduction for damage to or loss of goods expressly entrusted to the employed person for custody, or for loss of money or any other deduction which he is required to account, where such damage or loss is directly attributable to his neglect or default.
 - d) Deduction for recovery of advance or for adjustment of over payment of wages, advances granted shall be entered in a register.
 - e) Any other deduction which the Jammu & Kashmir Power Development Department may from time to time allow.
- ii) No fine shall be imposed on any worker except in respect of such acts and omissions on his part as have been approved of by the Engineer-in-Charge.
- iii) No fine should be imposed on a worker and no deduction for damage or loss shall be made good from his wages until the worker has been given an opportunity of showing cause against such fines or deductions.

10 REGISTER OF FINES

- i) The Contractor shall maintain a 'Register of Fines' and a 'Register of Deductions for Damages or Loss' in 'Form Nos. III & IV' respectively which should be kept at the places of work.
- ii) The Contractor shall maintain both English and in the local language, a list approved by the Engineer-in-Charge clearly stating the acts and omissions for which penalty or fine may be imposed on a workman and display it in a good condition in a conspicuous place on the work.

11 PRESERVATION OF REGISTER

The wage book, the wage slips, register of unpaid wages, the register of accidents, the register of fines, deduction required to be maintained under these regulations shall be preserved for 12 months after the date of last entry made in them and shall be made available for

inspection by the Engineer-in-Charge, labour officer or any other officer authorised by the RECTPCL on their behalf.

12 POWERS OF LABOUR WELFARE OFFICERS TO MAKE INVESTIGATION OR ENQUIRY

The Labour Welfare Officer or any other person authorised by the Indian **Govt.** on their behalf shall have power to make enquiries with a view to ascertaining and enforcing due and proper observance of the fair wage clause and the provisions of these regulations. He shall investigate into any complaint regarding the default made by the contractor or sub-contractor in regard to such provision.

13 REPORT OF LABOUR WELFARE OFFICER

The labour welfare officer or other persons authorised as aforesaid shall submit a report of result of his investigation or enquiry to the Engineer-in-Charge concerned indicating the extent, if any, to which the default has been committed, with a note that necessary deductions from the contractor's bill be made and the wages and other dues be paid to the labourers concerned. In case an appeal is made by the contractor under **para 14** of these regulations actual payment to labourers will be made by the Engineer-in-charge or authorised agent after RECTPCL has given its decision on such appeal.

The Engineer-in-Charge shall arrange payments to the labourers concerned within 45 days from the receipt of the report from the labour welfare officer.

14 APPEAL AGAINST THE DECISION OF LABOUR WELFARE OFFICER

Any person aggrieved by the decision and recommendations of the Labour Welfare Officer or other person so authorised may appeal such decision to the labour court, within 30 days from the date of decision. The decision of the labour court shall be final and binding upon the Contractor and RECTPCL as the case may be.

15 INSPECTION OF BOOKS AND SLIPS

The Contractor shall allow inspection of the wage books and the wage slips, register of unpaid wages, register of accidents, the register of fines and deductions to any of his workers or to his agent at convenient time and place after due notice is received or to the Labour Welfare Officer or any other persons, authorised by Engineer-in-Charge on his behalf.

16 SUBMISSION OF RETURNS

The Contractor shall submit periodical returns as may be specified from time to time.

17 AMENDMENTS

RECTPCL may from time to time add to or amend the regulations and on any question as to the application, interpretation or affect of those regulations, the decision of the Engineer-in-Charge or of his authorized representative shall be final.

FORM – I
EMPLOYMENT CARD REGULATION

Name & Sex of the worker.

Age or date of birth.

Father's name

Identification marks

.(Particulars of next of kin ,wife and children, if any or of
dependent next to kin in case the worker

has no wife or child)

Name

Full address of dependents

(Specify village, district and state).

Sl.No	Name and address of employer (Specify whether a contractor or Sub-contractor).	Particulars of location work site and description of work done	Total period for which the worker is employed (From.....to.....)	Actual number of days worked	Leave taken (Number of days Should be Specified)
1	2	3	4	5	6

(BACK SIDE OF THE CARD)

Nature of work done by the workers	Wage period	Wage rate (with particulars of unit in case of piece work)	Total wage earned by the worker during the period Shown under column(5)	Remarks	Signature of the employer
7	8	9	10	11	12

FORM – II
ATTENDANCE –CUM-WAGE CARD

Card No.

Name of Contractor.....

Name of work.....

Name of worker.....

Address.....

Designation.....

Rates of wages

Dates	Attendance	Signature of person marking attendance	REMARKS
1. 2. 3. 4. 5. etc.			

(ON THE BACK SIDE OF CARD)

Wage period	Date on which overtime Worked	Gross wage payable	Deductions if any.	Actual Wages paid	Date of payment	Signature of the Worker

FORM - III
REGISTER OF FINES

Sl. No.	Name	Father's/ Husband's Name	Sex	Department	Nature and Date of the offence for which fine imposed	Whether worker showed cause against Fine or not, if so, enter date.	Rate of Wages	Date and amount of fine Imposed	Date on which Fine Realised	Remarks
1	2	3	4	5	6	7	8	9	10	11

FORM - IV

REGISTER OF DEDUCTIONS FOR DAMAGES OR LOSS

Sl. No.	Name	Father's/ Husband's Name	Sex	Department	Damage or loss caused with date	Whether worker showed cause against deduction if so, enter date.	Date and amount of deduction Imposed	Number of install-ment, if any	Date on which total amount Realised	Remarks
1	2	3	4	5	6	7	8	9	10	11

SECTION-VIII, VOL-I
SAFETY REGULATIONS

SECTION - VIII

SAFETY PRECAUTIONS

- 1 Suitable scaffolds shall be provided for workmen for all Works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used, an extra workman shall be engaged for holding the ladder. If the ladder is used for carrying materials as well, suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 0.25 to 1 (0.25 horizontal and 1 vertical).
- 2 Scaffolding or staging more than 3.6 m above the ground or erected floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise secured at least 0.9 m high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such opening as may be necessary for the delivery of the materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the structure.
- 3 Working platform, gangways and stairways shall be so constructed that they do not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6 m above ground level or floor level, they shall be closely boarded, and shall have adequate width and shall be suitably fastened.
- 4 Every opening in the floor of a structure or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 0.9 m. Employees working on steep slopes or otherwise subject to possible falls from levels not protected by guardrails or safety nets, shall be secured by safety belts.
- 5 Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9.0 m in length while the width between side rails in hung ladder shall, in no case, be less than 28 cm. for ladder upto and including 3.0 m in length. For longer ladders, this width shall be increased at least by 6 mm for each additional 30 cm of length. Uniform step spacing shall not exceed 30 cm. Adequate precautions shall be taken to

prevent danger ~~from~~ electrical equipment. No materials on any of the Sites of Work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.

6 EXCAVATION AND TRENCHING

All trenches, 1.2 m or more in depth, shall, at all times, be supplied with at least one ladder for each 30 metres length or fraction thereof. Ladder shall be extended from bottom of the trench to at least 0.9 m above the surface of the ground. The side of the trenches which are 1.5 m or more in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides to collapse. The excavated materials shall not be placed within 1.5 m of the edges of the trench or half of the depth by the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.

7 DEMOLITION

Before any demolition work is commenced and also during the process of the work:

- (i) All roads and open areas adjacent to the site shall either be closed or suitably protected.
- (ii) No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.
- (iii) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the structure shall be overloaded with debris or materials as to render it unsafe.

8 All necessary personal safety equipment as considered adequate by the Engineer-in-Charge shall be kept available for the use of the persons employed on the Site and maintained in condition suitable for immediate use, and the Contractor shall take adequate steps to ensure proper use of equipment by those concerned.

- (i) The Contractor shall provide rubber gauntlets, gloves, mats, boots and galoshes, insulated platform and stools, safety belts, hand lamps, tower

wagons and other special insulated devices as required for working on electrical equipment and apparatus.

- (ii) Workers employed on mixing asphaltic materials, cement mortar and cement concrete shall be provided with protective footwear and protective goggles.
- (iii) Those engaged in mixing or stacking of cement bags or any materials which is injurious to eyes shall be provided with protective goggles.
- (iv) Those engaged in welding Works shall be provided with welder's protective eye shields.
- (v) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
- (vi) The Contractor shall not employ any person **below the age of 18 years**. Whenever a person above the age of 18 years is employed on the work of lead painting, the following precautions shall be taken:-

- (a) No paint containing lead, sulphate of lead or product containing their pigments shall be used except in the form of paste or readymade paint.
- (b) Suitable face masks shall be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
- (c) Overalls shall be supplied by the Contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of Work.
- (d) Measures shall be taken, whenever required, in order to prevent danger arising from the application of a paint in the form of spray.
- (e) Measures shall be taken, whenever practicable, to prevent danger arising out from dust caused by dry rubbing down and scrapping.
- (f) Suitable arrangements shall be made to prevent clothing put off during working hours, being spoiled by painting materials.
- (g) Cases of lead poisoning and suspected lead poisoning shall be notified and shall be subsequently verified by a medical officer appointed by the competent authority.
- (h) The contractor, when necessary, shall arrange for medical examination of workers and same shall be monitored by medical officer appointed by competent authority.

(i) Instructions with regard to special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

(vii) The Contractor shall observe all safety precautions to control the noise on all Sites and also provide all workmen deployed in the affected areas with the necessary equipment for safety against noise.

9 When the Work is done near any place where there is risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision shall be made for prompt first aid treatment of all injuries likely to be sustained during the course of the Work.

10 Use of hoisting machines and shackle including their attachments, anchorage and supports shall conform to the following standards or conditions:

(i) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defect and shall be kept in good working order.

(ii) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength and free from patent defects.

(iii) Every crane driver or hoisting appliance operator shall be properly qualified for his job.

(iv) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or as means of suspension, the safe working load shall be ascertained by adequate means. Every hoisting machine and all gears referred to above shall be plainly marked with the safe working load.

In case of hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing. The capacity of the hoisting machines shall be periodically checked.

- (v) The Contractor shall notify the safe working load of the machines to the Engineer-in-Charge whenever he brings any machinery to Site of work and gets it verified by the Engineer-in-Charge or his representative.

11 Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards.

Hoisting appliances shall be provided with such means as shall reduce to the minimum, the risk of any part of a suspended load becoming accidentally displaced. When workmen are employed on or near electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boot, as may be necessary, shall be provided. The workers shall not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

12 All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe conditions and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at or near places of Work.

13 These safety provisions shall be brought to the notice of all concerned by display on a notice board at a prominent place on the Site. The person responsible for compliance of the safety code shall be named therein by the Contractor.

14 To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangements made by Contractor shall be open to inspection by the Labour officer /or the Engineer-in-Charge.

15 In addition to above, the Contractor shall take the following specific precautions for the Underground Works.

- (i) All precautions regarding safety of personnel working in tunnels/caverns/shafts, in connection with the handling of electrical installations, loading, blasting and seepage water etc. as specified in the relevant stipulations of IS codes shall be taken by the Contractor in order to ensure safe underground working. He shall also provide adequate medical, drinking water, sanitation, lighting and ventilation facilities.

- (ii) Emergency material shall be provided at each underground excavation heading

This equipment shall include, but not be limited to the following:

- 3 stretchers
- 3 woolen blankets
- 2 appliances for artificial breathing
- 1 oxygen flask
- 3 explosion-proof lamps
- wound dressing and disinfection material
- anti-pain injections
- gas masks

- (iii) At least two members of the Rescue Team as described hereinafter, properly instructed and trained in the rescue procedures, shall be in each crew working underground.
- (iv) Prior to the commencement of construction, the Contractor shall organize and train a Rescue Team composed of his employees. This Rescue Team shall be capable to render help after accidents caused by fire, gas explosion and avalanche etc.
- (v) The Rescue Team shall be organized in such a way that sufficient numbers of members are ready for action at any time until the Completion of Work.
- (vi) The Rescue Team members shall be instructed and trained for their task by a qualified and experience person. If required, the Contractor shall hire an outside specialist to perform such training. A refresher training for all members of the Rescue Team shall be conducted at least every six months.
- (vii) Each Rescue Team member shall be skilled in giving the first aid, dealing with the appliances for artificial respiration and fire fighting equipment and shall possess a good local knowledge. Adequate equipment for reaching even the remotest working area shall be at their disposal.
- (viii) The Contractor shall submit the details of the proposed Rescue Team organization to the Engineer-in-Charge for approval.

- 16 The Contractor shall at all times exercise reasonable and proper precautions for the safety of the people on the Works and shall comply with the provisions of current safety law and building and construction codes as may be applicable. All machinery and equipment and other sources of physical hazards shall be properly guarded. The Contractor shall have a full time staff exclusively in charge of securing the safety of the Work ensuring that all safety regulations are followed and in charge of indoctrination and teaching course on safety to the work force.
- 17 The Contractor shall provided all necessary fencing and lights to protect the public from accidents and shall be bound to bear all the expenses of defence of every suit, action and other proceedings at Law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit, action and proceedings to any such persons or which may, with the consent of the Contractor, be paid to compromise any claim by any person.
- 18 About his employees, the Contractor shall ensure as follows:
- (i) Each employee shall be provided initial indoctrination regarding safety by the Contractor so as to enable him to conduct his Work in a safe manner.
 - (ii) No employee shall be given a new assignment of work unfamiliar to him without proper introduction as to the hazardous incident thereto, both to himself and his fellow employees.
 - (iii) Under no circumstances shall an employee hurry or take unnecessary chances when working under hazardous conditions.
 - (iv) Employees shall not leave naked fires unattended. Adequate fire fighting equipment shall be provided at crucial locations.
 - (v) Employees under the influence of any intoxicating beverage, even to the slightest degree, shall not be permitted to remain on Work.
 - (vi) There shall be suitable arrangement on every site for rendering prompt and sufficient first aid to the injured.
 - (vii) The stair cases and passage ways shall be adequately lighted.
 - (viii) The employees, when working around moving machinery, shall not be permitted to wear loose garments. Safety shoes are recommended when working in shops or places where materials or tools are likely to fall.

Only experienced workers shall be permitted to go behind guard rails or to clean around energized or moving equipment.

- (ix) The employees shall use the standard protection equipment intended before and after it is used.

19 The following precautions shall be taken for fire prevention:

- (i) All construction areas and storage yards shall be kept clean and well arranged.
- (ii) A clear space of 15 metres around the outer boundary of saw mill and lumber storage area may be provided. All lumber shall be stored in sections with fire breaks with a distance of 15 metres between consecutive section.
- (iii) All combustible waste material, wood scalings and soiled rags etc shall be removed daily and burnt in suitable burning area. The saw mill and lumber yard shall be kept free from accumulation of combustible debris.
- (iv) Fires, welding, flame cutting shall in general not be permitted in combustible area. Fires and open flame devices shall not be left unattended.
- (v) Smoking shall be prohibited in all fire prone areas, flammable material storages viz. Carpentry, paint shops, garages, service stations etc. "No smoking" signs shall be pasted on all such areas.
- (vi) Accumulations of flammable liquids on floors, walkways etc. should be prohibited. All spills of flammable liquids shall be cleaned up immediately.
- (vii) Smoke pipes from Diesel Engines passing through roof of combustible material e.g. in compressor stations on various Sites shall be insulated by asbestos. All joints of smoke pipe shall be riveted, welded or otherwise securely fastened together and supported to prevent accidental displacement or separation. The joints shall not be leaky.
- (viii) Flammable liquids, lubricants etc. shall be handled and transported in safety containers and drums which can be kept tightly capped.
- (ix) Storage of fuels and other flammable materials and liquids shall be set not less than 100 m away from the Works and permanent installations. All storage installations and tanks shall conform to the regulations set out in relevant Indian Standards.

- (x) Petrol or other flammable liquids with a flash point below 100 degrees Centigrade shall not be used for cleaning purpose.
- (xi) Oxygen cylinders shall not be stored with combustible materials.
- (xii) All electric installation shall be properly earthed. Repairs shall not be made on electrical circuits until the circuit has been de-energized.

20 THE FOLLOWING FIRE FIGHTING ARRANGEMENTS SHALL BE MADE BY THE CONTRACTOR:

- (i) Fire extinguishers and fire buckets filled with clean dry sand, painted red, shall be provided at all fire hazardous locations viz. Bathing and Mixing Plant, Winch houses, Workshops, store yards, Saw-mill, Switch Gear Room, Compressor Stations, Office establishments etc. The extinguishers shall be inspected, serviced and maintained in accordance with manufacturer's instructions. The inspection shall be evidenced by notations on tag attached to the extinguisher.
- (ii) Full reliance shall never be placed on portable hand extinguishers as all of these have a very limited capacity. Water, in ample quantity and under adequate pressure, shall always be available for fire fighting.
- (iii) Where a group of work points are located beyond the range of protection from a public water supply, the installation of a water system for private fire protection shall be warranted.
- (iv) Evacuation facilities and fire exit shall be provided at all locations featuring fire hazards.
- (v) Siren or other suitable fire alarm arrangement shall be made on all Sites. Warning signs shall be pasted at all locations having fire hazards.
- (vi) All staff shall be conversant with the use of all type of fire extinguishing apparatus.
- (vii) In the event of fire on electrical mains or apparatus, the effected part shall immediately be completely isolated from its source of supply of electrical energy.
- (viii) Demonstrations and training in fire fighting shall be conducted at sufficient intervals to ensure that sufficient personnel are familiar with and are capable of operating fire fighting equipment.

21 When any work is carried on, which is likely to affect the security or stability of an installation or structure or any part thereof and endanger any person employed, all practicable precautions shall be taken by shoring or otherwise to prevent collapse of

structure or fall of any part thereof and thus remove the cause of danger to such structures and the persons employed.

- 22 For persons engaged in handling of corrosive materials, adequate equipment shall be provided.
- 23 Where, in connection with any grinding, cleaning, spraying or manipulation of any material, there is emission of dust or fume of such character and to such extent as is likely to be injurious to the health of persons employed, all practical measures shall be taken by securing adequate ventilation or by the provision and use of suitable respirators or otherwise to prevent inhalation of such dust and fume.
- 24 The Contractor shall strictly follow the safety procedures & practices as mentioned in Indian standard IS5216-1982 “Guide for Safety Procedure & Practices in Electrical Work” during the execution of this Contract. In this regard the under J&K Electricity rules 1978 shall also be applicable to the Contractor to fulfill the safety precaution for workmen and Plant.
- 25 In addition to instructions contained here-in-above the safety regulations contained in the following IS Codes shall also apply wherever the provisions in the codes are exhaustive in nature.

i)	IS:4756-1978 (Reaffirmed 1991)	Safety Code for Tunneling Work
ii)	IS: 3696-1987 (Part-I) (Reaffirmed 1991)	Safety Code of Scaffolds & Ladders (Pt. I Scaffolds)
iii)	IS: 3696-1991 (Part-II)	Safety Code of Scaffolds & Ladders (Pt. II Ladders)
iv)	IS: 3016-1982 (Reaffirmed 1990)	Fire precaution in welding and cutting operations
v)	IS - 5216-1982 Part 1 & 2 (Reaffirmed 1990)	Guide for Safety procedures and Practices in Electrical work Part 1 – General Part-2 – Life saving techniques

- 26 Notwithstanding the above provisions, the Engineer-in-Charge may require the Contractor to follow any other Act or Rules in force in J&K in respect of Safety Precautions so as to ensure the safety of the Workmen and the Plant and the Contractor shall promptly comply with such requirements.

SECTION – IX

SAMPLE FORMS AND PROCEDURES (FORMS)

SAMPLE FORMS AND PROCEDURES (FORMS)

Preamble

This Section (Section –IX) of the Bidding Documents [named as Sample Forms and Procedures (FORMS)] provides proforma to be used by the bidders at the time of their bid preparation and by the Contractor subsequent to the award of Contract.

The Bidder shall complete, sign and submit with its bid the relevant FORMS to be used unamended, in accordance with the requirements included in the Bidding Documents.

The Bidder shall provide the Bid Security, either in the form included hereafter or in another form acceptable to the Employer, pursuant to the provisions in the instructions to Bidders.

The Form of Contract Agreement shall be used unamended, except for the need to complete Article 1.1 (Contract Documents), as appropriate and as may be required to suit the specific requirement of the Contract. The form shall also include the Appendices listed, as required, which should be completed according to the instructions for their completion provided at the beginning of each Appendix. The Price Schedule deemed to form part of the contract shall be modified according to any corrections or modifications to the accepted bid resulting from price corrections, pursuant to the provisions of the Instructions to Bidders.

The Performance Security (ies) and Bank Guarantee for Advance Payment forms should not be completed by the bidders at the time of their bid preparation. Only the successful Bidder will be required to provide the Performance Security(ies) and Bank Guarantee for Advance Payment, according to one of the forms indicated herein or in another form acceptable to the Employer and pursuant to the provisions of the General and Special Conditions of Contract, respectively.

Depending on specific facts and circumstances related to the Bid, other specific agreement, if any, and the contract, the text of the Forms herein may need to be modified to some extent. The Employer reserves the right to make such modifications in conformity with such specific facts and circumstances and rectify and consequent discrepancies, if any. However, modifications, if any, to the text of the Forms that may be required in the opinion of the Bidder/Contractor shall be effected only if the same is approved by the Employer. The Employer's decision in this regard shall be final and binding.

1. BID FORMS AND PRICE SCHEDULES

1.1 Bid Form

Please see Volume – III.

1.2 Price Schedule

Please see Volume - III

2. BID SECURITY FORM

*((To be stamped in accordance with Stamp Act, the Non-Judicial Stamp Paper should be in the name of the issuing Bank. **For the purpose of verification/confirmation of this Bank Guarantee by the Employer, the Bank shall indicate 2 official email ids of the authorized signatories from Issuing Branch and also of the designated higher office (Corporate Office, Zonal Office etc) in the covering letter of the Bank forwarding the Bank Guarantee.**)*

Bank Guarantee No.:

Date:

To: *(insert Name and Address of Employer)*

WHEREAS M/s. *(Insert name of Bidder)*..... having its Registered/Head Office at *(Insert address of the Bidder)* (Hereinafter called "the Bidder") has submitted its Bid for the performance **of the Contract for(insert name of the Package) under(insert Specification No).....** (Hereinafter called "the Bid")

KNOW ALL PERSONS by these present that WE *(insert name & address of the issuing bank)* having its Registered/Head Office at*(insert address of registered office of the bank)*..... (hereinafter called "the Bank"), are bound unto*(insert name of Employer)*..... (hereinafter called "the Employer") in the sum of*(insert amount of Bid Security in figures & words)*..... for which payment well and truly to be made to the said Employer, the Bank binds itself, its successors and assigns by these presents.

Sealed with the Common Seal of the said Bank this day of 20....

THE CONDITIONS of this obligation are:

- (1) If the Bidder withdraws its bid during the period of bid validity specified by the Bidder in the Bid Form; or
- (2) In case the Bidder does not withdraw the deviations proposed by him, if any, at the cost of withdrawal stated by him in the bid and/or accept the withdrawals/rectifications pursuant to the declaration/confirmation made by him in Attachment – Declaration of the Bid; or
- (3) If the Bidder does not accept the corrections to arithmetical errors identified during preliminary evaluation of his bid pursuant to ITB Clause 27.2; or

- (4) If, as per the requirement of Qualification Requirements the Bidder is required to submit a Deed of Joint Undertaking and he fails to submit the same, duly attested by Notary Public of the place(s) of the respective executants (s) or registered with the Indian Embassy/High Commission in that Country, within ten days from the date of intimation of post – bid discussion; or
- (5) In the case of a successful Bidder, if the Bidder fails within the specified time limit
- (i) To sign the Contract Agreement, in accordance with ITB Clause 34, or
 - (ii) To furnish the required performance security, in accordance with ITB Clause 35.
- or
- (6) In any other case specifically provided for in ITB.

WE undertake to pay to the Employer up to the above amount upon receipt of its first written demand, without the Employer having to substantiate its demand, provided that in its demand the Employer will note that the amount claimed by it is due to it, owing to the occurrence of any of the above-named CONDITIONS or their combination, and specifying the occurred condition or conditions.

This guarantee will remain in full force up to and including (*insert date, which shall be the date 30 days after the period of bid validity*)....., and any demand in respect thereof must reach the Bank not later than the above date.

Notwithstanding anything contained herein:

1. Our liability under this Bank Guarantee shall not exceed _____ (*value in figures*)_____ [*value in words*]_____.
2. This Bank Guarantee shall be valid upto _____ (*validity date*)_____.
3. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only & only if we receive a written claim or demand on or before _____ (*validity date*) _____

For and on behalf of the Bank

[*Signature of the authorised signatory(ies)*]

Signature_____

Name_____

Designation_____

POA Number_____

Contact Number(s): Tel. _____ Mobile _____

Fax Number _____

email _____

Common Seal of the Bank _____

Witness:

Signature _____

Name _____

Address _____

Contact Number(s): Tel. _____ Mobile _____

email _____

Note:

1. In case the bid is submitted by a Joint Venture, the bid security shall be in the name of the Joint Venture and not in the name of the Lead Partner or any other Partner(s) of the Joint Venture.
2. The Bank Guarantee should be in accordance with the proforma as provided. However, in case the issuing bank insists for additional paragraph regarding applicability of ICC publication No: 758, the following may be added at the end of the proforma of the Bank Guarantee [*i.e., end paragraph of the Bank Guarantee preceding the signature(s) of the issuing authority(ies) of the Bank Guarantee*]:

“This Guarantee is subject to Uniform Rules for Demand Guarantee, ICC publication No. 758.”

3a. FORM OF NOTIFICATION BY THE EMPLOYER TO THE BANK
(Applicable for Forfeiture of Bank Guarantee)

To: *(insert Name and Address of the issuing Bank)*

Ref.: Forfeiture of Bid Security Amount against Bank Guarantee No. dated
..... for, issued by you on behalf of M/s.*(insert name of the Bidder)*

Dear Sirs,

Please refer to the subject Bank Guarantee executed by you in our favour for
..... as Bid Security for the bid submitted by M/s.*(insert name of the Bidder)* against *(insert name of the Package)* ; Specification No.
.....

As per the terms of the said guarantee, the bank has guaranteed and undertaken to pay immediately on demand by the Employer the amount of without any reservation, protest, demur and recourse. Further, any demand made by the Employer shall be conclusive and binding on the Bank irrespective of any dispute or difference raised by the Bidder.

In terms of the said guarantee, we hereby submit our claim/demand through this letter for remittance of Bid Security amount to *(insert name of the Employer)* owing to the occurrence of the condition referred to at Sl. No. The Bank is requested to remit the full guaranteed sum towards proceeds of the bid security in the form of Demand Draft in favour of '.... *(insert name of the Employer)*', payable at*(insert place of the Employer)*....'.

Thanking you,

For.....*(Name of the Employer)*

(AUTHORISED SIGNATORY)

Copy to:

.....*(Registered Office of the Bank)*....

3b. FORM OF NOTIFICATION BY THE EMPLOYER TO THE BANK
(Applicable for conditional claim pending extension of Bank Guarantee by the Bidder)

To: *(insert Name and Address of the issuing Bank)*

Ref.: Conditional Claim against Bank Guarantee No. dated for
..... valid up to issued by you on behalf of M/s.*(insert name of the Bidder)*

Dear Sirs,

Please refer to the subject Bank Guarantee executed by you in our favour on behalf of M/s.*(insert name of the Bidder)*, who have submitted this Bank Guarantee to us towards Bid Security against *(insert name of the Package)* ; Specification No.

We, ... *(insert name of the Employer)* do hereby request you to lodge our claim/demand against the subject Bank Guarantee for full guaranteed sum. Kindly note that this claim/demand against the subject Bank Guarantee is without any further notice in case the amendment to Bank Guarantee No. dated extending its validity upto is not got arranged by*(insert name of the Bidder)* in our favour and are not received by us upto In such an event you are requested to remit the full guaranteed amount in terms of the subject guarantee in its letter and spirit and proceeds of this Bank Guarantee shall be forwarded to us in form of demand draft in favour of '.... *(insert name of the Employer)*, payable at*(insert place of the Employer)*....'.

This is without prejudice to our right under this guarantee and under the law.

Thanking you,

For.....*(Name of the Employer)*

(AUTHORISED SIGNATORY)

Copy to:
(insert Name and Address of the Bidder)

- You are requested to do the needful so that the amendment to the subject Bank Guarantee extending the validity up to is received by us by

4. FORM OF CONTRACT AGREEMENT

(The document will be shared with Successful bidder)

4.1 PROCEDURES OF PAYMENT

In accordance with the provision of **GCC clause 33 (Payment Terms & Mode of Payment)**, the Employer shall pay the Contractor in the following manner and at the following times, on the basis of the Price Breakdown given in the section on price schedules. Payments will be made in the currencies quoted by the Bidder unless otherwise agreed between the parties. The Contractor may make applications for payment in respect of part deliveries as work proceeds.

1. TERMS OF PAYMENT

In addition to the condition stipulated under GCC clause 33, the following terms & Conditions will apply

1.1 Supply Portion

- A. Interest Bearing Advance (Optional*): Ten percent (10%) of the Ex-works price component of all items shall be paid as an interest bearing initial advance after signing the Contract Agreement and on submission of (a) **Proforma invoice(s)**, (b) **Advance Bank Guarantee for [{110% (one hundred ten percent) of the amount of Advance} Plus {amount of GST reimbursable on Advance as per the Proforma invoice(s)}]** in line with GCC Clause 33.1.2, (c) Performance Securities in line with GCC Clause 9 and (d) Detailed PERT Network/Bar chart and its approval by the Employer. **Provided further that the Proforma Invoice(s) for advance payment along with all supporting documents is submitted by the Contractor to the Employer within 3 months from the date of Notification of Award. In case the Contractor does not submit the requisite documents including applicable Bank Guarantee(s)/Security(ies) within the aforesaid period, the advance shall not be payable. The Contractor shall, within 7 days from the date of receipt of Advance, furnish an Advance Receipt Voucher to the Employer, as prescribed under the GST Law.**

Note: * This payment is an optional payment. The Contractor has the option of taking the interest bearing initial advance or otherwise.

Interest rate applicable on advance payment to the Contractor shall be 200 Basis Points (BPS) above the MCLR [One Year Tenor rate p.a.] published by State Bank of India prevailing as on the date of drawal of advance. The said interest rate shall remain fixed and shall be applicable till the advance amount is fully repaid. The interest will be charged considering proportionate adjustment of advance against progressive payment as per 1.1 (C.1) below. The interest shall be calculated on daily progressive balances outstanding as on the date of recovery/adjustment. It is the Employer's understanding that as per extant provisions, GST is not payable on interest paid on the amount of Advance. The Contractor is, however, advised to check the position from their own sources. If payable, the same shall be to the Contractor's account and Employer shall not reimburse any GST on this account.

Further, the Contractor shall submit the certificate of Tax Deduction at Source (TDS) on interest within 3 months from the end of the quarter in which adjustment of advance has been made for claiming refund from Employer. No claim for refund will be entertained after end of the aforesaid period of 3 months. Further, while submitting the TDS Certificate the details of Contract No, Project,

Region, Quarter etc to which the TDS certificate pertains, shall also be submitted tallying the amount with the TDS Certificate.

In case, the Contractor opts not to take interest bearing advance as above, it would be mandatory for him to submit the documents listed at Sl. No. (c), and (d) above within twenty eight (28) days of issuance of NOA.

(The above is to be incorporated in case the Contractor has opted for the interest bearing initial advance, as declared by it in its bid in the relevant Attachment to Bid Form).

B. It would be mandatory for contractor to fulfill the following conditions mentioned at as per terms & conditions of Contract and agreed work schedule:

- a) Approval of all designs, drawings & guaranteed technical particulars as identified in Technical Specifications, Volume-II of the Bidding Documents.
- b) Approval of all quality plans and sub-vendor list.
- c) Approval of type test reports in case type tests are not required to be repeated.

C Progressive Payment

Payment of the Ex-works price of all items for each consignment shall be made progressively on certification of the Employer and on the basis of work performed using the following guidelines:

C.1 **Sixty percent (60%)[^]** payment of the: (i) Ex-works price component ***for the fabricated tower parts/tower shall be paid on successful completion of inspection and testing of the materials/items and on submission of documents indicated hereinunder:***

- (a) Evidence of dispatch (R/R or receipted L/R)
- (b) Contractor's **GST invoice, claim** & packing list identifying contents of each shipment.
- (c) Insurance policy/certificate
- (d) Manufacturer's/Contractor's guarantee certificate of Quality.
- (e) Material Inspection Clearance Certificate (MICC) for dispatch issued by the Employer's representative and the contractor's factory inspection report.
- (f) Test certificate

The payment of fabricated tower parts/towers shall, however, be made on completed tower basis on certification by the Employer.

[^] In case, the Contractor opts not to take interest bearing initial advance **or has opted to take interest bearing initial advance but the advance payment has become inadmissible for the reason specified in 1.1(A) above**, then this payment shall be 70% instead of 60%.

C.2 ***Eighty percent (80%)^{^^} of the Ex-works price component of all items, excluding of fabricated tower parts/tower, shall be paid on despatch of the same and on submission of the documents indicated under Clause 1.1 (C.1) above.***

^^ In case, the Contractor opts not to take interest bearing initial advance, then this payment shall be 90% instead of 80%.

- C.3 Twenty percent (20%) of the Ex-works price component for the fabricated tower parts/tower shall be paid on completion of erection of complete tower and furnishing of necessary certificate by Employer's representative.**

D Final Payment

- D.1** The balance ten percent (10%) of the Ex-works price component shall be paid on **completion of erection of all the towers of the transmission line** and on submission of an unconditional & irrevocable Bank Guarantee for full 10% amount initially valid till scheduled date of completion of testing & commissioning of the transmission line and its taking over by the Employer and shall be extended from time to time till the actual date of successful completion of testing & commissioning of line and its taking over by the Employer.

The payment for bolts and nuts shall be subject to a ceiling of approved weight of bolts and nuts for the respective type of towers as per the Bill of Material to be furnished by the Employer.

- 1.2 Type Test Charges:** Not Applicable.

- 1.3 Supply of Services Portion:**

Inland Transportation, In-transit insurance, loading & unloading Charges

Inland transportation and In-transit insurance charges shall be paid to the Contractor on pro-rata basis, as per the unit rates indicated in the Contract Agreement, after receipt of materials/items at site and on presentation of the **Bill of supply or any other documents prescribed under GST Law** alongwith supporting documents by the Contractor. However, these charges will be subject to a limitation that the aggregate of all invoices does not exceed the total amount indicated in the Contract Agreement. **It is the Employer's understanding that as per extant provisions, on the charges for supply of services related to Inland transportation, In-transit insurance, loading and unloading by the Contractor to the Employer, GST is not payable. The Contractor is, however, advised to check the position from their own sources. If payable, the same shall be to the Contractor's account and Employer shall not reimburse any GST on this account.**

- 1.4 Price Component for Installation (including Civil Works)**

- A. Survey (covered in Transmission Line Portion)**

Payment for survey shall be paid on pro-rata basis on completion of survey and approval of the same by the Employer.

- B. Interest Bearing Initial Advance (Optional ^^) Ten percent (10%):**

Initial Advance (Optional ^): An advance of 10% (ten) of the total erection price (excluding the price component for survey) shall be paid as an interest bearing initial advance on submission of (a) **Proforma invoice(s)**, (b) Establishment of Contractor's site offices, commencement of stub setting work & certification by Project Manager that satisfactory mobilisation for erection exists, (c) Advance Bank Guarantee for **[{110% (one hundred ten percent) of the amount of Advance} Plus {amount of GST reimbursable on Advance as per the Proforma invoice}]** and (d) Performance Securities in line with GCC Clause 9.

Note: ^: This payment is an optional payment. The Contractor has the option of taking the interest bearing advance or otherwise.

Provided further that the **Proforma** Invoice(s) for advance payment along with all supporting documents is submitted by the Contractor to the Employer within 3 months from the date of fulfillment of the requisite activities, as per the L2 network. In case the Contractor does not submit the requisite documents including applicable Bank Guarantee(s)/ Security(ies) within the aforesaid period, the advance shall not be payable.

The Contractor, shall, within 7 days from the date of receipt of Advance, furnish an Advance Receipt Voucher to the Employer, as prescribed under the GST Law.

Note: ^^: This payment is an optional payment. The Contractor has the option of taking the interest bearing advance or otherwise.

Interest rate applicable on advance payment to the Contractor shall be 200 Basis Points(BPS) above the MCLR [One year Tenor rate p.a.] published by State Bank of India prevailing as on the date of drawl of advance. The said interest rate shall remain fixed and shall be applicable till the advance amount is fully repaid. The interest will be charged considering proportionate adjustment of advance against progressive payment for the work done as per 1.4(B). The interest shall be calculated on the daily progressive balances outstanding as on the date of recovery/adjustment. **It is the Employer's understanding that as per extant provisions, GST is not payable on Interest paid on the amount of Advance. The Contractor may, however, advised to check the position from their own sources. If payable, the same shall be to the Contractor's account and Employer shall not reimburse any GST on this account.**

(The above is to be incorporated in case the Contractor has opted for the interest bearing initial advance, as declared by it in its bid in the relevant Attachment to Bid Form).

Further, the Contractor shall submit the certificate of Tax Deduction at Source (TDS) on interest within 3 months from the end of the quarter in which adjustment of advance has been made for claiming refund from Employer. No claim for refund will be entertained after end of the aforesaid period of 3 months. Further, while submitting the TDS Certificate the details of Contract No, Project, Region, Quarter etc to which the TDS certificate pertains, shall also be submitted tallying the amount with the TDS Certificate.

In case, the Contractor opts not to take interest bearing advance as above, it would be mandatory for him to submit the document listed at Sl. No. (d) above within twenty eight (28) days of issuance of NOA.

(The above is to be incorporated in case the Contractor has opted for the interest bearing initial advance, as declared by it in its bid in the relevant Attachment to Bid Form).

C Progressive Payment

Eighty percent (80%)*^^(excluding Survey) shall be paid on completion the each of the items of Erection activity and on successful completion of quality check point involved in Installation, submission of the details of items, components, raw materials, services etc. procured/availed from MSEs, if any, for the preceding 6 months, in respect of all the contracts in the respective executing Region of RECTPCL as per format enclosed at Section IX, Forms, Volume-I of the bidding documents and certification by Employer's representative **and on submission of GST invoice.**

^^ This payment shall be 90% instead of 80% in case, the Contractor opts not to take **interest bearing initial advance or has opted to take interest bearing initial advance but the advance payment has become inadmissible for the reason specified in 1.4 (B) above.**

Further, one of the conditions for release of first progressive payment / subsequent payment shall be submission of 'Safety Plan' alongwith all requisite documents in line with tender document on Safety Precaution and proforma provided in this Section – Sample Forms and Procedure and approval of the same by the Engineer In-Charge.

D. **Final Payment**

Final 10% payment shall be made as follow:

(1) Transmission Line Portion

The balance 10% (ten percent) of the erection price component (excluding price component for survey) shall be paid after successful commissioning of the transmission line and issuance of Taking Over Certificate. However, in case, for any reason solely attributable to the Employer, the commissioning of line is delayed beyond 120 days of successful completion of final checking and testing of line for the purpose of commissioning as defined in Technical Specification, Volume-II of the Bidding Documents, the balance 10% payment shall be released against an unconditional & irrevocable bank guarantee of equivalent amount initially valid till 6 months from the readiness of transmission line for commissioning and charging at rated voltage, to be extended till 90 days beyond actual commissioning & taking over.

- 1.4.1 'Commissioning' for the purpose of payments shall mean satisfactory completion of all supplies, erection, commissioning checks and successful completion of all site tests and charging of the transmission line at rated voltage as per the Contract and to the satisfaction/approval of the Employer.

1.5 **Payment towards Price Adjustment**

Any variation in Contract price due to price adjustment provision of Appendix-2 shall be effected on presentation of **debit note/credit note, as prescribed under the GST law,**

supported by calculations as per formulae specified therein along with documentary evidence for different indices applicable for Price Adjustment.

- 1.5.1 Any increase in Contract price due to price adjustment provision shall be payable as follows:

Supply of Goods Portion:

90% (ninety percent) of the price adjustment amount for the respective shipment shall be paid on receipt of said shipment at site **and issuance of Debit Note, as prescribed under the GST law, by the Contractor.** Balance 10% (ten percent) of the price adjustment amount shall be paid alongwith the final payment.

Any interest on GST payable due to increase in Contract price due to price adjustment shall be to the Contractor's account and Employer shall not reimburse any amount on this account.

Supply of Services Portion:

90% (ninety percent) of the price adjustment amount for the respective billing period shall be paid after certification by Employer's representative for quantum of work done in the said billing period **and issuance of Debit Note, as prescribed under the GST law, by the Contractor.** Balance 10% (ten percent) of the price adjustment amount shall be paid alongwith the final payment.

Any interest on GST payable due to increase in Contract price due to price adjustment shall be to the Contractor's account and Employer shall not reimburse any amount on this account.

- 1.5.2 **For any reduction in Contract Price due to price adjustment provisions the Contractor shall issue 'Credit note', as prescribed under the GST law. Further, the reduction in Contract Price shall be effected by recovering 100% of the reduction amount along with applicable GST, if any charged earlier, from Contractor's invoices falling immediately due for payment or any other payments.**

1.6 Payment towards Taxes & Duties

Taxes and duties applicable as per Indian Tax laws, **concerning Supply of Goods and Services** in respect of transaction between the Employer and the Contractor, **shall be reimbursed by the Employer as follows:**

- (a) GST on Advance payment shall be reimbursed along with the Advance payment.**
- (b) In case of Ex-works supply of goods, remaining GST (GST charged on invoice less GST on advance) shall be reimbursed along with progressive payment on dispatch.**
- (c) In case of Installation, the remaining GST(GST charged on invoice less GST on advance) shall be reimbursed along with Progressive payment on completion of Erection activity.**

(d) GST on type test shall be reimbursed after successful completion of the Type test and along with the progressive payment on dispatch for the first consignment of Equipment for which the type test has been conducted.

(e) GST on Training charges shall be reimbursed on successful completion of Training.

(f) 100% GST reimbursable on account of increase in Contract price due to price adjustment shall be reimbursed along with the 90% payment of the Price adjustment amount.

All GST payment except GST applicable on Advance shall be against GST invoices/debit notes raised by the Contractor as specified under the GST Act and related Rules, Notifications, etc as notified by the Government in this regard. In the event that the Contractor fails to provide the invoice/debit note in the form and manner prescribed under the GST Act and Rules, the Employer shall not be liable to make any payment against such invoice/debit note. Reimbursement of GST payment against Advance payment shall be against proforma invoice(s). Further, the Contractor shall, within 7 days from the date of receipt of Advance, furnish an Advance Receipt Voucher to the Employer, as prescribed under the GST Law. Payment towards taxes & duties shall be released by the Employer directly to the Contractor.

2. PAYMENT PROCEDURES

2.1 Method of Payment

The Employer shall make payments promptly within thirty (30) days of submission of an invoice/claim by the Contractor, complete in all respects and supported by the requisite documents and fulfillment of stipulated conditions, if any. **All invoices/claims shall be raised by the Contractors in the name of Owner acting through RECTPCL.**

All payments to be made directly to the Contractor shall be made by the Employer through electronic payment mechanism (e-payment) for which necessary details shall be tied up during execution of the Contract. However, a request for payment to be released through cheque shall be considered on case to case basis and merit of the same.

Note: Pro-rata shall refer to functionally complete part(s) of the facilities, for which unit rates are identified in the contract

1.2 Payment Tracking

(Payment tracking method will be intimated to the contractor in due course of time.)

4.2 PRICE ADJUSTMENT

General

- 1.1 Prices for work and materials covered under the scope of this Specification shall be furnished by the bidder in the manner specified in the Bid Form & Price Schedules. The bidder shall quote base prices for the Ex-Works price component of the equipment/materials and installation (including civil works) price component of the equipment/materials. These price components for certain equipment/ materials, as specified, shall be subject to price adjustment to reflect changes in the cost of labour and material components as per the provisions given below:
- 1.2 The Ex-Works Price Components for tower accessories such as danger plate, phase plate, circuit plates, number plate, anti-climbing device, bird guards, pipe and counterpoise earthing, etc. shall remain firm and no price adjustment shall be applicable for the price components of these items.
- 1.3 Other Charges viz. inland transportation, inland insurance, type test charges, survey, soil investigation & painting of towers etc. shall be firm and no price variation shall be payable for these components.

2.0 Ex-works Price Component

The formulae for calculating the price adjustment to be applied to the Ex-works price component of the equipment/material will be as follows:

A. **Fabricated Tower Parts (including Bolts & Nuts)**

$$EC_1 = EC_0 [0.15 + a \times (A_1/A_0) + b \times B_1/B_0 + l \times (L_1/L_0)] - EC_0$$

Where, EC_1 is the price adjustment amount payable on ex-works prices of fabricated tower parts (including Bolts & Nuts), shipment-wise.

EC_0 = Ex-works price component of fabricated tower parts (including ex-works price of Bolts & Nuts) shipment-wise.

A = Price of Steel Blooms of size 150 mm x 150 mm, as published by IEEMA.

B = Price for Electrolytic High Grade Zinc, as published by IEEMA.

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as

published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

a = Co-efficient of Steel Blooms, Value of which shall be between 0.51 & 0.57.

b = Co-efficient of Zinc, Value of which shall be between 0.08 & 0.10

l = Co-efficient of labour, Value of which shall be between 0.20 & 0.24.

and the sum of a, b & l shall be 0.85.

B. Line Materials

B.1 Earthwire

$$EC_{EW1} = EC_{EW} [0.20 + a \times (A_1/A_0) + l \times (L_1/L_0)] - EC_{EW}$$

Where,

EC_{EW1} = Price adjustment amount payable on Ex-works price of Earthwire, shipment-wise.

EC_{EW} = Ex-works price for Earthwire, shipment-wise.

A = Published price indices for high tensile steel galvanized wire, as published by CACMAI/Nationally recognized published index acceptable to Employer.

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

a = Co-efficient of High Tensile Steel Galvanized Wire, Value of which shall be between 0.69 & 0.71.

l = Co-efficient of labour, Value of which shall be between 0.09 & 0.11.

and the sum of a & l shall be 0.80.

B.2 Hardware Fittings

$$EC_{HW1} = EC_{HW} [0.20 + a \times (A_1/A_0) + b \times (B_1/B_0) + c \times (C_1/C_0) + l \times (L_1/L_0)] - EC_{HW}$$

EC_{HW1} = Price adjustment amount payable on Ex-works price of Hardware Fittings, shipment-wise.

EC_{HW} = Ex-works price for Hardware fittings, shipment-wise.

A = Price indices for EC Grade Aluminium Ingots, as published by IEEMA.

B = Price indices for Electrolytic High Grade Zinc, as published by IEEMA.

C = Wholesale Price Index Number for 'Ferrous Metals' (Group Item) (monthly) (Base: 2004-05=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in).

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

a = Co-efficient of EC Grade Aluminum Ingots, Value of which shall be between 0.35 & 0.45.

b = Co-efficient of Electrolytic High Grade Zinc, Value of which shall be between 0.04 & 0.06.

c = Co-efficient of Ferrous Metal, Value of which shall be between 0.18 & 0.22.

l = Co-efficient of labour, Value of which shall be between 0.13 & 0.17.

and the sum of a, b, c & l shall be 0.80.

B.3 Conductor and Earthwire Accessories:

(i) Mid Span Compression Joint for Earthwire

$$EC_1 = EC_0 [0.20 + a \times (A_1/A_0) + b \times (B_1/B_0) + c \times (C_1/C_0) + l \times (L_1/L_0)] - EC_0$$

Where,

a = Co-efficient of EC Grade Aluminum Ingots, Value of which shall be between 0.35 & 0.45.

b = Co-efficient of Electrolytic High Grade Zinc, Value of which shall be between 0.04 & 0.06.

c = Co-efficient of Ferrous Metal, Value of which shall be between 0.18 & 0.22.

l = Co-efficient of labour, Value of which shall be between 0.13 & 0.17.

and the sum of a, b, c & l shall be 0.80.

- (ii) Mid Span Compression Joint for Conductor, Repair Sleeve for Conductor

$$EC_1 = EC_0 [0.20 + a \times (A_1/A_0) + l \times (L_1/L_0)] - EC_0$$

Where,

a = Co-efficient of EC Grade Aluminum Ingots, Value of which shall be between 0.63 & 0.67.

l = Co-efficient of labour, Value of which shall be between 0.13 & 0.17.

and the sum of a & l shall be 0.80.

- (iii) Vibration Damper for Earthwire, Suspension Clamp for Earthwire, Tension Clamp for Earthwire and Vibration Damper for Conductor

$$EC_1 = EC_0 [0.20 + b \times (B_1/B_0) + c \times (C_1/C_0) + l \times (L_1/L_0)] - EC_0$$

Where,

b = Co-efficient of Electrolytic High Grade Zinc, Value of which shall be between 0.06 & 0.08.

c = Co-efficient of Ferrous Metal, Value of which shall be between 0.55 & 0.61.

l = Co-efficient of labour, Value of which shall be between 0.13 & 0.17.

and the sum of b, c & l shall be 0.80.

- (iv) Flexible Copper Bond shall be on Firm price basis.

In the above formulae,

EC₁ = Price adjustment amount of respective items, shipment-wise.

EC₀ = Ex-works price for Conductor & Earthwire Accessories, shipment-wise.

A = Price indices for EC Grade Aluminium Ingots, as published by IEEMA.

B = Price indices for Electrolytic High Grade Zinc, as published by IEEMA.

C = Wholesale Price Index Number for 'Ferrous Metals' (Group Item) (monthly) (Base: 2004-05=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in).

- L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).
- 2.1 i) Subscript '0' refers to indices for material & labour as on thirty (30) days & three (3) months prior to date of opening of Bids respectively.
- ii) Subscript '1' refers to indices for material & labour as on 60 (sixty) days & four months prior to the date of shipment respectively.
- 2.2 The total adjustment for Earthwire, Hardware Fittings, Conductor & Earthwire Accessories shall be subject to a ceiling of $\pm 20\%$ individually of respective Ex-Works price of Earthwire, Hardware Fittings, Conductor & Earthwire Accessories.

However, the total price adjustment of fabricated tower parts (including Bolts & Nuts) shall not be subject to any ceiling whatsoever.

3.0 Installation (including Civil Works) Price Component

The formula for calculation of the monthly price adjustments for Installation [including civil works but excluding survey, soil investigation and aviation signal for river crossing towers(if any)] price component shall be as under:

A. Installation price component [including civil works but excluding 'supply & placement of reinforcement steel', 'concreting', survey, soil investigation and aviation signal for river crossing towers (if any)]

$$ER_1 = ER_0 [0.20 + a \times (A_1/A_0) + l \times (L_1/L_0)] - ER_0$$

Where,

ER_1 = Price adjustment amount payable on Installation price component (excluding supply & placement of steel and concreting) for each billing.

ER_0 = Value of erection work done (excluding supply & placement of steel and concreting) in billing period as established by Contract.

A = Wholesale Price Index Number for 'High Speed Diesel'(Individual Commodity) (monthly) (Base: 2004-05=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in).

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

Where,

a = Co-efficient of 'High Speed Diesel Oil', Value of which shall be between 0.20 & 0.24.

l = Co-efficient of labour, Value of which shall be between 0.56 & 0.60.

and the sum of a & l shall be 0.80.

B. Supply and Placement of Reinforcement Steel

$$ER_1 = ER_0 [0.20 + a \times (A_1/A_0) + l \times (L_1/L_0) + b \times (B_1/B_0)] - ER_0$$

Where,

ER₁ = Price adjustment amount payable on price components of Supply and Placement of Steel.

ER₀ = Value of supply & placement of steel in billing period as established by Contract.

A = Wholesale Price Index Number for 'High Speed Diesel'(Individual Commodity) (monthly) (Base: 2004-05=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in).

B = Wholesale Price Index Number for 'Ferrous Metals'(Group Item) (monthly) (Base: 2004-05=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in).

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

Where,

a = Co-efficient of 'High Speed Diesel Oil', Value of which shall be between 0.09 & 0.11.

b = Co-efficient of 'Ferrous Metal', Value of which shall be between 0.63 & 0.67.

l = Co-efficient of labour, Value of which shall be between 0.04 & 0.06.

and the sum of a, b & l shall be 0.80.

C. Concreting

$$ER_1 = ER_0 [0.20 + a \times (A_1/A_0) + l \times (L_1/L_0) + b \times (B_1/B_0) + c \times (C_1/C_0)] - ER_0$$

Where,

ER₁ = Price adjustment amount payable on price components of concreting.

ER₀ = Value of concreting in billing period as established by Contract.

A = Wholesale Price Index Number for 'High Speed Diesel'(Individual Commodity) (monthly) (Base: 2004-05=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in).

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

B = Wholesale Price Index Number for 'Cement & Lime'(Group Item) (monthly) (Base: 2004-05=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry (www.eaindustry.nic.in).

C = Wholesale Price Index Number for 'Structural Clay Products'(Group Item) (monthly) (Base: 2004-05=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in).

Where,

a = Co-efficient of 'High Speed Diesel Oil', Value of which shall be between 0.18 & 0.22.

b = Co-efficient of 'Cement & Lime', Value of which shall be between 0.25 & 0.35.

c = Co-efficient of 'Structural Clay products', Value of which shall be between 0.18 & 0.22.

l = Co-efficient of labour, Value of which shall be between 0.09 & 0.11.

and the sum of a, b, c & l shall be 0.80.

- 3.1 i) Subscript 'o' will correspond to thirty (30) days prior to date of opening of Bids.

- ii) Subscript '1' will correspond to the month of billing.
- 3.2 The total price adjustment amount for Installation (including civil works) price component shall not be subject to any ceiling whatsoever.
- 4.0 The Bidders are required to estimate and indicate the values of different coefficients for each of the items in the price variation formulae within the specified range such that their summation is as specified in the Bidding Documents. Where no value or '-' or 'shall be furnished later' is specified against the coefficient, the same will be deemed to be zero and the fixed component would be suitably adjusted. If the values of all coefficients in price variation formulae indicated by the Bidder are within the specified range but their sum exceeds the summation specified in the Bidding Documents, the values of the coefficients shall be pro-rata adjusted such that the summation remains as per the provisions of the Bidding Documents. If the values of all coefficients indicated by the Bidder are within the specified range but their summation is less than the value specified in the Bidding Documents, the values of the coefficients as indicated by the Bidder shall be considered as such and the fixed component in the price variation formulae would be suitably adjusted. Further, if any of values of the coefficients indicated by the Bidder is out of the range specified in the Bidding Documents, the lower of the values, as indicated by the Bidder vis-à-vis lower value of the range for that coefficient specified in the Bidding Documents, shall be considered and the fixed component would be suitably adjusted.
- 5.0 The above price adjustment provision shall be invoked by either party subject to the following further conditions:
 - a) For the purpose of Price Adjustment on ex-works price components of the equipment, the date of shipment for Goods shall mean scheduled date of shipment or actual date of shipment, whichever is earlier. Scheduled date of shipment will be ex-works date of despatch, governed by the accepted PERT Network/Bar Chart. Similarly, for the purpose of Price Adjustment on Installation price component, the Billing period shall mean the billing period as per Contract time schedule i.e., the agreed Bar Chart or actual period, whichever is earlier. The Billing period for various Installation activities will be as per agreed Installation Bar Chart indicating monthly schedule of Installation activities for completion of works. However, when the Employer's specific approval for advancement of shipment/installation activities has been obtained in such case the said advanced date shall be treated as the schedule date of shipment/installation activities for the purpose of working out the price adjustment payable.

No price increase shall be allowed beyond the original delivery/ Installation dates unless specifically stated in the Time Extension Letter, if

any, issued by the Employer. The Employer will, however, be entitled to any decrease in the Contract Price which may be caused due to lower price adjustment amount in case of delivery of Goods/ Installation beyond the original delivery/Installation dates. Therefore, in case of delivery of Goods/Installation beyond the original delivery/ Installation dates, the liability of the Employer shall be limited to the lower of the price adjustment amount which may work out either on schedule date or actual date of despatch of Goods/ Installation.

- b) In case IEEMA does not publish any of the price indices, as mentioned above, the Bidder shall indicate any nationally recognised published index for respective items and the source of the same shall be furnished in the Bid.
- c) In case of non-publication of applicable indices on a particular date, which happens to be the applicable date for Price Adjustment purposes, the published indices prevailing immediately prior to the particular date shall be applicable.
- d) If the Price Adjustment amount works out to be positive, the same is payable to the Contractor by the Employer and if it works out to be negative, the same is to be recovered by the Employer from the Contractor.
- e) The Contractor shall promptly submit price adjustment invoices for the supplies made/work done, positively within three (3) months from the date of shipment/ work done, whether it is positive or negative.

4.3 INSURANCE REQUIREMENTS**A) Insurances to be taken out by the Contractor**

In accordance with the provisions of GCC Clause 40, the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurances set forth below in the sums and with the deductibles and other conditions specified. The identity of the insurers and the form of the policies shall be subject to the approval of the Employer, such approval not to be unreasonably withheld. The inability of the insurers to provide insurance cover in the sums and with the deductibles and other conditions as set forth below, shall not absolve the Contractor of his risks and liabilities under the provisions of GCC Clause 40. However, in such a case the Contractor shall be required to furnish to the Employer documentary evidence from the insurer in support of the insurer's inability as aforesaid.

(a) Marine Cargo Policy/Transit Insurance Policy:**(I)(i) Marine Cargo policy for imported equipment**

The Contractor shall take the Marine Cargo Policy for Plant and Equipment including mandatory Spares to be supplied from abroad wherein export/import including inland transit is involved for the movement of the Plant and Equipment including mandatory Spares. The policy shall cover movement of Plant and Equipment including mandatory Spares from the manufacturer's works to the project's warehouse at final destination site. The policy shall cover all risk for loss or damage that may occur during transit of Plant and Equipment including mandatory Spares from the Contractor/sub-Contractor's works or stores until arrival at project's warehouse/ store at final destination. Institute Cargo Clause (ICC) 'A' along with war & Strike Riots & Civil Commotion (SRCC) cover shall be taken.

(I)(ii) Transit Insurance Policy for indigenous equipment

Similarly, Transit Insurance Policy shall be taken wherein only inland transit is involved for the movement of Plant and Equipment including mandatory Spares supplied from within India. The policy shall cover movement of Plant and Equipment including mandatory Spares from the manufacturer's works to the project's warehouse at final destination site. Inland Transit Clause (ITC) 'A' along with war & Strike Riots & Civil Commotion (SRCC) extension cover shall be taken.

Amount	Deductible Limits	Parties insured	From	To
120% of CIP Entry Border Point Price /CIF Indian Port of Entry Price of all the Plant and Equipment including mandatory Spares to be supplied from abroad plus customs duties (including BCD, GST, Cess etc.) on merit rate and 120% of Ex-work Price of all the Plant and Equipment including mandatory Spares to be supplied from within India plus GST , if additionally payable.	Nil	Contractor & Employer	Mfrs ware-house	Project's ware-house store at final destination

(II) If during the execution of Contract, the Employer requests the Contractor to take any other add-on cover(s)/ supplementary cover(s) in aforesaid insurance, in such a case, the Contractor shall promptly take such add-on cover(s)/ supplementary cover(s) and the charges towards such premium for such add-on cover(s)/ supplementary cover(s) shall be reimbursed to the Contractor on submission documentary evidence of payment to the Insurance company. Therefore, charges towards premium for such add-on cover(s)/ supplementary cover(s) are not included in the Contract Price.

(III) The Contractor shall take the policy in the joint names of Employer and the Contractor. The policy shall indicate the Employer as the beneficiary. However, if the Contractor is having an open policy for its line of business, it should obtain an endorsement of the open cover policy from the insurance company indicating that the dispatches against this Contract are duly covered under its open policy and include the name of the Employer as jointly Insured in the endorsements to the open policy.

(b) Erection All Risk Policy/Contractor All Risk Policy:

(I) The policy should cover all physical loss or damage to the facility at site during storage, erection and commissioning covering all the perils as provided in the policy as a basic cover and the add on covers as mentioned at Sl. No. (III) below.

Amount	Deductible limits	Parties insured	From	To
105% of CIP Entry Border Point Price /CIF Indian Port of Entry	Nil	Contractor & Employer	Receipt at site of first lot of the Plant and	Up to Operational Acceptance

Price of all the Plant and Equipment including mandatory Spares to be supplied from abroad plus customs duties (including BCD, GST, Cess etc.) on merit rate and 105% of Ex-work Price of all the Plant and Equipment including mandatory Spares to be supplied from within India plus GST , if additionally payable. and 100% of erection price component			Equipment including mandatory Spares	

- (II) The Contractor shall take the policy in the joint name of Employer and the Contractor. All these policies shall indicate Employer as the beneficiary. The policy shall be kept valid till the date of the Operational Acceptance of the project and the period of the coverage shall be determined with the approval of the Employer.

If the work is completed earlier than the period of policy considered, the Contractor shall obtain the refund as per provisions of the policy and pass on the benefit to Employer. In case no refund is payable by the insurance company then the certificate to that effect shall be submitted to Employer at the completion of the project.

- (III) The following add-on covers shall also be taken by the Contractor:

- i) Earthquake
- ii) Terrorism
- iii) Escalation cost (approximately @10% of sum insured on annual basis)
- iv) Extended Maintenance cover for Defect Liability Period
- v) Design Defect
- vi) Other add-on covers viz., 50-50 clause, 72 hours clause, loss minimization clause, waiver of subrogation clause (for projects of more than Rs.100 crores, cover for offsite storage/fabrication (over Rs.100 crores).

- (IV) ***Third Party Liability cover with cross Liability within Geographical limits of India as on ADD-on cover to the basic EAR cover:***

The third party liability add-on cover shall cover bodily injury or death suffered by third parties (including the Employer's personnel) and loss of

or damage to property (including the Employer's property and any parts of the Facilities which have been accepted by the Employer) occurring in connection with supply and installation of the Facilities.

Amount	Deductible limits	Parties insured	From	To
- For projects upto Rs. 100 crores, the third party liability limit shall be 10% of the project value for single occurrence/ multiple occurrences in aggregate during the entire policy period. - For projects from Rs. 100 crores to Rs. 500 crores, the third party liability limit shall be Rs. 10 crores for single occurrence/multiple occurrences in aggregate during entire policy period. For projects of more than Rs.500 crores, the third party liability limit shall be Rs. 25 crores for single occurrence/ multiple occurrences in aggregate during entire policy period.	Nil	Contractor/ Sub-contractor	Receipt at site	Upto Defect Liability Period.

(V) As there is no OSM material in this contract. So, Contractor shall take consolidated insurance on all supply items mentioned in the Supply Contract.

(c) Automobile Liability Insurance

The Contractor shall ensure that all the vehicles deployed by the Contractor or its Subcontractors (whether or not owned by them) in connection with the supply and installation of the Facilities in the project are duly insured as per RTA act. Further the Contractor or its Subcontractors may also take comprehensive policy(own damage plus third party liability) of each individual vehicles deployed in the project on their own discretion in their own name to protect their own interest.

(d) Workmen Compensation Policy:

(I) Workmen Compensation Policy shall be taken by the Contractor in accordance with the statutory requirement applicable in India. The Contractor shall ensure that all the workmen employed by the Contractor

or its Subcontractors for the project are adequately covered under the policy.

- (II) The policy may either be project specific covering all men of the Contractor and its Subcontractors. The policy shall be kept valid till the date of Operational Acceptance of the project.

Alternatively, if the Contractor has an existing 'Workmen Compensation Policy' for all its employees including that of the Subcontractor(s), the Contractor must include the interest of the Employer for this specific Project in its existing 'Workmen Compensation Policy'.

- (III) Without relieving the Contractor of its obligations and responsibilities under this Contract, before commencing work the Contractor shall insure against liability for death of or injury to persons employed by the Contractor including liability by statute and at common law. The insurance cover shall be maintained until all work including remedial work is completed including the Defect Liability Period. The insurance shall be extended to indemnify the Principal for the Principal's statutory liability to persons employed by the Contractor.

The Contractor shall also ensure that each of its Subcontractors shall effect and maintain insurance on the same basis as the 'Workmen Compensation Policy' effected by the Contractor.

(e) Contractor's Plant and Machinery (CPM) Insurance

The Employer (including without limitation any consultant, servant, agent or employee of the Employer) shall not in any circumstances be liable to the Contractor for any loss of or damage to any of the Contractor's Equipment or for any losses, liabilities, costs, claims, actions or demands which the Contractor may incur or which may be made against it as a result of or in connection with any such loss or damage.

The Employer shall be named as co-insured under all insurance policies taken out by the Contractor except for the Third Party Liability, Workmen Compensation Policy Insurances, and the Contractor's Subcontractors shall be named as co-insureds under all insurance policies taken out by the Contractor except for the Cargo Insurance During Transport, Workmen Compensation Policy Insurances. All insurer's rights of subrogation against such co-insureds for losses or claims arising out of the performance of the Contract shall be waived under such policies.

B) Insurances to be taken out by the Employer

The Employer shall at its expense take out and maintain in effect during the performance of the Contract the following insurances.

Amount	Deductible limits	Parties Insured	From	To
_____ NIL _____				

-- End --

4.4 TIME SCHEDULE

1. The Project Completion Schedule shall be as follows:

Description	Duration in Months from the date of Notification of Award
Taking Over by the Employer upon successful Completion of:	
Transmission Line Package: : “Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”. i) Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik, ii) Package 04- RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum, iii) Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum	18 months

- 1.1 The activity(ies) under the Contractor’s programme for Project Completion shall be in the form of a master network (MNW) and shall identify the various activities like design, engineering, manufacturing, supply, installation, factory testing, transportation to site, site testing and commissioning, trial operation and Taking Over etc. of the Facilities or specific part thereof (where specific parts are specified in GCC). The network shall conform to the above Project Completion Schedule.

This master network will be discussed and agreed before Award in line with above, engineering drawing and data submission schedule shall also be discussed and finalised before Award. Liquidated damages for delay in successful Completion of the Facilities or specific part thereof (where specific parts are specified in GCC) and Operational Acceptance at rates specified in Tender document shall be applicable beyond the date specified above.

- 1.2 The Employer reserves the right to request minor changes in the work schedule at the time of Award of Contract to the successful Bidder.
- 1.3 The successful Bidder shall be required to prepare detailed Network(s) and project implementation plans & programmes and finalise the same with the Employer as per the requirement specified in Technical Specifications, which shall form a part of the Contract.

4.5 LIST OF APPROVED SUBCONTRACTORS

Prior to award of Contract, the following details shall be completed indicating those sub-contractors proposed by the Bidder by Attachment to its bid that are approved by the Employer for engagement by the Contractor during the performance of the contract.

The following Subcontractors are approved by PGCIL (CTU) or JKPDD (STU of J&K) for carrying out the item of the facilities indicated. Where more than one Subcontractor is listed, the Contractor is free to choose between them, but it must notify the Employer of its choice in good time prior to appointing any selected Subcontractor. In accordance with tender document, the Contractor is free to submit proposals for Subcontractors for additional items from time to time. No Subcontracts shall be placed with any such Subcontractors for additional items until the Subcontractors have been approved in writing by the OWNER/Employer/PGCIL and their names have been added to this list of Approved Subcontractors.

Item of Facilities	Approved Subcontractors	Nationality

Further, erection portion of the contract shall not be subcontracted without the prior approval of the Employer. However, such approval shall not be necessary for engaging labour.

4.6 LIST OF DOCUMENTS FOR APPROVAL OR REVIEW

Pursuant to tender document, the Contractor shall prepare, or cause its Subcontractor to prepare, and present to the Project Manager (EMPLOYER) in accordance with the requirements of contract (Program of Performance), the following documents for:

A. Approval

- 1.
- 2.
- 3.

B. Review

- 1.
- 2.
- 3.

Note:

Bidder shall furnish the exhaustive list, which shall be discussed and finalised for incorporation into the Contract Agreement.

4.7 GUARANTEES, LIQUIDATED DAMAGES FOR NON – PERFORMANCE

(NOT APPLICABLE)

Instruction for printing & submitting Integrity Pact

The requisite format of Integrity Pact is displayed here below.

Take print out of first page on a non-judicial stamp paper of Rs. 100/- /Company's Letterhead, as applicable, and other pages on plain A4 size paper. **Such two sets shall be prepared by the bidder.**

All the pages of both the copies of the Integrity Pact shall be signed by the authorised representative of the bidder and duly stamped.

Both the original copies shall be submitted by the bidder in the form of Hard Copy as part of the first envelope before due date & time of submission of the bid.

4.8 AGREEMENT

UNDER INTEGRITY PACT

No.

Dated

To,

**REC Transmission Projects Company Limited,
New Delhi**

Sub : Procurement of Bidding Documents

Ref. Tender no.

RECTPCL and the Bidder agree that the Notice Inviting Tender (NIT) is an offer made on the condition that the bidder will sign the Integrity Pact and the Bid would be kept open in its original form without variation or modification for a period of (state the number of days from the last date for the receipt of tenders stated in the NIT) days and the making of the bid shall be regarded as an unconditional and absolute acceptance of this condition of the NIT.

We confirm acceptance and compliance with the Integrity Pact in letter and spirit. We further agree that the contract consisting of the above conditions of NIT as the offer and the submission of Bid as the Acceptance shall be separate and distinct from the contract which will come into existence when bid is finally accepted by RECTPCL.

The consideration for this separate initial contract preceding the main contract is that RECTPCL is not agreeable to sell the NIT to the Bidder and to consider the bid to be made except on the condition that the bid shall be kept open for days after the last date fixed for the receipt of the bids and the Bidder desires to make a bid on this condition and after entering into this separate initial contract with RECTPCL.

RECTPCL promises to consider the bid on this condition and the Bidder agrees to keep the bid open for the required period. These reciprocal promises form the consideration for this separate initial contract between the parties.

If Bidder fails to honour the above terms and conditions, RECTPCL shall have unqualified, absolute and unfettered right to encash / forfeit the bid security submitted in this behalf.

Yours faithfully,

(BIDDER)

Yours faithfully

(PURCHASER)

INTEGRITY PACT

PRE-CONTRACT INTEGRITY PACT

General

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on day of the month of __ 20, between, on one hand, **REC Transmission Projects Company Limited** acting through Shri (Designation of the officer,), Department (hereinafter called the "BUYER", which expression shall mean and include, unless the context otherwise requires, his successors in office and assigns) of the First Part and M/s. _____ represented by Shri _____, _____, (hereinafter called the "BIDDER/Seller" which expression shall mean and include unless the context otherwise requires, his successors and permitted assigns) of the Second Part.

WHEREAS the BUYER proposes to procure _____ (Name what is being procured) and the BIDDER/Seller is willing to offer/has offered the (State what is being offered).

WHEREAS the BIDDER/SELLER is a private company/ public company/Government undertaking / partnership / registered export agency, constituted in accordance with the relevant law in the matter and the BUYER is a Ministry/Department of the Government of Indian/PSU performing its functions on behalf of the President of India.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/unprejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to:-

Enabling the BUYER to obtain the desired said stores/equipment item at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement, and

Enabling BIDDER/SELLER to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the BUYER will commit to prevent corruption, in any form, by their officials by following transparent procedures.

The parties hereto hereby agree to enter into this Integrity Pact and agree as follows:

Commitments of the Buyer

1.1 The Buyer undertakes that no official of the BUYER, connected directly or indirectly with the contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the BIDDER, either for themselves or for any person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the Contract.

- 1.2 The Buyer will, during the pre-contract stage, treat all Bidders alike, and will provide to all Bidders the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that particular BIDDER in comparison to other BIDDERS.
- 1.3 All the officials of the Buyer will report to SBU Head or concerned Functional Director of RECTPCL for any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.
2. In case of any such preceding misconduct on the part of such official(s) is reported by the BIDDER/SELLER to the BUYER with full and verifiable facts and the same is *prima facie* found to be correct by the Buyer, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the BUYER and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the Buyer the proceedings under the contract would not be stalled.
- 2.1 The BUYER will exclude from the process all known prejudiced persons.
- 2.2 If the BUYER obtains information on the conduct of any of its employees which is a criminal offense under the relevant Anti-Corruption Laws of India, or if there be a substantive suspicion in this regard, the BUYER will inform its Vigilance Office and in addition can initiate disciplinary actions.

Commitments of Bidders

3. The BIDDER/SELLER commits himself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commits himself to the following:-
 - 3.1 The BIDDER/SELLER will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the Buyer, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the Contract.
 - 3.2 The BIDDER/SELLER further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the Buyer or otherwise in procuring the Contract or for bearing to do or having done any act in relation to the obtaining or execution of the Contract or any other Contract with the BUYER for showing or for bearing to show favour or dis-favour to any person in relation to the Contract or any other Contract with the BUYER.

- 3.3 BIDDERS shall disclose the name and address of agents and representatives and Indian BIDDERS shall disclose their foreign principals or associates.
- 3.4 BIDDERS shall disclose the payments to be made by them to agents/brokers or any other intermediary, in connection with this bid/contract.
- 3.5 The BIDDER further confirms and declares to the BUYER that the BIDDER is the original manufacturer/integrator and has not engaged any individual or firm or company whether Indian or foreign to intercede, facilitate or in any way to recommend to the BUYER or any of its functionaries, whether officially or unofficially to the award of the contract to the BIDDER, nor has any amount been paid, promised or intended to be paid to any such individual, firm or company in respect of any such intercession, facilitation or recommendation.
- 3.6 The Bidder, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payments he has made, is committed to or intends to make to officials of the Buyer or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.
- 3.7 The BIDDER/SELLER will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.
- 3.8 The BIDDER/SELLER will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.
- 3.9 The BIDDER/SELLER shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the BUYER as part of the business relationship, regarding plans, technical proposals and business details, including information contained in any electronic data carrier. The BIDDER/SELLER also undertakes to exercise due and adequate care lest any such information is divulged.
- 3.10 The BIDDER/SELLER commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts.
- 3.11 The BIDDER/SELLER shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.
- 3.12 The BIDDER/SELLER or any employee of the BIDDER/SELLER or any person acting on behalf of the BIDDER/SELLER, either directly or indirectly, is a relative of any of the officers of the BUYER, or alternatively, if any relative of an officer of the BUYER has financial interest/stake in the BIDDER/SELLER's firm, the same shall be disclosed by the BIDDER/SELLER at the time of filing of tender.

The term 'relative' for this purpose would be as defined in Section 6 of the Companies Act 1956.

3.13 The BIDDER/SELLER shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the BUYER.

4. Previous Transgression

4.1 The BIDDER/SELLER declares that no previous transgression occurred in the last three years immediately before signing of this Integrity Pact, with any other company in any country in respect of any corrupt practices envisaged hereunder or with any Public Sector Enterprise in India or any Government Department in India that could justify BIDDER/SELLER's exclusion from the tender process.

4.2 The BIDDER/SELLER agrees that if it makes incorrect statement on this subject, BIDDER/SELLER can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Earnest Money

5.1 While submitting commercial bid, the BIDDER/SELLER shall deposit an amount (to be specified in the RFP (Request for Proposal) as Earnest Money, with the BUYER through any of the following instruments (as specified in RFP):-

(i) Bank Draft or a Pay Order

(ii) A confirmed guarantee by an Indian Nationalized Bank, promising payment of the guaranteed sum to the BUYER, on demand within three working days without any demur whatsoever and without seeking any reasons whatsoever. The demand for payment by the BUYER shall be treated as conclusive proof for payment.

(iii) Any other mode or through any other instrument (to be specified in RFP).

5.2 The Security Deposit & Retention Money shall be valid & retained by the buyer for such period as specified in the RFP/GTC.

5.3 In the case of successful BIDDER/SELLER a clause would also be incorporated in the Article pertaining to Performance Bond in the Purchase Contract that the provisions of Sanctions for Violation shall be applicable for forfeiture of Performance Bond in case of a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this pact.

5.4 No interest shall be payable by the BUYER to the BIDDER/SELLER on Earnest Money/Security Deposit for the period of its currency.

6. Sanctions for Violation

6.1 Any breach of the aforesaid provisions by the BIDDER/SELLER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER/SELLER) shall entitle the BUYER to take all or any one of the following actions, wherever required:-

- (i) To immediately call off the pre-contract negotiations without assigning any reason or giving any compensation to the BIDDER / SELLER. However, the proceedings with the other BIDDER(s) / SELLER(s) would continue.
- (ii) The Earnest Money Deposit (in pre-contract stage) and/or Security Deposit Performance Bond (after the contract is signed) shall stand forfeited either fully or partially, as decided by the BUYER and the BUYER shall not be required to assign any reason therefore.
- (iii) To immediately cancel the contract, if already signed, without giving any compensation to the BIDDER/SELLER.
- (iv) To recover all sums already paid by the BUYER and in case of an Indian BIDDER/SELLER with interest thereon at 2% higher than the prevailing Prime Lending Rate of State Bank of India, while in case of a BIDDER/SELLER from a country other than India with interest thereon at 2% higher than the L1BOR. If any outstanding payment is due to the BIDDER/SELLER from the BUYER in connection with any other contract for any other stores, such outstanding payment could also be utilized to recover the aforesaid sum and interest.
- (v) To encash the advance bank guarantee and performance bond/warranty bond, if furnished by the BIDDER/SELLER, in order to recover the payments, already made by the BUYER, along with interest.
- (vi) To cancel all or any other Contracts with the BIDDER/SELLER. The BIDDER/SELLER shall be liable to pay compensation for any loss or damage to the BUYER resulting from such cancellation/rescission and the BUYER shall be entitled to deduct the amount so payable from the money(s) due the BIDDER/SELLER
- (vii) To debar the BIDDER/SELLER from participating in future bidding processes of the Government of India or the BUYER for a minimum period of five years, which may be further extended at the discretion of the BUYER.
- (viii) To recover all sums paid in violation of this Pact by BIDDER/SELLER(s) to any middleman or agent or broker with a view to securing the contract.
- (ix) In cases where irrevocable Letters of Credit have been received in respect of any contract signed by the BUYER with the BIDDER/SELLER, the same shall not be opened.
- (x) Forfeiture of Performance Bond in case a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

6.2 The BUYER will be entitled to take all or any of the actions mentioned at para 6.1 (i) to (x) of this Pact also on the Commission by the BIDDER/SELLER or anyone employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER/SELLER), of an offence as defined in Chapter IX of the Indian Penal code, 1860 or Prevention of Corruption Act, 1988 or any other statute enacted for prevention of corruption.

6.3 The decision of the BUYER to the effect that a breach of the provisions of this Integrity Pact has been committed by the BIDDER/SELLER shall be final and conclusive on the BIDDER/SELLER. However, the BIDDER/SELLER can approach the Independent external monitor(s) appointed for the purposes of this Pact.

7. Fall Clause

- a) The Bidder undertakes that during the previous one year, the Bidder has not supplied / is not supplying and/or has not agreed to supply similar product systems or subsystems at a price lower than that offered in the present bid in respect of same location as mentioned in the present bid to any other Ministry/Department of the Government of India or PSU.
- b) Further the Bidder unconditionally agrees and confirms that in case it is found at any stage that during the financial year in which bid was submitted by the bidder, the bidder had supplied/agreed to supply similar product systems or subsystems in respect of same location to any other Ministry/Department of the Government of India or a PSU at a price lower than that mentioned in the present bid ("**Lower Price**"), then the Buyer by providing a written notice to the Bidder shall be at liberty to apply Lower Price to the contract and accordingly reduce the contract value. The Bidder further undertakes to refund to the Buyer the difference between payment received under the contract and the Lower Price ("**Price Difference**") within 15 days of receipt of the said written notice.
- c) In case the Price Difference is not received by the Buyer from the Bidder within the period stipulated under clause 7 (b), then the Buyer shall be free to recover the Price difference from any amount due and payable to the Bidder under any contract or transaction undertaken with the Buyer.

8. Independent Monitors

8.1 The BUYER has appointed Independent Monitors (hereinafter referred to as Monitors) for this Pact.

Shri P. V. Rao, IRS
Ex-Chief Commissioner of Income
Tax,
The IEMs' Secretariat,
Procurement and Contract
Management (PCM) Division,
REC LIMITED (Formerly Rural
Electrification Corporation Limited),.
Core-IV, SCOPE Complex, 7-Lodhi
Road,
New Delhi- 110003
Email:
pasupuletirao[at]yahoo[dot]co[dot]in

8.2 The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.

- 8.3 The Monitors shall not be subject to instructions by the representatives of the parties and perform their functions neutrally and independently.
- 8.4 Both the parties accept that the Monitors have the right to access all the documents relating to the project procurement, including minutes of meetings.
- 8.5 As soon as the Monitors notice, or have reason to believe, a violation of this Pact, he will so inform the C&MD of the BUYER Corporation.
- 8.6 The BIDDER(s) accepts that the Monitors have the right to access without restriction to all Project documentation of the BUYER including that provided by the BIDDER/SELLER. The BIDDER/SELLER will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Subcontractors. The Monitor shall be under contractual obligation to treat the information and documents of the BIDDER/Subcontractor(s) with the confidentiality.
- 8.7 The BUYER will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the parties. The parties will offer to the Monitor the option to participate in such meetings.
- 8.8 The Monitors will submit a written report to the C&MD of the BUYER/Secretary in the Department/within 8 to 10 weeks from the date of reference or intimation to him by the BUYER / BIDDER and, should the occasion arise, submit proposals for correcting problematic situations.

9. Facilitation of Investigation

In case of any allegation of violation of any provisions of this Pact or payment of commission, the BUYER or its authorised agencies & other Govt. authorities shall be entitled to examine all the documents including the Books of Accounts of the BIDDER/SELLER and the BIDDER/SELLER shall provide necessary information and documents in English and shall extend all possible help for the purpose of such examination.

10. Law and Place of Jurisdiction

This Pact is subject to Indian Law. The place of performance and jurisdiction is the seat of the BUYER.

11. Other Legal Actions

The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.

12. Validity

- 12.1 The validity of this Integrity Pact shall be from date of its signing and extend up to 5 years or the complete execution of the contract to the satisfaction of both the BUYER and the BIDDER/SELLER, including warranty period, whichever is later. In case BIDDER is

unsuccessful, this Integrity Pact shall expire after six months from the date of the Signing of the contract.

12.2 Should one or several provisions of this Pact turn out to be invalid, the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

13. The Parties hereby sign this Integrity Pact at ____ on ____

BUYER

BIDDER

Name of the Officer
Designation
RECTPCL

Name of the Officer
Designation
Name of the
Organisation/Dep/Ministry/PSU

Witness

Witness

1. _____

1. _____

2. _____

2. _____

Instruction for printing & submitting Safety Pact

1. The requisite format of Safety Pact is getting generated automatically and displayed here below.
2. Take print out of first page on a non-judicial stamp paper of Rs. 100/- /Company's Letterhead, as applicable, and other pages on plain A4 size paper. **Such two sets shall be prepared by the bidder.**
3. All the pages of both the copies of the Safety Pact shall be signed by the authorised representative of the bidder and duly stamped.
4. Both the original copies shall be submitted by the bidder in the form of Hard Copy as part of the first envelope before due date & time of submission of the bid.

4.9 SAFETY PACT

Between

REC Transmission Projects Company Limited,
 (A 100% subsidiary of REC Ltd, Government of India Enterprise), a company incorporated
 in India having their Registered Office at Core-4, SCOPE Complex, 7, Lodhi Road, New Delhi-
 110003,, India
 hereinafter referred to as "RECTPCL"

and

insert name of bidder

having its Registered Office at

and

*insert name of partner(s) in case of JV having its
 Registered Office at*

Hereinafter referred to as "The Bidder/Contractor"

Preamble

RECTPCL intends to award, under laid-down organisational procedures, contract(s) for
 Transmission Line Package : **“Construction of 220 kV S/C Transmission Line on
 D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on
 Turnkey Basis associated with Strengthening of Transmission System of
 JKPDD under PMDP Scheme-15 for the following packages”. i) Package 03-
 RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik, ii) Package 04-
 RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum, iii) Package 05-
 RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum**
 and Specification Number: **xxxxxxxxxxxxxxxx**

RECTPCL values full compliance with all relevant laws and regulations and the principles of
 Safety, Health & Environment in its relations with its Bidders/ Contractors.

In order to achieve these goals, RECTPCL and the above named Bidder / Contractor enter
 into this agreement called "Safety Pact" which will form part of the Bid.

It is hereby agreed by and between the parties as under:

Section I - Commitments of RECTPCL:

RECTPCL commits itself to take all measures necessary to prevent accidents during Construction and Operation of the Transmission Assets and to observe the following:

- 1 RECTPCL recognizes and accepts its statutory responsibilities for ensuring construction, operation and maintenance of equipments and for the provision of safe methods of work and safe working conditions.
- 2 RECTPCL recognizes and accepts its statutory responsibilities for ensuring safety of not only its employees but also that of the Contracting Agencies as Principal Employer.
- 3 RECTPCL shall review the accidents in a structured manner and take necessary actions to ensure that the safety criteria are strengthened for safe construction as well as Operation & Maintenance of the Transmission Assets.
- 4 RECTPCL shall conduct necessary awareness and training programmes to its Employees to augment the various safety requirements to be followed during Construction and Operation & Maintenance of the Transmission Assets from time to time.
- 5 RECTPCL shall, from time to time, issue necessary guidelines, instructions and deterrents to its employees as well as to the Contracting Agencies, to update them to take necessary preventive measures to avoid repetition of similar accident attributes.
- 6 RECTPCL shall review and provide necessary guidance to the Contracting Agencies, as and when, any abnormality / special situations are brought to its notice by the Contracting Agencies during execution of the Transmission Projects being executed by them.
- 7 RECTPCL shall conduct periodical surveillance site inspections / audits to identify the unsafe conditions and unsafe actions, and bring them to the knowledge of the Contracting Agencies for taking timely corrective actions.
- 8 RECTPCL shall investigate all accidents, fatal as well as non-fatal, to identify the lapses, the reason for the accident / incident and suggest measures for prevention of recurrence of such accidents, and fix responsibility for the lapses leading to the accident.

9 RECTPCL shall augment the training to the workers and supervising personnel of the Contracting Agencies, as per schedules, upon nomination by the Contracting Agencies in reasonable time frame.

10 RECTPCL shall exercise the right to claim and recover compensation from the Contracting Agencies in case of any violation of the safety requirements / provisions during execution of the Transmission Projects, as built in the applicable Laws and contractual specifications / guidelines in vogue / issued by RECTPCL from time to time.

11 **Section II - Commitments of the Bidder / Contractor:**

The Bidder / Contractor commits himself to take all measures necessary to prevent / minimise accidents at their construction / erection sites and to observe the following:

1 The Bidder / Contractor recognizes and accepts the statutory and comprehensive responsibility for ensuring safe construction and Testing & Commissioning in the Transmission Projects being executed by them by providing safe methods of work, working conditions and Tools & Plants for human safety.

2 The Bidder / Contractor recognizes and accepts the responsibilities for ensuring safety of not only their employees but also that of the Sub-contractors, Principal Employer and the general public during execution of the Transmission Projects / works.

3 The Bidder / Contractor shall review the accidents in a structured manner and take necessary actions to ensure that the safety criteria are strengthened for safe construction of the Transmission Assets.

4 The Bidder / Contractor shall endeavour continuous development of safe methods of work to ensure that the effect of risks and perils are minimised to the extent possible and implement the same at their work sites.

5 The Bidder / Contractor shall conduct periodical Training to their Employees as well as to that of their Sub-contractors for safety awareness during construction works being executed by them.

6 The Bidder / Contractor shall provide all requisite Tools & Plants required for the work and ensure their healthiness by periodical inspections / testing as required. Unhealthy and sub-standard Tools & Plants will be immediately removed from site as and when they are identified.

- 7 The Bidder / Contractor shall, at their cost, provide all necessary Personal Protective Equipments such as Double Lanyard Safety Belts, Appropriate Fall Arrest Systems, Safety Helmets, Foot Wear, Hand Gloves, etc., as required for various activities pertaining to execution of the Projects / works, confirming to relevant Indian Standards.
- 8 The Bidder / Contractor shall ensure that dedicated qualified Safety Officers are posted in the construction projects being executed by them and ensure that the Safety Officer visits each and every gang periodically and conducts audits / inspections to identify the unsafe conditions and unsafe actions, to be rectified by the site supervising personnel promptly.
- 9 The Bidder / Contractor shall conduct appropriate medical checks-up for the workers before deploying them at their construction sites to ensure that only those who are medically fit are deployed in the Projects / works to be executed by them. The copy of the Medical Reports shall be provided by the Bidder / Contractor to RECTPCL, whenever requested by RECTPCL.
- 10 The Bidder / Contractor shall screen the workers before deploying them at their construction sites to ensure that only those with the skills, experience and competence to work at height and also medically fit for work at height are deployed for work at height in the Projects executed by them.
- 11 The Bidder / Contractor shall ensure daily before starting the work that their site Supervising Personnel / Safety Officer briefs the workers about the work for the day and the safety measures / precautions required to be taken by them.
- 12 The Bidder / Contractor shall investigate all the accidents at their working sites to ascertain the lapses leading to the incident and the precautionary / corrective measures required to be taken to avoid recurrence of such accidents. These accidents will be reviewed at the Board Management level of the Agencies and the findings / recommendations will be put up to RECTPCL Apex Safety Board within the stipulated period.
- 13 The Bidder / Contractor shall ensure that all accidents, whether fatal or non-fatal in nature, will be informed to RECTPCL, in writing, immediately on the occurrence of the same and in any case, within not more than 24 hours of occurrence of the same.
- 14 The Bidder / Contractor shall ensure that in case of any accident, all necessary medical help / support shall be provided to the victims / injured till they are completely fit to return to work.

- 15 The Bidder / Contractor shall ensure that in case of fatal accidents, all statutory Authorities, including Police, concerned Labour Dept. Officials, concerned Workmen Compensation Commissioner, etc., will be intimated in writing as required by the statutory Law, and followed up for compliance of all statutory obligations. The Bidder / Contractor shall own full responsibility of timely accident reporting to various authorities, including RECTPCL.
- 16 The Bidder / Contractor shall ensure that in case of fatality or serious injury leading to permanent disablement of the victims, the compensation amount will be deposited with the concerned authorities, as required by the Laws, and followed up for early disbursement to the beneficiaries of the victims.
- 17 The Bidder / Contractor assures that they shall co-operate to the fullest extent for carrying out any investigation of the accidents at their work sites by RECTPCL to identify the lapses, the reason for the accident / incident and suggest measures for prevention of recurrence of such accidents. All factual details of the occurrence of the accident will be provided to RECTPCL, as and when required.
- 18 The Bidder / Contractor assures that they take full responsibility of meeting the statutory obligations in case of accidents, and in case of any reference by any Statutory Body at a later date also, they shall provide all information to RECTPCL and meet all the statutory obligations, including payment of additional compensation, if any.
- 19 The Bidder / Contractor assures that in case of any inspection of their work site or Notice by any Statutory Authority, they shall comply promptly and inform RECTPCL Site Officials of the same, and also provide all necessary information and assistance for smooth compliance of the observations / instructions of such Authorities.
- 20 The Bidder / Contractor accepts the provisions regarding safety, including payment of compensation to RECTPCL, in case of any violation of the safety requirements / provisions during execution of the Transmission Projects, as built in the Contractual Conditions, Safety Plan and the Safety Pact, and confirm to abide by the same.

Section III - Equal treatment to all Bidders / Contractors:

- 1 RECTPCL will enter into agreements with identical conditions as this one with all Bidders.
- 2 RECTPCL will disqualify, from the tender process, any bidder/ take punitive actions on the bidder, who does not sign this Pact or violate its provisions.

Section IV - Pact Duration:

This Pact begins when both parties have legally signed it. It expires for the successful Bidder / Contractor after closure of the contract and, for all other Bidders, after the contract has been awarded.

Section V - Other Provisions:

- 1 This agreement is subject to Indian Law. Place of performance and jurisdiction is the establishment of RECTPCL. The Arbitration clause provided in the main tender document / contract shall not be applicable for any issue / dispute arising under the Safety Pact.
- 2 Changes and supplements need to be made in writing, which shall come into force only upon mutual agreement / acceptance.
- 3 If the Contractor is a partnership firm or consortium of Joint Venture, this agreement must be signed by all partners, consortium members and Joint Venue partners, as applicable as per the Tender Specifications.
- 4 Nothing in this agreement shall affect the rights of the parties available under General Conditions of Contract (GCC) and Special Conditions of Contract (SCC).
- 5 Should one or several provisions of this agreement turn out to be invalid, the reminder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

(Signature)_____

(For & on behalf of RECTPCL)

(Office Seal)

Name:_____

Designation:_____

Witness 1:_____

(Name & Address)_____

Witness 2:_____

(Name & Address)_____

(Signature)_____

(For & on behalf of Bidder / Partner(s) of
Joint Venture/ Consortium partner (s))

(Office Seal)

Name:_____

Designation:_____

Witness 1:_____

(Name & Address)_____

Witness 2:_____

(Name & Address)_____

5. PERFORMANCE SECURITY FORM

(TO BE SUBMITTED BY THE CONTRACTOR OPTING FOR SUBMISSION OF PERFORMANCE SECURITY IN ACCORDANCE WITH CLAUSE GCC 9)

(For the purpose of verification/confirmation of this Bank Guarantee by the Employer, the Bank shall indicate 2 official email ids of the authorized signatories from Issuing Branch and also of the designated higher office (Corporate Office, Zonal Office etc) in the covering letter of the Bank forwarding the Bank Guarantee.)

Bank Guarantee No.

Date.....

NOA/Contract No.....

.....*[Name of Contract]*.....

To: *[Name and address of the Owner]*

Dear Ladies and/or Gentlemen,

We refer to the Contract ("the Contract")

vide notification of award issued on *(insert date of the notification of award)*....by M/s. REC Transmission Project Company Ltd., 3rd Floor ECE House, Annex-II, 28A KG MARG ,New Delhi-110001 ("the Employer"/"RECTPCL") on behalf of Name of OWNER..... (hereinafter referred to as 'Owner') to M/s *(Name of Contractor)*,

(or)

signed on*(insert date of the Contract)*..... between M/s. REC Transmission Project Company Ltd., having its Registered Office at Core-4 SCOPE Complex, 7, Lodhi Road, New Delhi-110003 ("the Employer"/"RECTPCL") on behalf of Name of OWNER..... (hereinafter referred to as 'Owner'), and M/s *(Name of Contractor)*,having its Principal place of business at*(Address of Contractor)* and Registered Office at*(Registered address of Contractor)* ("the Contractor") and the Contract ("the Contract") signed on*(insert date of the Contract)*..... between you and M/s *(Name of Associate)*, having its Principal place of business at*(Address of Associate)* and Registered Office at*(Registered address of Associate)*, the Associate of the Contractor for executing the Facilities concerning *(Indicate brief scope of work)* for the complete execution of the *(insert name of Package)*

alongwith name of the Project)..... [Applicable for Bank Guarantees to be issued by Contractor against those Contracts awarded to their Associate]

By this letter we, the undersigned, ...(insert name & address of the issuing bank), a Bank (which expression shall include its successors, administrators, executors and assigns) organized under the laws of and having its Registered/Head Office at(insert address of registered office of the bank) do hereby irrevocably guarantee payment to you up to i.e., ten percent (10%) of the Contract Price until 60 months i.e., upto and inclusive of (dd/mm/yy).

We undertake to make payment under this Letter of Guarantee upon receipt by us of your first written demand signed by the Employer's duly authorized officer or the authorized officer of Owner declaring the Contractor to be in default under the Contract and without cavil or argument any sum or sums within the above named limits, without your need to prove or show grounds or reasons for your demand and without the right of the Contractor to dispute or question such demand.

Our liability under this Letter of Guarantee shall be to pay to you whichever is the lesser of the sum so requested or the amount then guaranteed hereunder in respect of any demand duly made hereunder prior to expiry of the Letter of Guarantee, without being entitled to inquire whether or not this payment is lawfully demanded.

This letter of Guarantee shall remain in full force and shall be valid from the date of issue until 60 months i.e. upto and inclusive of (dd/mm/yy) and shall be extended from time to time for such period, as may be desired by M/s. on whose behalf this Letter of Guarantee has been given.

Except for the documents herein specified, no other documents or other action shall be required, notwithstanding any applicable law or regulation.

Our liability under this Letter of Guarantee shall become null and void immediately upon its expiry, whether it is returned or not, and no claim may be made hereunder after such expiry or after the aggregate of the sums paid by us to you shall equal the sums guaranteed hereunder, whichever is the earlier.

All notices to be given under shall be given by registered (airmail) posts to the addressee at the address herein set out or as otherwise advised by and between the parties hereto.

We hereby agree that any part of the Contract may be amended, renewed, extended, modified, compromised, released or discharged by mutual agreement between you and the Contractor, and this security may be exchanged or surrendered without in any way impairing or affecting our liabilities hereunder without notices to us and without the necessity for any additional endorsement, consent or guarantee by us, provided, however, that the sum guaranteed shall not be increased or decreased.

No action, event or condition which by any applicable law should operate to discharge us from liability hereunder shall have any effect and we hereby waive any right we may have to apply such law so that in all respects our liability hereunder shall be irrevocable and, except as stated herein, unconditional in all respects.

Notwithstanding anything contained herein:

1. Our liability under this Bank Guarantee shall not exceed _____ (*value in figures*) _____ [*value in words*] _____.
2. This Bank Guarantee shall be valid upto _____ (*validity date*) _____.
3. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only & only if we receive a written claim or demand on or before _____ (*validity date*) _____."

For and on behalf of the Bank

[*Signature of the authorised signatory(ies)*]

Signature _____

Name _____

Designation _____

POA Number _____

Contact Number(s): Tel. _____ Mobile _____

Fax Number _____

email _____

Common Seal of the Bank _____

Witness:

Signature _____

Name _____

Address _____

Contact Number(s): Tel. _____ Mobile _____

email _____

Note :

1. For the purpose of executing the Bank Guarantee, the non-judicial stamp papers of appropriate value shall be purchased in the name of Bank who issues the 'Bank Guarantee'.
2. The Bank Guarantee shall be signed on all the pages by the Bank Authorities indicating their POA nos. and should invariably be witnessed.
3. The Bank Guarantee should be in accordance with the proforma as provided. However, in case the issuing bank insists for additional paragraph regarding applicability of ICC publication No: 758, the following may be added at the end of the proforma of the Bank Guarantee [*i.e., end paragraph of the Bank Guarantee preceding the signature(s) of the issuing authority(ies) of the Bank Guarantee*]:
"This Guarantee is subject to Uniform Rules for Demand Guarantee, ICC publication No. 758 except that article 15(a) is hereby excluded."

6. FORM OF TAKING OVER CERTIFICATE

Date.....

Name of Contract.....

Contract No.....

To :

(Name and address of the Contractor)

Dear Ladies and/or Gentlemen,

Pursuant to GCC 30 (Taking Over) of the General Conditions of the Contract entered into between yourselves and the Employer dated relating to the *(insert brief description of the Facilities)*..... we hereby notify you that the following part(s) of the Facilities was (were) complete on the date specified below, and that, in accordance with the terms of the Contract, the Employer hereby takes over the said part(s) of the Facilities, together with the responsibility for care and custody and the risk of loss thereof on the date mentioned below :

1. Description of the Facilities or part thereof
.....
2. Date of Completion :.....

However, you are required to complete the outstanding items listed in the attachment hereto as soon as practicable.

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defects Liability Period.

Very truly yours,

Title
(Project Manager)

7. FORM OF INDEMNITY BOND TO BE EXECUTED BY THE CONTRACTOR FOR THE EQUIPMENT HANDED OVER IN ONE LOT BY(abbreviated name of the Employer)..... FOR PERFORMANCE OF ITS CONTRACT

INDEMNITY BOND

THIS INDEMNITY BOND is made this..... day of 20.... by a Company registered under the Companies Act, 1956/Partnership firm/ proprietary concern having its Registered Office at.....(hereinafter called as 'Contractor' or "Obligor" which expression shall include its successors and permitted assigns) in favour of (insert name of the Employer)....., a Company incorporated under the Companies Act, 1956 having its Registered Office at(insert registered address of the Employer) and its project at (hereinafter called ".....(abbreviated name of the Employer)....." which expression shall include its successors and assigns):

WHEREAS(abbreviated name of the Employer)..... has awarded to the Contractor a Contract for.....vide its Notification of Award/Contract No..... dated..... and its Amendment No. (applicable when amendments have been issued) (hereinafter called the "Contract") in terms of which(abbreviated name of the Employer)..... is required to hand over various Equipment to the Contractor for execution of the Contract.

And WHEREAS by virtue of Clause No.....of the said Contract, the Contractor is required to execute an Indemnity Bond in favour of(abbreviated name of the Employer)..... for the Equipment handed over to it by(abbreviated name of the Employer)..... for the purpose of performance of the Contract/Erection portion of the contract (hereinafter called the "Equipment").

AND THEREFORE, This Indemnity Bond witnesseth as follows:

1. That in consideration of various Equipment as mentioned in the Contract, valued at (amount in words.....) handed over to the Contractor for the purpose of performance of the Contract, the Contractor hereby undertakes to indemnify and shall keep(abbreviated name of the Employer)..... indemnified, for the full value of the Equipment. The Contractor hereby acknowledges receipt of the Equipment as per despatch title documents handed over to the Contractor duly endorsed in their favour and detailed in the Schedule appended hereto. It is expressly understood by the Contractor that handing over of the despatch title documents in respect of the said Equipments duly endorsed by(abbreviated name of the Employer)..... in favour of the Contractor shall be construed as handing over of the Equipment purported to be covered by such title documents and the Contractor shall hold such Equipment in trust as a Trustee for and on behalf of(abbreviated name of the Employer).....
2. That the Contractor is obliged and shall remain absolutely responsible for the safe transit/protection and custody of the Equipment at(abbreviated name of

- the Employer*)..... project Site against all risks whatsoever till the Equipment are duly used/erected in accordance with the terms of the Contract and the Plant/Package duly erected and commissioned in accordance with the terms of the Contract, is taken over by(*abbreviated name of the Employer*)..... The Contractor undertakes to keep(*abbreviated name of the Employer*)..... harmless against any loss or damage that may be caused to the Equipment.
3. The Contractor undertakes that the Equipment shall be used exclusively for the performance/execution of the Contract strictly in accordance with its terms and conditions and no part of the equipment shall be utilised for any other work of purpose whatsoever. It is clearly understood by the Contractor that non-observance of the obligations under this Indemnity Bond by the Contractor shall inter-alia constitute a criminal breach of trust on the part of the Contractor for all intents and purpose including legal/penal consequences.
 4. That(*abbreviated name of the Employer*)..... is and shall remain the exclusive Employer of the Equipment free from all encumbrances, charges or liens of any kind, whatsoever. The equipment shall at all times be open to inspection and checking by the Employee or Employer's Representative in this regard. Further, ...(*abbreviated name of the Employer*)..... shall always be free at all times to take possession of the Equipment in whatever form the equipment may be, if in its opinion, the Equipment are likely to be endangered, misutilised or converted to uses other than those specified in the Contract, by any acts of omission or commission on the part of the Contractor or any other person or on account of any reason whatsoever and the Contractor binds himself and undertakes to comply with the directions of demand of(*abbreviated name of the Employer*)..... to return the equipment without any demur or reservation.
 5. That this indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipment or the same or any part thereof is misutilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Employer's Representative as to assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Equipment at his own cost and/or shall pay the amount of loss to(*abbreviated name of the Employer*)..... without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to(*abbreviated name of the Employer*)..... against the Contractor under the Contract and under this Indemnity Bond.
 6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with the terms and conditions of this Bond to the satisfaction of(*abbreviated name of the Employer*)....., THEN, the above Bond shall be void, but otherwise, it shall remain in full force and virtue.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorised representative under the common seal of the Company, the day, month and year first above mentioned.

SCHEDULE

Particulars of the Equipment handed over	Quantity	Particulars of Despatch title Documents		Value of the Equipment	Signature of the Attorney in token of receipt
		RR/GR No. date of lading	Carrier		

For and on behalf of
M/s.....

WITNESS

1. Signature.....

Signature.....

Name.....

Name.....

Address.....

Address.....

2. Signature.....

Authorised representative

Name.....

(Common Seal)

Address.....

(In case of Company)

Indemnity Bonds are to be executed by the authorised person and (i) in case of contracting Company under common seal of the Company or (ii) having the power of attorney issued under common seal of the company with authority to execute Indemnity Bonds, (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a Photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.

8. FORM OF INDEMNITY BOND TO BE EXECUTED BY THE CONTRACTOR FOR THE EQUIPMENT HANDED OVER IN INSTALLMENTS BY(abbreviated name of the Employer)..... FOR PERFORMANCE OF ITS CONTRACT

INDEMNITY BOND

THIS INDEMNITY BOND is made this day of 20..... by a Company registered under the Companies Act, 1956/Partnership firm/proprietary concern having its Registered Office at(hereinafter called as 'Contractor' or 'Obligor' which expression shall include its successors and permitted assigns) in favour of(insert name of the Employer)....., a company incorporated under the Companies Act, 1956 having its Registered Office at(insert registered address of the Employer)..... and its project at (hereinafter called ".....(abbreviated name of the Employer)....." which expression shall include its successors and assigns):

WHEREAS(abbreviated name of the Employer)..... has awarded to the Contractor a Contract for vide its Notification of Award/Contract No. dated and Amendment No. (applicable when amendments have been issued) (hereinafter called the "Contract") in terms of which(abbreviated name of the Employer)..... is required to handover various Equipment to the Contractor for execution of the Contract.

AND WHEREAS by virtue of Clause No.....of the said Contract, the Contractor is required to execute an Indemnity Bond in favour of(abbreviated name of the Employer)..... for the Equipment handed over to it by(abbreviated name of the Employer)..... for the purpose of performance of the contract/Erection portion of the Contract (hereinafter called the "Equipment".)

NOW THEREFORE, This Indemnity Bond witnesseth as follows:

1. That in consideration of various Equipments as mentioned in the Contract, valued at (amount in words _____) to be handed over to the Contractor in installments from time to time for the purpose of performance of the contract, the Contractor hereby undertakes to indemnify and shall keep(abbreviated name of the Employer)..... indemnified, for the full value of Equipment. The Contractor hereby acknowledges receipt of the initial installment of the equipment per details in the schedule appended hereto. Further, the Contractor agrees to acknowledge receipt of the subsequent installments of the Equipment as required by(abbreviated name of the Employer)..... in the form of Schedules consecutively numbered which shall be attached to this Indemnity bond so as to form integral parts of this Bond. It is expressly understood by the Contractor that handing over the despatch title documents in respect of the said Equipments duly endorsed by(abbreviated name of the Employer)..... in favour of the Contractor shall be construed as handing over the Equipment purported to be covered by such title documents

and the Contractor shall hold such Equipments in trust as a Trustee for and on behalf of(*abbreviated name of the Employer*).....

2. That the Contractor is obliged and shall remain absolutely responsible for the safe transit/protection and custody of the Equipment at(*abbreviated name of the Employer*)..... project Site against all risks whatsoever till the Equipment are duly used/erected in accordance with the terms of the Contract and the Plant/Package duly erected and commissioned in accordance with the terms of the Contract, is taken over by(*abbreviated name of the Employer*)..... The Contractor undertakes to keep(*abbreviated name of the Employer*)..... harmless against any loss or damage that may be caused to the Equipment.
3. The Contractor undertakes that the Equipment shall be used exclusively for the performance/execution of the Contract strictly in accordance with its terms and conditions and no part of the equipment shall be utilised for any other work or purpose whatsoever. It is clearly understood by the Contractor that non-observance of the obligations under this Indemnity Bond by the Contractor shall inter-alia constitute a criminal breach of trust on the part of the Contractor for all intents and purpose including legal/penal consequences.
4. That(*abbreviated name of the Employer*)..... is and shall remain the exclusive Employer of the Equipment free from all encumbrances, charges or liens of any kind, whatsoever. The equipment shall at all times be open to inspection and checking by the Employer or Employer's Representative in this regard. Further, ...(*abbreviated name of the Employer*)..... shall always be free at all times to take possession of the Equipment in whatever form the Equipment may be, if in its opinion, the Equipment are likely to be endangered, misutilised or converted to uses other than those specified in the Contract, by any acts of omission or commission on the part of the Contractor or any other person or on account of any reason whatsoever and the Contractor binds himself and undertakes to comply with the directions of demand of(*abbreviated name of the Employer*)..... to return the equipment without any demur or reservation.
5. That this indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipment or the same or any part thereof is misutilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Employer's Representative as to assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Equipment at its own cost and/or shall pay the amount of loss to(*abbreviated name of the Employer*)..... without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to(*abbreviated name of the Employer*)..... against the Contractor under the Contract and under this Indemnity Bond.
6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with the terms and conditions of this Bond to the satisfaction

of(abbreviated name of the Employer)....., THEN, the above Bond shall be void, but otherwise, it shall remain in full force and virtue.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorised representative under the common seal of the Company, the day, month and year first above mentioned.

SCHEDULE No. 1

Particulars of the Equipment handed over	Quantity	Particulars of Despatch title Documents		Value of the Equipment	Signature of the Attorney in token of receipt
		RR/GR No. date of lading	Carrier		

For and on behalf of
M/s.....

WITNESS

1. Signature.....
Name.....
Address.....

Signature.....
Name.....
Address.....

2. Signature.....
Name.....
Address.....

Authorised representative
(Common Seal)
(In case of Company)

Indemnity Bonds are to be executed by the authorised person and (i) in case of contracting Company under common seal of the Company or (ii) having the power of attorney issued under common seal of the company with authority to execute Indemnity Bonds, (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.

9. FORM OF AUTHORISATION LETTER

Ref. No:

Date :

To

M/s.....

.....

.....

REF.: Contract No. dated for awarded by
....(*insert name of the Employer*).....

Dear Sir,

Kindly refer to Contract No. dated for
You are hereby authorised on behalf of (*Name of Employer*)..... a
company incorporated under the laws of Companies Act 1956 and having its Registered
Office at(*registered address of the Employer*) and its Project at
..... to take physical delivery of materials/equipments covered under Despatch
Document/Consignment Note No.*..... dated and as detailed in the
enclosed schedule for the sole purpose of successful performance of the aforesaid
contract and for no other purpose, whatsoever.

(Signature of Project Authority)**

Designation.....

Date.....

Encl: As Above.

** To be signed not below the rank of Manager.

* Mention LR/RR No.

Schedule of Material/Equipment covered under Despatch Title Document (RR No./LR
No.)

Sl. No.	Contract Name	NOA No./ CA No.	Description of Materials/ Equipments	Spec. No.	Qty.	Value	Remarks

(Signature of the Project Authority)

(Designation)

(Date)

10. FORM OF TRUST RECEIPT FOR PLANT, EQUIPMENT AND MATERIALS RECEIVED

We M/s.(*insert name of the Contractor*) having our Principal place of business at having been awarded a Contract No. dated for (*insert Package name alongwith name of the Project*)..... by(*insert name of the Employer*)

We do hereby acknowledge the receipt of the Plant, Equipment and Materials as are fully described and mentioned under Documents of Title/RR/LR etc. and in the schedule annexed hereto, which shall form an integral part of this receipt as "Trustee" of (*insert name of the Employer*)..... The aforesaid materials etc. so received by us shall be exclusively used in the successful performance of the aforesaid Contract and for no other purpose whatsoever. We undertake not to create any charge, lien or encumbrance over the aforesaid materials etc, in favour of any other person/institution(s)/Banks.

For M/s
(*Contractor's Name*)

Dated :

(AUTHORISED SIGNATORY)

Place :

SEAL OF COMPANY

11. FORM OF EXTENSION OF BANK GUARANTEE

Ref. No.....

Dated:.....

To: *[Name and address of the Employer]*

Dear Sirs,

Sub.: Extension of Bank Guarantee No. dated for, issued to you on behalf of M/s. *(insert name of the Contractor)* in respect of Contract No. dated for *(insert name of the Package alongwith the Project name)* (hereinafter called original Bank Guarantee).

At the request of M/s..... *(insert name of the Contractor)*, We*(insert name & address of the issuing bank)*, a Bank organized under the laws of and having its Registered/Head Office at*(insert address of registered office of the bank)*..... do hereby extend our liability under the above-mentioned Guarantee No. Dated for a further period of Years/Months from to expire on Except as provided above, all other terms and conditions of the original Bank Guarantee No. dated shall remain unaltered and binding.

Please treat this as an integral part of the original Guarantee to which it would be attached.

For and on behalf of the Bank

[Signature of the authorised signatory(ies)]

Signature_____

Name_____

Designation_____

POA Number_____

Contact Number(s): Tel._____ Mobile_____

Fax Number_____

email _____

Common Seal of the Bank_____

Witness:

Signature_____

Name_____

Address_____

Contact Number(s): Tel._____Mobile_____

email _____

Note:

1. For the purpose of executing the Bank Guarantee, the non-judicial stamp papers of appropriate value shall be purchased in the name of Bank who issues the 'Bank Guarantee'.
2. The Bank Guarantee shall be signed on all the pages by the Bank Authorities indicating their POA nos. and should invariably be witnessed.

12A. POWER OF ATTORNEY

To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution.

Know all men by these presents, We(name and address of the registered office of the Bidder) do hereby constitute, appoint and authorize Mr./Ms.....(name and residential address) who is presently employed with us and holding the position of as our attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to our Response against Tender No..... Name of work the bids for which have been invited by (insert name of the Employer alongwith address) (hereinafter called the 'Employer') to undertake the following acts :

- a. To submit proposal and participate in the aforesaid Bid Specification of the Employer.
- b. To negotiate with the Employer the terms and conditions for award of the Contract pursuant to the aforesaid Bid and to sign the Contract with the Employer.
- c. To do any other act or submit any document related to the above.
- d. To receive, accept and execute the Contract.
- e. To ensure performance of the Contract(s)
- f. It is expressly understood that this Power of Attorney shall remain valid binding and irrevocable till completion of the Defect Liability Period in terms of the Contract.

We hereby agree to ratify all acts, deeds and things lawfully done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall and shall always be deemed to have been done by us.

for and on behalf of the bidder

.....

.....

.....

Seal and Signature

in the presence of:

WITNESS

Signature..... Name Designation Occupation.....	Signature..... Name Designation Occupation.....

Note :

1. For the purpose of executing the Agreement, the non-judicial stamp papers of appropriate value.
2. The Agreement shall be signed on all the pages by the authorized representatives

12B. FORM OF POWER OF ATTORNEY FOR JOINT VENTURE

KNOW ALL MEN BY THESE PRESENTS THAT WE , the Partners whose details are given hereunder have formed a Joint Venture under the laws of and having our Registered Office(s)/Head Office(s) at (hereinafter called the 'Joint Venture' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) acting through M/s being the Partner in-charge do hereby constitute, nominate and appoint M/s..... a Company incorporated under the laws of and having its Registered/Head Office at as our duly constituted lawful Attorney (hereinafter called "Attorney" or "Authorised Representative" or "Partner In-charge") to exercise all or any of the powers for and on behalf of the Joint Venture in regard to Specification No..... Package the bids for which have been invited by (insert name of the Employer alongwith address) (hereinafter called the 'Employer') to undertake the following acts :

- i) To submit proposal and participate in the aforesaid Bid Specification of the Employer on behalf of the "Joint Venture".
- ii) To negotiate with the Employer the terms and conditions for award of the Contract pursuant to the aforesaid Bid and to sign the Contract with the Employer for and on behalf of the "Joint Venture".
- iii) To do any other act or submit any document related to the above.
- iv) To receive, accept and execute the Contract for and on behalf of the "Joint Venture".

It is clearly understood that the Partner In-charge (Lead Partner) shall ensure performance of the Contract(s) and if one or more Partner fail to perform their respective portions of the Contract(s), the same shall be deemed to be a default by all the Partners.

It is expressly understood that this Power of Attorney shall remain valid binding and irrevocable till completion of the Defect Liability Period in terms of the Contract.

The Joint Venture hereby agrees and undertakes to ratify and confirm all the whatsoever the said Attorney/Authorised Representatives/Partner in-charge quotes in the bid, negotiates and signs the Contract with the Employer and/or proposes to act on behalf of the Joint Venture by virtue of this Power of Attorney and the same shall bind the Joint Venture as if done by itself.

IN WITNESS THEREOF the Partners Constituting the Joint Venture as aforesaid have executed these presents on this day of under the Common Seal(s) of their Companies.

for and on behalf of the
Partners of Joint Venture

.....
.....
.....

The Common Seal of the above Partners of the Joint Venture:

The Common Seal has been affixed there unto in the presence of:

WITNESS

1. Signature.....
Name
Designation
Occupation
2. Signature.....
Name
Designation
Occupation

Note:

1. For the purpose of executing the Agreement, the non-judicial stamp papers of appropriate value shall be purchased in the name of Joint Venture.
2. The Agreement shall be signed on all the pages by the authorised representatives of each of the partners and should invariably be witnessed.

13. FORM OF UNDERTAKING BY THE JOINT VENTURE PARTNERS

THIS JOINT DEED OF UNDERTAKING executed on this..... day of..... Two Thousand and..... by a company incorporated under the laws of and having its Registered Office at(hereinafter called the "Party No.1" which expression shall include its successors, executors and permitted assigns) and M/s.....a company incorporated under the laws of and having its Registered Office at (hereinafter called the "Party No.2" which expression shall include its successors, executors and permitted assigns) and M/s..... a Company incorporated under the laws of and having its Registered Office at (hereinafter called the "Party No.3" which expression shall include its successors, executors and permitted assigns) for the purpose of making a bid and entering into a contract [hereinafter called the "Contract" {in case of award}] against the Specification No..... for (*insert name of the package alongwith project name*) of (*insert names of the Employer*), a Company incorporated under the Companies Act of 1956 having its registered office at(*insert registered address of the Employer*)..... (hereinafter called the "Employer").

WHEREAS the Party No.1, Party No.2 and Party No.3 have entered into an Agreement dated.....

AND WHEREAS the Employer invited bids as per the above mentioned Specification for the design, manufacture, supply, erection, testing and commissioning of Equipment/ Materials stipulated in the Bidding Documents under (*insert name of the package alongwith project name*)

AND WHEREAS Clause 9.3, Section-ITB & Qualification Criteria in Section-III, Vol-I to forming part of the Bidding Documents, inter-alia stipulates that an Undertaking of two or more qualified manufacturers as partners, meeting the requirements of Qualification Criteria in Section-III, Vol-I, as applicable may bid, provided, the Joint Venture fulfills all other requirements under Clause 9.3 (c) of ITB and Qualification Criteria in Section-III, Vol-I and in such a case, the Bid Forms shall be signed by all the partners so as to legally bind all the Partners of the Joint Venture, who will be jointly and severally liable to perform the Contract and all obligations hereunder.

The above clause further states that this Undertaking shall be attached to the bid and the Contract performance guarantee will be as per the format enclosed with the Bidding Documents without any restrictions or liability for either party.

AND WHEREAS the bid is being submitted to the Employer vide proposal No.....dated by Party No.1 based on this Undertaking between all the parties; under these presents and the bid in accordance with the requirements of Clause 9.3, Section-ITB and Qualification Criteria in Section-III, Vol-I, has been signed by all the parties.

NOW THIS UNDERTAKING WITNESSETH AS UNDER:

In consideration of the above premises and agreements all the parties of this Deed of Undertaking do hereby declare and undertake:

1. In requirement of the award of the Contract by the Employer to the Joint Venture Partners, we, the Parties do hereby undertake that M/s..... the Party No.1, shall act as Lead Partner and further declare and confirm that we the parties to the Joint Venture shall jointly and severally be bound unto the Employer for the successful performance of the Contract and shall be fully responsible for the design, manufacture, supply and successful performance of the equipment in accordance with the Contract:
2. In case of any breach or default of the said Contract by any of the parties to the Joint Venture, the party(s) do hereby undertake to be fully responsible for the successful performance of the Contract and to carry out all the obligations and responsibilities under the Contract in accordance with the requirements of the Contract.
3. Further, if the Employer suffers any loss or damage on account of any breach in the Contract or any shortfall in the performance of the equipment in meeting the performances guaranteed as per the specification in terms of the Contract, the Party(s) of these presents undertake to promptly make good such loss or damages caused to the Employer, on its demand without any demur. It shall not be necessary or obligatory for the Employer to proceed against Lead Partner to these presents before proceeding against or dealing with the other Party(s), the Employer can proceed against any of the parties who shall be jointly and severally liable for the performance and all other liabilities/obligations under the Contract to the Employer.
4. The financial liability of the Parties of this Deed of Undertaking to the Employer, with respect to any of the claims rising out of the performance or non-performance of the obligations set forth in this Deed of Undertaking, read in conjunction with the relevant conditions of the Contract shall, however not be limited in any way so as to restrict or limit the liabilities or obligations of any of the Parties of this Deed of Undertaking.
5. It is expressly understood and agreed between the Parties to this Undertaking that the responsibilities and obligations of each of the Parties shall be as delineated in Appendix – I (*to be suitably appended by the Parties alongwith this Undertaking in its bid*) to this Deed of Undertaking. It is further undertaken by the parties that the above sharing of responsibilities and obligations shall not in any way be a limitation of joint and several responsibilities of the Parties under the Contract.
6. It is also understood that this Undertaking is provided for the purposes of undertaking joint and several liabilities of the partners to the Joint Venture for

submission of the bid and performance of the Contract and that this Undertaking shall not be deemed to give rise to any additional liabilities or obligations, in any manner or any law, on any of the Parties to this Undertaking or on the Joint Venture, other than the express provisions of the Contract.

7. This Undertaking shall be construed and interpreted in accordance with the provisions of the Contract.
8. In case of an award of a Contract, we the parties to this Deed of Undertaking do hereby agree that we shall be jointly and severally responsible for furnishing a Contract performance security from a bank in favour of the Employer in the currency/currencies of the Contract.
9. It is further agreed that this Deed of Undertaking shall be irrevocable and shall form an integral part of the bid and shall continue to be enforceable till the Employer discharges the same or upon the completion of the Contract in accordance with its provisions, whichever is earlier. It shall be effective from the date first mentioned above for all purposes and intents.

IN WITNESS WHEREOF, the Parties to this Deed of Undertaking have through their authorised representatives executed these presents and affixed Common Seals of their companies, on the day, month and year first mentioned above.

Common Seal of
has been affixed in my/ our
presence pursuant to Board of
Director's Resolution dated

For Lead Partner (Party No.-1)
For and on behalf of M/s
.....

Name

Designation

Signature

(Signature of the authorized
representative)

WITNESS :

I.

II.

Common Seal of
has been affixed in my/ our
presence pursuant to Board of
Director's Resolution dated

For Party No.-2
For and on behalf of
M/s.....

Name

(Signature of the authorized
representative)

Designation

Signature

WITNESS :

I.

II.

Common Seal of
has been affixed in my/ our
presence pursuant to Board of
Director's Resolution dated

For Party No.-3
For and on behalf of M/s.
.....

Name

Designation

Signature

(Signature of the authorized
representative)

WITNESS :

I.

II.

Note:

1. For the purpose of executing the Joint Deed of Undertaking, the non-judicial stamp papers of appropriate value shall be purchased in the name of Joint Venture.
2. The Undertaking shall be signed on all the pages by the authorised representatives of each of the partners and should invariably be witnessed

14. FORMAT FOR EVIDENCE OF ACCESS TO OR AVAILABILITY OF CREDIT/FACILITIES

BANK CERTIFICATE

This is to certify that M/s. _____ (*insert Name & Address of the Contractor*) _____ who have submitted their bid to(*insert name of the Employer*)..... against their tender specification Vide ref. No. for (*insert name of the package alongwith the project name*) is our customer for the past years.

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

Sl. No.	Type of Facility	Sanctioned Limit as on Date	Utilisation as on Date

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

Signature _____

Name of Bank _____

Name of Authorised
Signatory _____

Designation _____

Phone No. _____

Address _____

SEAL OF THE BANK

15. FORM OF OPERATIONAL ACCEPTANCE

Date.....

Name of Contract.....

Contract No.....

To :

(Name and address of the Contractor)

Dear Ladies and/or Gentlemen,

Pursuant to GCC 29, 30 of the General Conditions of the Contract entered into between yourselves and the Employer dated relating to the (*insert brief description of the Facilities*)..... we hereby notify you that the we System tests and Acceptance tests of the following part(s) of the Facilities were satisfactorily completed on the date specified below :

1. Description of the Facilities or part thereof
.....
2. Date of Operational Acceptance:.....

This letter does not relieve you of your obligation during the Defects Liability Period and Latent Defect warranty.

Very truly yours,

Title
(Project Manager)

FORM No. 16

FORM OF SAFETY PLAN TO BE SUBMITTED BY THE CONTRACTOR WITHIN SIXTY DAYS OF AWARD OF CONTRACT

[TO BE EXECUTED ON A NON JUDICIAL STAMP PAPER WORTH RS. TWENTY ONLY]

SAFETY PLAN

THIS SAFETY PLAN is made this day of 20..... by a Company registered under the Companies Act, 1956 or 2013, as the case may be/Partnership firm/proprietary concern having its Registered Office at[*to be modified suitably for JV Contractor*] (hereinafter called as 'Contractor' which expression shall include its successors and permitted assigns) for approval of(*insert name of the Employer*)....., a company incorporated under the Companies Act, 1956 having its Registered Office at(*insert registered address of the Employer*)..... for its Contract for (*insert package name, project name alongwith Specification number of the Contract*).....

WHEREAS(*abbreviated name of the Employer*)..... has awarded to the Contractor the aforesaid Contract vide its Notification of Award/Contract No. dated and Amendment No. (applicable when amendments have been issued) (hereinafter called the "Contract") in terms of which the Contractor is required to submit 'Safety Plan' alongwith certain documents to the Engineer In-Charge/Project Manager of the Employer within Sixty (60) days of Notification of Award for its approval.

NOW THEREFORE, the Contractor undertakes to execute the Contract as per the safety plan as follows:

1. THAT the Contractor shall execute the works as per provisions of Bidding Documents including those in regard to Safety Precautions / provisions as per statutory requirements.
2. THAT the Contractor shall execute the works in a well planned manner from the commencement of Contract as per agreed mile stones of work completion schedule so that planning and execution of construction works goes smoothly and consistently through out the contract duration without handling pressure in last quarter of the financial year/last months of the Contract and the shall be finalized in association with RECTPCL Engineer In-charge/Project Manager from time to time as required.
3. THAT the Contractor has prepared the safe work procedure for each activity i.e. foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc. to be executed at site, which is enclosed at **Annexure – 1A (SP)** for acceptance and approval of Engineer

In-charge/Project Manager. The Contractor shall ensure that on approval of the same from Engineer In-charge/Project Manager , the approved copies will be circulated to Employer's personnel at site [Supervisor(s)/Executive(s)] and Contractor's personnel at site [Gang leader, supervisor(s) etc.] in their local language / language understood by gang.

THAT the Contractor has prepared minimum manpower deployment plan, activity wise as stated above, which is enclosed at **Annexure – 1B (SP)** for approval of Engineer In-charge/Project Manager.

4. THAT the Contractor shall ensure while executing works that they will deploy minimum 25% of their own experienced work force who are on the permanent roll of the company and balance 75% can be a suitable mixed with the hired gangs / local workers / casual workers if required. The above balance 75% work force should be provided with at least 10 days training by the construction agencies at sites and shall be issued with a certificate. No worker shall be engaged without a valid certificate. Hired gang workers shall also follow safe working procedures and safety norms as is being followed by company's workmen. It should also be ensured by the contractor that certified fitters who are climbing towers / doing stringing operations can be easily identifiable with a system like issue of Badge / Identification cards (ID cards) etc. Colour identification batches should be worn by the workers. Contractor has to ensure that inexperience workers / unskilled workers should not be deployed for skilled job.
5. THAT the Contractor's Gang leader / Supervisor / Senior most member available at every construction site shall brief to each worker daily before start of work about safety requirement and warn about imminent dangers and precautions to be taken against the imminent dangers (Daily Safety Drill). This is to be ensured without fail by Contractor and maintain record of each gang about daily safety instructions issued to workers and put up to RECTPCL site In-charge for his review and record.
6. THAT the Contractor shall ensure that working Gangs at site should not be left at the discretion of their Gang Leaders who are generally hired and having little knowledge about safety. Gang leader should be experienced and well versed with the safe working procedures applicable for transmission line/ Sub Station works. In case gang is having Gang leader not on permanent roll of the company then additional Supervisor from company's own roll having thorough knowledge about the works would be deployed so as to percolate safety instructions upto the grass root level in healthy spirits. Contractor has to ensure close supervision while executing critical locations of transmission lines / sub stations and ensures that all safety instructions are in place and are being followed.
7. THAT the Contractor shall maintain in healthy and working condition all kind of Equipments / Machineries / Lifting tools / Lifting tackles / Lifting gears / All kind of Ropes including wire ropes / Polypropylene ropes etc. used for Lifting purpose during execution of the project and get them periodically examined and load

tested for safe working load in accordance with relevant provisions and requirement of Building & other construction workers Regulation of Employment and Conditions of Services Act and Central Rule 1998, Factories Act 1948, Indian Electricity Act 2003 before start of the project. A register of such examinations and tests shall be properly maintained by the contractor and will be promptly produced as and when desired by the Engineer In-charge/Project Manager or by the person authorised by him. The Contractor has to ensure to give special attention on the formation / condition of eye splices of wire rope slings as per requirement of IS 2762 Specification for wire rope slings and sling legs.

THAT the Contractor has prepared a list of all Lifting machines, lifting Tools / Lifting Tackles / Lifting Gears etc. / All types of ropes and Slings which are subject to safe working load is enclosed at **Annexure – 2 (SP)** for review and approval of Engineer In-charge/Project Manager.

8. THAT the Contractor has to procure sufficient quantity of Personal Protective Equipment (PPE) conforming to Indian / International standards and provide these equipment to every workman at site as per need and to the satisfaction of Engineer-in-charge/Project Manager of RECTPCL. The Contractor's Site Supervisor/ Project Manager has to ensure that all workmen must use Personal Protective Equipment at site. The Contractor shall also ensure that Industrial Safety helmets are being used by all workmen at site irrespective of their working (at height or on ground). The Contractor shall further ensure use of safety shoes by all ground level workers and canvas shoes for all workers working at height, Rubber Gum Boots for workers working in rainy season and concreting job, Use of Twin Lanyard Full body Safety Harness with attachment of light weight such as aluminium alloy etc. and having features of automatic locking arrangement of snap hook, by all workers working at height for more than three meters and also for horizontal movement on tower shall be ensured by contractor. The Contractor shall not use ordinary half body safety harness at site. The Contractor has to ensure use of Retractable type fall arrestors by workers for ascending / descending on suspension insulator string and other similar works etc., Use of Mobile fall arrestor for ascending / descending from tower by all workers. The contractor has to provide cotton / leather hand gloves as per requirement, Electrical Resistance Hand gloves for operating electrical installations / switches, Face shield for protecting eyes while doing welding works and Dust masks to workers as per requirement. **The Contractor shall also provide Reflective Jackets to all workmen working on the site including differently coloured such Jackets to the persons working at height.** The Contractor will have to take action against the workers not using Personal Protective Equipment at site and those workers shall be asked to rest for that day and also their Salary be deducted for that day. RECTPCL may issue warning letter to Project Manager of contractor in violation of above norms.

THAT the Contractor shall prepare a detailed list of PPEs, activity wise, to commensurate with manpower deployed, which is enclosed at **Annexure – 3 (SP)** for review and approval of Engineer In-charge/Project Manager. It shall also be

ensured that the sample of these equipment shall be got approved from RECTPCL supervisory staff before being distributed to workers. The contractor shall submit relevant test certificates as per IS / International Standard as applicable to PPEs used during execution of work. All the PPE's to be distributed to the workers shall be checked by RECTPCL supervisory staff before its usage.

The Contractor also agrees for addition / modification to the list of PPE, if any, as advised by Engineer In-Charge/Project Manager.

9. THAT the Contractor shall procure, if required sufficient quantity of Earthing Equipment / Earthing Devices complying with requirements of relevant IEC standards (Generally IECs standards for Earthing Equipments / Earthing Devices are – 855, 1230, 1235 etc.) and to the satisfaction of Engineer In-Charge/ Project Manager and contractor to ensures to maintained them in healthy condition.

THAT the Contractor has prepared / worked out minimum number of healthy Earthing Equipments with Earthing lead confirming to relevant IS / European standards per gang wise during stringing activity/as per requirement, which is enclosed herewith at **Annexure – 4 (SP)** for review and acceptance of Engineer In-Charge/ Project Manager prior to execution of work.

10. THAT the Contractor shall provide communication facilities i.e. Walky – Talkie / Mobile Phone, Display of Flags / whistles for easy communication among workers during Tower erection / stringing activity, as per requirement.
11. THAT the Contractor undertakes to deploy qualified safety personnel responsible for safety as per requirements of Employer/Statutory Authorities.

THAT the Contractor employing more than 250 workmen whether temporary, casual, probationer, regular or permanent or on contract, shall employ at least one full time officer exclusively as qualified safety officer having diploma in safety to supervise safety aspects of the equipment and workmen who will coordinate with Engineer In-charge /Project Manager/Safety Co-ordinator of the Employer. In case of work being carried out through sub contractors the sub – contractor's workmen / employees will also be considered as the contractor's employees / workmen for the above purpose. If the number of workers are less than 250 then one qualified safety officer is to be deployed for each contract. He will report directly to his head of organization and not the Project Manager of contractor He shall also not be assigned any other work except assigning the work of safety. The curriculum vitae of such person shall be got cleared from RECTPCL Project Manager / Construction staff.

The Contractor shall deploy one dedicated Safety Staff(s) for every 200 kms of a Transmission Line Project.

The name and address of such safety officers/staff(s) of contractor will be promptly informed in writing to Engineer In-charge with a copy to safety officer -

In-charge before start of work or immediately after any change of the incumbent is made during the currency of the contract. The list is enclosed at **Annexure – 5A (SP)**.

THAT the Contractor has also prepared a list including details of Explosive Operator (if required), Safety officer / Safety Staff/ Safety supervisor / nominated person for safety for each erection / stringing gang, list of personnel trained in First Aid Techniques as well as copy of organisation structure of the Contractor in regard to safety. The list is enclosed at **Annexure – 5B (SP)**.

12. The Project Manager shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and/or property, and/or equipment. In such cases, the Contractor shall be informed in writing about the nature of hazards and possible injury/accident and he shall comply to remove shortcomings promptly. The Contractor after stopping the specific work can, if felt necessary, appeal against the order of stoppage of work to the Project Manager within 3 days of such stoppage of work and decision of the Project Manager in this respect shall be conclusive and binding on the Contractor.
13. THAT, if, any Employer's Engineer/ supervisor at site observes that the Contractor is failing to provide safe working environment at site as per agreed Safety Plan / RECTPCL Safety Rule/ Safety Instructions / Statutory safety requirement and creates hazardous conditions at site and there is possibility of an accident to workmen or workmen of the other contractor or public or the work is being carried out in an un safe manner or he continues to work even after being instructed to stop the work by Engineer / Supervisor at site / RHQ / Corp. Centre, the Contractor shall be bound to pay a penalty of Rs. 10,000/- per incident per day till the instructions are complied and as certified by Engineer / Supervisor of Employer at site. The work will remain suspended and no activity will take place without compliance and obtaining clearance / certification of the Site Engineer / Supervisor of the Employer to start the work.
14. THAT, if the investigation committee of Employer observes any accident or the Engineer In-charge/Project Manager of the Employer based on the report of the Engineer/Supervisor of the Employer at site observes any failure on the Contractor's part to comply with safety requirement / safety rules/ safety standards/ safety instruction as prescribed by the Employer or as prescribed under the applicable law for the safety of the equipment, plant and personnel and the Contractor does not take adequate steps to prevent hazardous conditions which may cause injury to its own Contractor's employees or employee of any other Contractors or Employer or any other person at site or adjacent thereto, or public involvement because of the Contractor's negligence of safety norms, the Contractor shall be liable to pay a compensation of Rs. 15,00,000/- (Rupees Fifteen Lakh only) per person affected causing death and Rs. 5,00,000/- (Rupees Five Lakh only) per person for serious injuries / 25% or more permanent disability to the Employer for further disbursement to the deceased family/

Injured persons. The permanent disability has the same meaning as indicated in Workmen's Compensation Act 1923. The above stipulations is in addition to all other compensation payable to sufferer as per workmen compensation Act / Rules

Notwithstanding above, the Contractor shall also be responsible for payment of sum as indicated below additionally which shall be deposited in Safety Corpus Fund pursuant to GCC Sub-Clause 18.3.3.26:

a.	Upon 1st Fatal Accident due to negligence by the Contractor	Rs. 50,00,000/-
b.	Upon 2nd Fatal Accident due to negligence by the Contractor	Rs. 75,00,000/-
c.	Upon 3rd Fatal Accident due to negligence by the Contractor	Rs. 1,00,00,000/-
d.	Re-occurrence of Fatal Accident even after 3rd Fatal Accident due to negligence by the Contractor	Rs. 1,00,00,000/- per fatal accident
e.	Tower Collapse leading to more than one (01) death attributable to the Contractor as per the Accident Enquiry Committee Report	Rs. 1,00,00,000/- per fatal accident in addition to a, b, c or d above, as applicable

THAT as per the Employer's instructions, the Contractor agrees that this amount shall be deducted from their running bill(s) immediately after the accident, That the Contractor understands that this amount shall be over and above the compensation amount liable to be paid as per the Workmen's Compensation Act /other statutory requirement/ provisions of the Bidding Documents.

15. THAT the Contractor shall submit Near-Miss-Accident report alongwith action plan for avoidance such incidence /accidents to Engineer – In-charge/ Project Manager. Contractor shall also submit Monthly Safety Activities report to Engineer – In-charge/ Project Manager and copy of the Monthly Safety Activities report also to be sent to Safety In-charge at RHQ of the Employer for his review record and instructions.
16. THAT the Contractor is submitting a copy of Safety Policy/ Safety Documents of its Company which is enclosed at **Annexure – 6 (SP)** and ensure that the safety Policy and safety documents are implemented in healthy spirit.
17. THAT the Contractor shall make available of First Aid Box [Contents of which shall be as per Building & other construction workers (Regulation of Employment and Conditions of Services Act and Central Rule 1998 / RECTPCL Guidelines)] to the satisfaction of Engineer In-Charge/ Project Manager with each gang at site and not at camp and ensures that trained persons in First Aid Techniques with each gang before execution of work.

18. THAT the Contractor shall submit an 'Emergency Preparedness Plan' for different incidences i.e. Fall from height, Electrocution, Sun Stroke, Collapse of pit, Collapse of Tower, Snake bite, Fire in camp / Store, Flood, Storm, Earthquake, Militancy etc. while carrying out different activities under execution i.e. foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc. which is enclosed at **Annexure – 7 (SP)** for approval of the Engineer In-Charge/ Project Manager before start of work.
19. THAT the Contractor shall organise Safety Training Programs on Safety, Health and Environment and for safe execution of different activities of works i.e. foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc. for their own employees including sub contractor workers on regular basis.

The Contractor, therefore, submits copy of the module of training program, enclosed at **Annexure – 9 (SP)**, to Engineer In-charge/Project Manager for its acceptance and approval and records maintained.

20. THAT the Contractor shall conduct safety audit, as per Safety Audit Check Lists enclosed at **Annexure – 8 (SP)**, by his Safety Officer(s) every month during construction of Transmission Lines / Sub Stations / any other work and copy of the safety audit report will be forwarded to the Employer's Engineer In-charge / Site In-charge/Project Manager for his comments and feedback. During safety audit, healthiness of all Personal Protective Equipments (PPEs) shall be checked individually by safety officer of contractor and issue a certificate of its healthiness or rejection of faulty PPEs and contractor has to ensure that all faulty PPEs and all faulty lifting tools and tackles should be destroyed in the presence of RECTPCL construction staff. Contractor has to ensure that each gang be safety audited at least once in two months. During safety audit by the contractor, Safety officer's feedback from RECTPCL concerned shall be taken and recorded. The Employer's site officials shall also conduct safety audit at their own from time to time when construction activities are under progress. Apart from above, the Employer may also conduct surveillance safety audits. The Employer may take action against the person / persons as deemed fit under various statutory acts/provisions under the Contract for any violation of safety norms / safety standards.
21. THAT the Contractor shall develop and display Safety Posters of construction activity at site and also at camp where workers are generally residing.
22. THAT the Contractor shall ensure to provide potable and safe drinking water for workers at site / at camp.
23. THAT the Contractor shall do health check up of all workers from competent agencies and reports will be submitted to Engineer In-Charge within fifteen (15) days of health check up of workers as per statutory requirement.

24. THAT the Contractor shall submit information alongwith documentary evidences in regard to compliance to various statutory requirements as applicable which are enclosed at **Annexure – 10A (SP)**.

The Contractor shall also submit details of Insurance Policies taken by the Contractor for insurance coverage against accident for all employees are enclosed at **Annexure – 10B (SP)**.

25. THAT a check-list in respect of aforesaid enclosures alongwith the Contractor's remarks, wherever required, is attached as **Annexure – Check List** herewith.

THE CONTRACTOR shall incorporate modifications/changes in this 'Safety Plan' necessitated on the basis of review/comments of the Engineer In-Charge/Project Manager within fourteen (14) days of receipt of review/comments and on final approval of the Engineer In-Charge/Project Manager of this 'Safety Plan', the Contractor shall execute the works under the Contract as per approved 'Safety Plan'. Further, the Contractor has also noted that the first progressive payment towards Supply of Supply of Services Contract shall be made on submission of 'Safety Plan' alongwith all requisite documents and approval of the same by the Engineer In-Charge/Project Manager.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorised representative under the common seal of the Company, the day, month and year first above mentioned.

For and on behalf of

M/s.....

WITNESS

1. Signature.....

Signature.....

Name.....

Name.....

Address.....

Address.....

2. Signature.....

Authorised representative

Name.....

(Common Seal)

Address.....

(In case of Company)

Note:

All the annexure referred to in this "Safety Plan" are required to be enclosed by the contractor as per the attached " Check List "

1. Safety Plan is to be executed by the authorised person and (i) in case of contracting Company under common seal of the Company or (ii) having the power of attorney issued under common seal of the company with authority to execute such contract documents etc., (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a Photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to this Safety Plan.
2. For all safety monitoring/ documentation, Engineer In-charge / Regional In-charge of safety at RHQ will be the nodal Officers for communication.

CHECK LIST FOR SAFETY PLAN

S. N.	Details of Enclosure	Status of Submission of information/ documents	Remarks
1.	Annexure – 1A (SP) Safe work procedure for each activity i.e. foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc. to be executed at site.	Yes/No	
2.	Annexure – 1B (SP) Manpower deployment plan, activity wise foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc.	Yes/No	
3.	Annexure – 2 (SP) List of Lifting Machines i.e. Crane, Hoist, Triffor, Chain Pulley Blocks etc. and Lifting Tools and Tackles i.e. D shackle, Pulleys, come along clamps, wire rope slings etc. and all types of ropes i.e. Wire ropes, Poly propylene Rope etc. used for lifting purposes along with test certificates.	Yes/No	
4.	Annexure – 3 (SP) List of Personal Protective Equipment (PPE), activity wise including the following along with test certificate of each as applicable: 1. Industrial Safety Helmet to all workmen at site. (EN 397 / IS 2925) with chin strap and back stay arrangement. 2. Safety shoes without steel toe to all ground level workers and canvas shoes for workers working on tower.	Yes/No	

S. N.	Details of Enclosure	Status of Submission of information/ documents	Remarks
	3. Rubber Gum Boot to workers working in rainy season / concreting job. 4. Twin lanyard Full Body Safety harness with shock absorber and leg strap arrangement for all workers working at height for more than three meters. Safety Harness should be with attachments of light weight such as of aluminium alloy etc. and having a feature of automatic locking arrangement of snap hook and comply with EN 361 / IS 3521 standards. 5. Mobile fall arrestors for safety of workers during their ascending / descending from tower / on tower. EN 353 -2 (Guided type fall arresters on a flexible anchorage line.) 6. Retractable type fall arrestor (EN360: 2002) for ascending / descending on suspension insulator string etc. 7. Providing of good quality cotton hand gloves / leather hand gloves for workers engaged in handling of tower parts or as per requirement at site. 8. Electrical Resistance hand gloves to workers for handling electrical equipment / Electrical connections. IS : 4770 9. Dust masks to workers handling cement as per requirement. 10. Face shield for welder and Grinders. IS : 1179 / IS : 2553 11. Reflective Jackets 12. Other PPEs, if any, as per requirement etc.		
5.	Annexure - 4 (SP) List of Earthing Equipment / Earthing devices with Earthing lead conforming to IECs for earthing equipments are - (855, 1230, 1235 etc.) gang wise for stringing activity/as per requirement	Yes/No	
6.	Annexure - 5A (SP) List of Qualified Safety Officer(s)/Safety Staff(s)	Yes/No	

S. N.	Details of Enclosure	Status of Submission of information/ documents	Remarks
	alongwith their contact details		
7.	Annexure – 5B (SP) Details of Explosive Operator (if required), Safety officer / Safety Staff(s)/ Safety supervisor for every erection / stringing gang, any other person nominated for safety, list of personnel trained in First Aid as well as brief information about safety set up by the Contractor alongwith copy of organisation of the Contractor in regard to safety	Yes/No	
8.	Annexure – 6 (SP) Copy of Safety Policy/ Safety Document of the Contractor's company	Yes/No	
9.	Annexure – 7 (SP) 'Emergency Preparedness Plan' for different incidences i.e. Fall from height, Electrocuting, Sun Stroke, Collapse of pit, Collapse of Tower, Snake bite, Fire in camp / Store, Flood, Storm, Earthquake, Militancy etc. while carrying out different activities under execution i.e. foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc.	Yes/No	
10.	Annexure – 8 (SP) Safety Audit Check Lists (Formats to be enclosed)	Yes/No	
11.	Annexure – 9 (SP) Copy of the module of Safety Training Programs on Safety, Health and Environment, safe execution of different activities of works for Contractor's own employees on regular basis and sub contractor employees.	Yes/No	

S. N.	Details of Enclosure	Status of Submission of information/ documents	Remarks
12.	Annexure – 10A (SP) Information alongwith documentary evidences in regard to the Contractor's compliance to various statutory requirements including the following:		
(i)	Electricity Act 2003 _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
(ii)	Factories Act 1948 _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
(iii)	Building & other construction workers (Regulation of Employment and Conditions of Services Act and Central Act 1996) and Welfare Cess Act 1996 with Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
(iv)	Workmen Compensation Act 1923 and Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
(v)	Public Insurance Liabilities Act 1991 and Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
(vi)	Indian Explosive Act 1948 and Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	

S. N.	Details of Enclosure	Status of Submission of information/ documents	Remarks
	<i>compliance]</i>		
(vii)	Indian Petroleum Act 1934 and Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
(viii)	License under the contract Labour (Regulation & Abolition) Act 1970 and Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
(ix)	Indian Electricity Rule 1956 and amendments if any, from time to time. _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
(x)	The Environment (Protection) Act 1986 and Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
(xi)	Child Labour (Prohibition & Regulation) Act 1986. _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
(xii)	National Building Code of India 2005 (NBC 2005). _____ <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
(xiii)	Indian standards for construction of Low/ Medium/ High/ Extra High Voltage	Yes/No	

S. N.	Details of Enclosure	Status of Submission of information/ documents	Remarks
	Transmission Line <i>[Name of Documentary evidence in support of compliance]</i>		
(iv)	Any other statutory requirement(s) <i>[please specify]</i> <i>[Name of Documentary evidence in support of compliance]</i>	Yes/No	
13.	Annexure – 10B (SP) Details of Insurance Policies alongwith documentary evidences taken by the Contractor for the insurance coverage against accident for all employees as below:		
(i)	Under Workmen Compensation Act 1923 and Rules. <i>[Name of Documentary evidence in support of insurance taken]</i>	Yes/No	
(ii)	Public Insurance Liabilities Act 1991 <i>[Name of Documentary evidence in support of insurance taken]</i>	Yes/No	
(iii)	Any Other Insurance Policies <i>[Name of Documentary evidence in support of insurance taken]</i>	Yes/No	

17. FORM OF JOINT DEED OF UNDERTAKING BY THE TOWER MANUFACTURER ALONGWITH THE BIDDER/CONTRACTOR

THIS DEED OF UNDERTAKING executed this day of Two Thousand and by M/s., a Company incorporated under the laws of and having its Registered Office at (hereinafter called the “Tower Manufacturer” which expression shall include its successors, executors and permitted assigns), and M/s., a Company incorporated under the laws of having its Registered Office at (hereinafter called the “Bidder”/“Contractor” which expression shall include its successors, executors and permitted assigns) in favour of (*insert names of the Employer*), a Company incorporated under the Companies Act of 1956 having its registered office at(*insert registered address of the Employer*)..... (hereinafter called the “Employer” which expression shall include its successors, executors and permitted assigns)

WHEREAS the “Employer” invited Bid as per its Specification No. for manufacture, fabrication, supply of tower parts as per Employer’s design, casting of foundation, erection of all types of towers, stringing of conductor and earthwire, testing and commissioning of Transmission Line.

AND WHEREAS Clause No., Section, of, Vol.–... forming part of the Bid Documents inter-alia stipulates that the Bidder and/or Manufacturer must fulfill the Qualifying Requirements and be jointly and severally bound and responsible for the quality and timely supply of tower parts in the event the Bid submitted by the Bidder is accepted by the Employer resulting in a Contract.

AND WHEREAS the Bidder has submitted its Bid to the Employer vide Proposal No. dated based on tie-up with the Tower Manufacturer for supply of tower parts.

NOW THEREFORE THIS UNDERTAKING WITNESSETH as under:

- 1.0 In consideration of the award of Contract by the Employer to the Bidder (hereinafter referred to as the “Contract”) we, the Tower Manufacturer and the Bidder/Contractor do hereby declare that we shall be jointly and severally bound unto the (*insert name of the Employer*), for the manufacture, testing, supply of tower parts on FOR destination delivery at site basis in accordance with the Contract Specifications.
- 2.0 Without in any way affecting the generality and total responsibility in terms of this Deed of Undertaking, the Tower Manufacturer hereby agrees to depute their representatives from time to time to the Employer’s Project site as mutually considered necessary by the Employer, Bidder/Contractor and the Tower Manufacturer to ensure proper quality, manufacture, testing and supply on FOR

destination delivery at site basis and successful performance of the material in accordance with Contract Specifications. Further, if the Employer suffers any loss or damage on account of non-performance of the material (tower parts) fully meeting the performance guaranteed as per Bid Specification in terms of the contract. We the Tower Manufacturer and the Contractor jointly and severally undertake to pay such loss or damages to the Employer on its demand without any demur.

- 3.0 This Deed of Undertaking shall be construed and interpreted in accordance with the laws of India and the Courts in Delhi shall have exclusive jurisdiction in all matters arising under the Undertaking.
- 4.0 As a security, the Tower Manufacturer shall apart from the Contractor's performance guarantee, furnish a Contract Performance Guarantee from its Bank in favour of the Employer in a form acceptable to the Employer. The value of such guarantee shall be equivalent to **02%** of the cost of tower parts to be supplied by the Tower Manufacturer as identified in the Contract awarded by the Employer to the Bidder/Contractor and it shall be part of guarantee towards the faithful performance/compliance of this Deed of Undertaking in terms of the Contract. The guarantee shall be unconditional, irrevocable and valid for the entire period of the Contract, namely till the end of the Defect Liability Period of under the Contract. The Bank Guarantee amount shall be payable to the Employer on demand without any reservation or demur.
- 5.0 We, the Tower Manufacture/ Bidder/Contractor agree that this Undertaking shall be irrevocable and shall form an integral part of the Contract and further agree that this Undertaking shall continue to be enforceable till the Employer discharges it. It shall become operative from the effective date of Contract.

IN WITNESS WHEREOF the Tower Manufacturer and/or the Bidder/Contractor have through their Authorised Representatives executed these presents and affixed Common seals of their respective Companies, on the day, month and year first above mentioned.

WITNESS

(For Tower Manufacturer)

Signature

(Signature of the authorized representative)

Name

Name

Office Address

Common Seal of Company

WITNESS

(For Bidder)

Signature

Name

Office Address

(Signature of the authorized
representative)

Name

Common Seal of Company

Note:

1. For the purpose of executing the Deed of Joint Undertaking, the non-judicial stamp papers of appropriate value shall be purchased in the name of executant(s).
2. The Undertaking shall be signed on all the pages by the authorised representatives of each of the partners and should invariably be witnessed.
3. This Deed of Joint Undertaking duly attested by Notary Public of the place(s) of the respective executant(s), shall be submitted alongwith the bid.
4. In case the bid is submitted by a Joint Venture (JV) of two or more firms as partners, then the Joint deed of undertaking shall be modified accordingly.

18. FORM OF BANK GUARANTEE FOR CONTRACT PERFORMANCE (TO BE SUBMITTED BY TOWER MANUFACTURER)

Bank Guarantee No.

Date.....

Contract No.....

.....[Name of Contract].....

To: [Name and address of Employer]

Dear Ladies and/or Gentlemen,

We refer to the Contract ("the Contract") signed on(insert date of the Contract)..... between M/s. ("the Employer"/"RECTPCL") on behalf of Government of Jammu & Kashmir Through Power Development Department (hereinafter referred to as 'PDD / 'Owner') and M/s (Name of Contractor), having its Principal place of business at(Address of Contractor) and Registered Office at(Registered address of Contractor) ("the Contractor") concerning (Indicate brief scope of work) for the complete execution of the (insert name of Package alongwith name of the Project).....

Whereas, the Contractor and M/s. (Name of Tower Manufacturer), having its Principal place of business at(Address of Tower Manufacturer) and Registered Office at(Registered address of Tower Manufacturer) (hereinafter referred to as the "Tower Manufacturer"), as a pre-requisite for qualification of the Bidder/Contractor, have submitted a deed of joint undertaking declaring that they are jointly and severally bound and responsible for the quality and timely supply of tower/tower parts and that the Tower Manufacturer having agreed to furnish a Contract Performance Guarantee for the faithful performance/compliance of the Deed of Undertaking equivalent to (2%) two per cent of the cost of tower parts to be supplied by the Tower Manufacturer under the Contract, in addition to Contract Performance Guarantee equivalent to 10% (ten per cent) of the value of the Contract to be provided by the Contractor for the faithful performance of the entire Contract.

By this letter we, the undersigned, ...(insert name & address of the issuing bank), a Bank (which expression shall include its successors, administrators, executors and assigns) organized under the laws of and having its Registered/Head Office at(insert address of registered office of the bank)..... do hereby irrevocably guarantee payment to you up to i.e., two percent (02%) of the cost of tower parts to be supplied by the Tower Manufacturer under the Contract until ninety (90) days beyond the Defect Liability Period i.e., upto and inclusive of (dd/mm/yy).

We undertake to make payment under this Letter of Guarantee upon receipt by us of your first written demand signed by the Employer duly authorized officer or the authorized officer of **Owner** declaring the Contractor/Tower Manufacturer to be in default under the Contract and without cavil or argument any sum or sums within the above named limits, without your need to prove or show grounds or reasons for your demand and without the right of the Contractor/Tower Manufacturer to dispute or question such demand.

Our liability under this Letter of Guarantee shall be to pay to you whichever is the lesser of the sum so requested or the amount then guaranteed hereunder in respect of any demand duly

made hereunder prior to expiry of the Letter of Guarantee, without being entitled to inquire whether or not this payment is lawfully demanded.

This letter of Guarantee shall remain in full force and shall be valid from the date of issue until ninety (90) days beyond the Defect Liability Period of the Facilities i.e. upto and inclusive of (dd/mm/yy) and shall be extended from time to time for such period (not exceeding one year), as may be desired by M/s. on whose behalf this Letter of Guarantee has been given.

Except for the documents herein specified, no other documents or other action shall be required, notwithstanding any applicable law or regulation.

Our liability under this Letter of Guarantee shall become null and void immediately upon its expiry, whether it is returned or not, and no claim may be made hereunder after such expiry or after the aggregate of the sums paid by us to you shall equal the sums guaranteed hereunder, whichever is the earlier.

All notices to be given under shall be given by registered (airmail) posts to the addressee at the address herein set out or as otherwise advised by and between the parties hereto.

We hereby agree that any part of the Contract may be amended, renewed, extended, modified, compromised, released or discharged by mutual agreement between you and the Contractor/Tower Manufacturer, and this security may be exchanged or surrendered without in any way impairing or affecting our liabilities hereunder without notices to us and without the necessity for any additional endorsement, consent or guarantee by us, provided, however, that the sum guaranteed shall not be increased or decreased.

No action, event or condition which by any applicable law should operate to discharge us from liability hereunder shall have any effect and we hereby waive any right we may have to apply such law so that in all respects our liability hereunder shall be irrevocable and, except as stated herein, unconditional in all respects.

For and on behalf of the Bank

[Signature of the authorised signatory(ies)]

Signature_____

Name_____

Designation_____

POA Number_____

Contact Number(s): Tel._____Mobile_____

Fax Number_____

email _____

Common Seal of the Bank_____

Witness:

Signature_____

Name_____

Address_____

Contact Number(s): Tel._____Mobile_____

email _____

Note:

1. For the purpose of executing the Bank Guarantee, the non-judicial stamp papers of appropriate value shall be purchased in the name of Bank who issues the 'Bank Guarantee'.
2. The Bank Guarantee shall be signed on all the pages by the Bank Authorities indicating their POA nos. and should invariably be witnessed.
3. The Bank Guarantee should be in accordance with the proforma as provided. However, in case the issuing bank insists for additional paragraph for limitation of liability, the following may be added at the end of the proforma of the Bank Guarantee [*i.e., end paragraph of the Bank Guarantee preceding the signature(s) of the issuing authority(ies) of the Bank Guarantee*]:

Quote

"Notwithstanding anything contained herein:

1. Our liability under this Bank Guarantee shall not exceed _____ (*value in figures*)_____ [*_____ (value in words)_____*].
2. This Bank Guarantee shall be valid upto _____(*validity date*)_____.
3. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only & only if we receive a written claim or demand on or before _____ (*validity date*) _____."

Unquote

REC TRANSMISSION PROJECTS COMPANY LIMITED



On Behalf of POWER DEVELOPMENT DEPARTMENT J&K GOVERNMENT

As Project Implementation Agency

(Invites bid through e-Tendering mode only)

FOR TURNKEY CONTRACT PACKAGE OF

Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”.

**Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik
Package 04- RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum
Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum**

Dated: 11-10-2019

VOL-II

October 2019

REC Transmission Projects Company Limited
(A wholly owned subsidiary of REC, a 'Navratna CPSE'
Under the Ministry of Power, Govt of India)
ECE House, 3rd Floor, Annexe – II,
28 A, K G MARG, NEW DELHI – 110 001
Website: www.rectpcl.in

1 BIDDING DOCUMENT FOR TOWER PACKAGES

“Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”.

- i) Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik,**
- ii) Package 04- RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum,**
- iii) Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum**

VOLUME - II TECHNICAL SPECIFICATIONS

**REC TRANSMISSION PROJECTS COMPANY LTD.
(A Government of India Enterprise)**

(This document is meant for the exclusive purpose of bidding against this specification and shall not be transferred, reproduced or otherwise used for purposes other than that for which it is specifically issued).

**TECHNICAL SPECIFICATION
(VOLUME - II)**

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SECTION- I (TECHNICAL SPECIFICATIONS)

1 General Information and Scope

1.1 Scope

1.1.1 The following transmission lines are included in the scope of the contractor for various packages:-

		<i>Line Length (Approx.)</i>
Tower Package –TL 03:	220 kV S/C Drass to Kochik Transmission line on D/C Tower	63.55 Kms
Tower Package –TL 04:	220 kV S/C Kochik to Rangdrum Transmission line on D/C Tower	65.12 Kms
Tower Package –TL 05:	220 kV S/C Rangdrum to Padum Transmission line on D/C Tower	66.63 Kms

1.1.2 This Specification covers the following scope of works:

- i. Detailed survey including route alignment, profiling, tower spotting, optimisation of tower locations, soil resistivity measurement & geotechnical investigation (including special foundation locations, viz. pile/well foundation locations).
- ii. Check survey;
- iii. Fabrication and supply of all type of 220 kV transmission line towers, including River crossing towers (wherever applicable) as per Employer design/drawings including fasteners, step bolts, hangers, D-shackles etc.
- iv. All types of tower accessories like phase plate, circuit plate (where ever applicable), number plate, danger plate, anti-climbing device, Bird guard (where ever applicable)
- v. Supply of Conductor, OPGW, Earth wire, Hardware Fittings and Conductor & Earth wire Accessories,
- vi. Classification of foundation for different type of tower and casting of foundation (excluding special foundation locations, viz. pile/well foundation locations) for tower footings as per Employer supplied foundations drawing;
- vii. Erection of towers, tack welding of bolts and nuts including supply and application of zinc rich primer & two coats of enamel paint, tower earthing, fixing of insulator strings, stringing of conductors and OPGW/ earth wires along with all necessary line accessories,

For Stringing in the tough terrain of hilly region and river crossing wherein, transmission Line is passing through the long span of nallas, rivers crossing or hills, Contractor is required to string the conductor in both circuit of the D/C tower. in order to restore the transmission line in case of snapping of the first circuit

Such Locations, where the stringing is required to be carried out on both the circuit of the D/C Tower shall be finalized jointly by RETPCL, JKPDD & Contractor finalized for the package.

- viii. Painting of towers & supply and erection of span markers, obstruction lights (wherever applicable) for aviation requirements (as required) Testing and commissioning of the erected transmission lines and

ix. With the purpose to train the officials of JKPDD and getting them acquainted with the various activities for assessing performance, monitoring the Transmission Line during O&M period. Contractor is required to provide the training to the JKPDD officials.

x. The training period envisaged will be as under:

Maximum 8 nos. of officers for 7 working days from NPTI or any other recognized training institute.

The entire cost for training including local transportation should be borne by the contractor. However, the other expenses like travel, accommodation, TA/DA etc of the trainee shall be borne by JKPDD.

xi. *Note: - As the above Transmission Lines are expected to pass through heavy avalanche prone area, provision of avalanche protection need to be taken care. Hence, after award of the contract the selected bidder is required to consult M/s Snow and Avalanche study Establishment (SASE), Chandigarh for the detail & check survey. In detail study, safety of individual Tower for Transmission Line from avalanche threat, required safety measures, improvisation of alignment & selection of more safe and economical alignment needs to be worked out. After detail study, if required, ground visit to be carried out jointly with SASE/RECTPCL officials. Based on the joint report of the study, Necessary provision for avalanche protection will be finalized. **All the expenses towards detail study by SASE & ground visits of SASE official to be borne by contractor.**

xii. Based on the above detailed study, if required, the contractor is required to provide the 220 kV, XLPE Cable in selected span to overcome the problems due to snow and avalanches. The scope under this specifications shall cover Survey, planning, design, engineering, manufacturing, testing, supply, transportation, insurance, delivery at site, unloading, handling, store, installation (including civil works), jointing, termination, testing, demonstration for acceptance, commissioning, including protection and documentation of underground 220 kV single core 800 sq.mm XLPE Copper cable complete with all materials.

The cable link shall transfer power at 220 kV through single circuit in trefoil formation with 1C x 800 sq.mm size copper conductor in each phase. In addition to this one (1) additional single core cable of identical size to the main circuit shall be laid along with the above for use as spare. The XLPE cable and its accessories shall be complete with all jointing and cable termination with air bushing and all fitting and components necessary for the satisfactory performance and ease of maintenance

The Locations of such patches where provision of cabling is required shall be finalized jointly by RETPCL, JKPDD & Contractor based on the detailed study report with SASE.

The detail scope of work shall mainly consist of:

- Route survey of the entire route length & Laying of 220 kV grade XLPE cables through buried cable trench in separate HDPE pipes encased in PCC for entire route under scope as per specification.
- Supply & Laying of one (1) number Fiber optic cable in separate HDPE pipe for entire route under scope as per specification. Supply & installation of HDPE pipe in same buried cable trench & jointing of fibre optic cable en-route shall be in the scope of the contractor.
- Formation of buried cable trenches for 220 kV cables as per specification including supply and installation of HDPE pipes, warning tape, construction of jointing bays, backfilling of trenches & restoration as per specification. Concrete trenches with precast covers may be

used in exceptional cases in smaller portions, wherever bending of cables are involved and HDPE pipes cannot be laid.

- Road crossings (wherever applicable) through HDPE pipe for each cable and restoration as per specification.
- Cable markers as per statutory requirements shall be provided all along the route at a maximum distance of 200 meters and other important locations. Also the location of underground cable shall be clearly indicated on the marker.
- Supply and installation of cable joints for complete route.
- Supply and installation of all critical installation materials as required for complete route.
- Bonding of screen/sheath to the earth station (as envisaged) through “disconnecting type link boxes” and “SVL (sheath voltage limiter) if required”. Bidder shall propose bonding method for entire route under scope. Bonding method proposed should be suitable for minimum circulating current and losses. Further sheath voltage shall be within permissible limit as per statutory requirement. Earthing stations/Earthing pits, earthing materials, earth link box and earthing conductors wherever applicable for complete route shall be in contractor’s scope. Earth continuity cable for bonding proposed shall be also in the scope of bidder.
- Supply and erection of cable end termination bushings and lightning arrestors for cables at both ends of both segments section of cable.
- Design, fabrication, supply and erection of galvanized steel cable terminating structures [for mounting each cable termination bushings and lightning arrestors (with all necessary accessories)] for both ends/segments as required.
- These cable terminating support structures shall be suitable for mounting on dead-end transmission line towers. Fabrication of supply of support structure is also in the scope of contractor

The bidder shall prepare and furnish suitable arrangement for clamping & mounting cable & cable terminations & LA on transmission line tower, keeping in view of all statutory electrical clearances for 220 kV system. The bidder may propose minimum necessary modification required in dead-end tower (with additional auxiliary/strengthened cross-arms etc) to install cable terminating bushing/LA being supplied by them during detailed engineering. Modification in dead-end tower with respect to addition of auxiliary cross-arms and strengthening etc shall be carried out by transmission line contractor.

Mounting of cable terminating and LA structure & its terminations on tower along with lifting of cables in air in suitable HDPE pipes with necessary clamping arrangement is in the scope of the contractor.

Terminal connectors offered by bidder for cable termination bushings and lightning arrestors at both ends shall be suitable to receive, single ACSR deer conductor.

- xiii. Other items not specifically mentioned in this Specification and / or BPS but are required for the successful commissioning of the transmission line, unless specifically excluded in the Specification

- 1.1.2.1 Employer shall provide Tower and extension design to the contractor for development of structural drawings, shop drawings & Bill of Materials of all type of transmission line towers and its extensions, river crossing towers/special towers as required after placement of award, in sequence, suiting the project requirement. Similarly the drawings for all type of foundations for the towers shall also be provided by Employer to the Contractor.

However, if required, Contractor has to develop structural drgs, BOM & Shop drawings of +18/25M extension based on SLD provided by the Employer.

- 1.1.2.2 (a) The provisional quantities of fabricated & galvanised steel parts as per specifications required for towers, grillage steel foundations, avalanche protection steel deflection pillar / frame, concrete, excavation volume & reinforcement steel for foundation & its protection work and other items are given in appropriate Schedule of Bid Proposal Sheet (BPS) for respective packages. However, the work shall be executed as per approved construction drawings.
- b) The various items of work are described very briefly in the appropriate Schedule of BPS. The various items of the BPS shall be read in conjunction with the corresponding sections in the Technical Specifications including amendments and, additions, if any. The Bidder's quoted rates shall be based on the description of activities in the BPS as well as other necessary operations required to complete the works detailed in these Technical Specifications.
- c) The Unit rates quoted shall include minor details which are obviously and fairly intended, and which may not have been included in these documents but are essential for the satisfactory completion of the various works.
- d) The unit rate quoted shall be inclusive of all plant equipment, men, material skilled and unskilled labour etc. essential for satisfactory completion of various works.
- e) All measurements for payment shall be in S.I. units, lengths shall be measured in meters corrected to two decimal places. Areas shall be computed in square meters & volume in cubic meters rounded off to two decimals.
- 1.1.3 The Bidder shall submit his offer taking into consideration that the tower design and foundation designs/drawings shall be developed/ provided by Employer and design rights will be strictly reserved with Employer. Bidder shall quote the unit rates for various items of towers and foundations as per units mentioned in appropriate schedule of (BPS). However, payment of these items identified in the schedule of prices shall be made as follows:

A)	TOWER	
i)	Supply items	On supply of respective complete tower, grillage foundation, avalanche protection deflection pillar / frame etc.
ii)	Erection items	On erection of respective complete tower
B)	Foundation items:	On completion of respective foundation, other tower footing and snow avalanche protection work in all respect

The payment to be made for towers/foundations shall be worked out based on the unit rates and approved Bill of Materials (BOM) for towers and quantities/volumes as per approved tower foundation drawings.

- 1.1.4 This specification also includes the supply of Conductor, Earth wire, OPGW, Insulator, hardware fittings and all type of accessories for conductor, OPGW and earth wire as detailed in the specification. Contractor shall clearly indicate in their offer, the sources from where they propose to procure these materials in appropriate Schedule of BPS. The technical description of these items is given in relevant section of this Volume of the bidding documents.
- 1.1.5 All the raw materials such as steel, zinc for galvanising, reinforcement steel, cement, coarse and fine aggregates for tower foundation, coke and salt for tower earthing etc. are included in the Contractor's scope of supply.
- 1.1.6 Bidder shall also indicate in the offer, the sources from where they propose to procure the fasteners, step bolts, hangers, D shackles etc., tower accessories, aviation signal (if required) etc.

1.1.7 Stringing

a) For transmission line with Single Conductor per phase:

The entire stringing work of conductor and OPGW/earth wire shall be carried out by standard stringing practice. The bidder shall indicate in the offer, the detail description of the procedure to be deployed for stringing operation.

The contractor shall deploy appropriate tools / equipment's / machinery to ensure that the stringing operation is carried out without causing damage to conductor/OPGW/earth wire and conductor/OPGW/earth wire is installed at the prescribed sag-tension as per the approved stringing charts.

- 1.1.8 The casting of special pile/well foundations, wherever required shall be in the scope of the Bidder. The design shall be provided by Employer. If the bidder does not have necessary experience, some other agencies meeting the qualifying requirements may be engaged by the bidder for the casting of pile/well foundations.

1.2 Details of Transmission Line Routes and Terrain

The detailed survey shall be carried out using Total stations, DGPS, etc. along the approved route alignment. As an alternative, the contractor may also use ALTM (Airborne Laser Terrain Modeling) techniques of equal or better accuracy for the detailed survey.

Bidders may visit the line route to acquaint themselves with terrain conditions and associated details of the proposed transmission lines. For this purpose they are requested to contact at the following address:-

Addl. Chief Operating Officer
REC Transmission Projects Company Limited
ECE House, 3rd Floor, Annex-II,
28A, KG Marg, New Delhi

1.3 Location Details and Terminal Points

- 1.3.1 The above transmission lines shall be laid in Leh Ladakh Region. The Contractor shall have to construct these transmission lines completely up to dead end towers on either end. Stringing shall also be carried out from dead end tower to terminal arrangements/terminal points.

1.4 Access to the Line and Right of Way

Right of way and way leave clearance shall be arranged by the employer in accordance with work schedules. Employer will also secure way leave and Right of way in the Forest area.

2 Qualification Requirement for Contractors Supplied Line Materials

The Bidder should have assured access to supply Conductor, OPGW/Earth wire, Insulators, Hardware fittings and Conductor & OPGW/Earth wire accessories from Qualified Manufacturers meeting the following minimum requirement and must demonstrate that based on known commitments they will be available for use in the proposed contract.

2.1 Conductor

The qualified manufacturer should have manufactured, tested and supplied at least One Thousand (1000) kms. of ACSR DEER Conductor or above size of Conductor.

2.2 Earthwire

The qualified manufacturer should have manufactured, tested and supplied at least three hundred (300) kms. of galvanized steel ground wire/ ACSR core wire of size 7/3.15mm or above.

2.3 OPGW

The Bidder shall offer OPGW from a manufacturer who has been manufacturing OPGW for the last three (3) years and at least 200 Km of OPGW manufactured by such manufacturer shall have been in satisfactory operation on 220 kV or higher voltage EHV Transmission lines for at least two (2) years as on the date of bid opening mentioned above commencing from date of use of fibres along with communication equipment.

2.4 Disc Insulator / Long rod Insulator

The Qualified Manufacturer shall be a manufacturer of Insulators of similar nature for the last five years. The Qualified Manufacturer's experience should include the following:-

2.4.1 The Qualified Manufacturer should have designed, manufactured, tested and supplied 120 / 160 KN or above electro mechanical strength Disc insulators / Long rod Insulator for 220KV or above voltage transmission line of quantities not less than 50,000 Nos. disc insulators of each rating / 6000 Nos. of Long rod Insulator of each rating and the same should have been in satisfactory operation for a minimum period of two years as on originally scheduled date of bid opening. Further, the manufacturer should also have successfully completed at least the following tests on insulator units and insulator strings of standard Disc insulators as on originally scheduled date of bid opening as mentioned in the bidding documents.

2.4.2 Tests on individual units as per IEC 60383-I

2.4.3 Following Type tests on insulator strings assembly for 220KV or above Voltage transmission lines with 120 KN & 160KN or above electromechanical strength insulators:

- Power Frequency Voltage withstand test (Wet)
- Lightning Impulse Voltage Withstand test (Dry)

2.5 Hardware Fittings

The qualified manufacturer should have designed, manufactured, tested and supplied hardware fittings for at least 450 sets of tension strings and 1,013 sets of suspension strings for 220 kV or above voltage transmission line and same should have been in satisfactory operation for a minimum period of three years as on date of bid opening.

2.6 Accessories for Conductor and OPGW / Earth wire

The qualified manufacturer (s) for any individual item(s) of accessories for conductor and OPGW / earthwire covered under the package should have designed, manufactured, tested and supplied the items of accessories for conductor & OPGW/earthwire covered under the package or items of similar/comparable nature. For vibration dampers, the experience should include at least the supply of 5,850 nos. of vibration dampers for conductor and 1,950 nos. of vibration dampers for OPGW/earthwire for 220 kV or above voltage transmission line and the same should have been in satisfactory operation for a minimum period of three years as on date of bid opening. (For accessories for OPGW/galvanized steel Earthwire, the requirement of voltage level shall not be applicable.)

The manufacturer (s) meeting the above requirement for any individual item or items shall be considered qualified for the respective item or items only

- 2.6.1 However, if the proposed manufacturer of Hardware fittings and Accessories for conductor and OPGW/earth wire is not meeting the above requirements of its own, he should be qualified licensee of a qualified manufacturer meeting the above specified requirements.

2.7 Manufacturer/licensees shall have adequate design infrastructure and manufacturing facility and capacity and procedures including quality control.

- a) A qualified Licensee of a qualified manufacturer shall mean all of the following:
- b) Any design undertaken by the licensee shall be approved by the licensor
 - i. Manufacture by the licensee shall be done with the approval of the licensor and Employer under a quality assurance programme approved and monitored by the licensor.
 - ii. Licensee must furnish back-up guarantee from the licensor for individual and overall performance of all equipment and materials supplied under the contract.
 - iii. Licensor must guarantee sequential and timely supply of equipments and materials and submission of technical information and data as desired by the Employer so as to meet the overall construction schedule and
 - iv. The agreement between licensee and licensor submitted along with the bid (Performance enclosed as Annexure-A to this section) shall be valid for a period of at least five (5) years after the guarantee period of equipment and materials under supply is over.

3 Transmission towers and Line data

3.1 General Description of the Tower

- 3.1.1 The transmission towers are of self-supporting hot dip galvanised lattice steel type, designed to carry the line conductors with necessary insulators, earth wires and all fittings under all loading conditions. Outline diagram of double circuit towers are enclosed with the Specification.
- 3.1.2 The tower shall be fully galvanized using mild steel or/and high tensile steel sections as specified in relevant clause in section - IV. Bolts and nuts with spring washer are to be used for connections.
- 3.1.3 The towers are of the following types:
Double Circuit (DA, DB, DC & DD)

3.2 Classification of Towers

- 3.2.1 The towers for 220 kV Lines are classified as given below:-

Type of Tower	Deviation Limit	Typical Use
DA	0 - 2 deg.	i) To be used as tangent tower.
DB	0 deg. - 15 deg.	i) Angle towers with tension insulator string. ii) Also to be used for uplift force resulting from an uplift span up to (-) 1200 m under broken wire condition. iii) Also to be used for Anti Cascading Condition.
DB	0 deg.	i) To be used as Section Tower.
DC	15 deg. - 30 deg.	i) Angle tower with tension insulator string. ii) Also to be used for uplift forces resulting from an uplift span up to (-) 1200 m under broken wire condition. iii) Also to be used for anti-cascading condition.
DC	0 deg.	i) To be used as section tower.
DD	30 deg. - 60 deg.	i) Angle tower with tension insulator string. ii) Also to be used for uplift forces resulting from an uplift span up to (-) 1200 m under broken wire condition.
DD	0 deg.	i) Dead end with 0 deg. To 15 deg. Deviation both on line side and sub-station side (slack span) ii) for river crossing anchoring with longer wind span & 0 deg. Deviation on crossing span side and 0 deg. To 30 deg. Deviation on other side.

Note: The above towers can also be used for longer span with smaller angle of deviations without infringement of ground clearance.

3.2.2 Special Towers

The towers which will be specially designed for very long spans (spans more than that of given in cl. 3.3) which cannot be crossed by normal tower with extensions as given in cl.no.3.2.3, like Major River crossings etc. shall be treated as special towers.

3.2.3 Extensions

- A) The Double Circuit towers are designed so as to be suitable for adding 3M, 6M and 9M body extensions / leg extensions for maintaining adequate ground clearances without reducing the specified factor of safety in any manner.
- B) The provision for addition of 18/25M body extension to tower types DA and DD is also kept by the Employer. For Power Line Crossing or any other obstacle, tower types DA or DD can be used with 18/25 M extensions depending, upon the merit of the prevailing site condition. The maximum reduced spans for DA and DD type towers shall be mentioned in the tower spotting data. However this shall, in no case be less than 250 meters.
- C) The towers have been designed for providing unequal leg extensions. The details of unequal leg extensions provided in the design shall be indicated to the contractor during execution stage, so that proper optimization of benching / revetment requirement can be done accordingly by the contractor. The towers are designed for unequal leg extensions of 1.5M, 3M, 4.5M, 6M, 7.5M and 9M generally with 3M maximum leg differential and in specific cases with 6m maximum leg differential. In exceptional situations where difference in leg differential does not suit the standard unequal leg extension provisions on the tower mentioned above, then suitable chimney extension shall be provided.
- D) All above extension provisions to towers and foundations shall be treated as part of normal towers and foundations only.
- E) The leg extensions, unequal leg extensions, chimney extensions and/or a combination of these alternatives, suitable for a tower location, shall be selected on the basis of techno-economics.

3.3 Span and clearances

3.3.1 Normal Span

The normal ruling span of the line is 350m for 220kV Line.

3.3.2 Wind Span

The wind span is the sum of the two half spans adjacent to the support under consideration. For normal horizontal spans this equals to normal ruling span.

3.3.3 Weight span

The weight span is the horizontal distance between the null point of the conductors on the two spans adjacent to the tower. For spotting of structures, the span limits given in Table below shall prevail.

FOR 220kV LINE

TOWER TYPE	NORMAL CONDITION		BROKENWIRE CONDITION	
	MAX (m)	MIN (m)	MAX (m)	MIN (m)
DA	600	0	360	100
DB	2000	(-) 2000	1200	(-)1200
DC	2000	(-) 2000	1200	(-)1200
DD	2000	(-) 2000	1200	(-)1200

- 3.3.4 In case, at certain locations, actual spotting spans exceed the design spans and cross-arms and certain members of towers are required to be modified/ reinforced, line diagrams/drawings for the modified/reinforced towers will be supplied to the Contractor as per requirement.

3.4 Electrical Clearances

3.4.1 Ground Clearance

The minimum ground clearance from the bottom conductor shall not be less than 8500 mm for 220 kV lines at the maximum sag conditions i.e. at 85° C and still air.

- 3.4.2 An allowance of 150mm shall be provided to account for errors in stringing.

- 3.4.3 Conductor creep shall be compensated by over tensioning the conductor at a temperature of 26 °C lower than the stringing temperature for ACSR “DEER” conductor for 220 kV transmission lines.

3.5 Electrical System Data

3.5.1 For 220 kV line

1	Nominal Voltage	kV	220
2	Maximum system voltage	kV	245
3	BIL (Impulse)	kV (Peak)	1800
4	Power frequency withstand voltage (Wet)	kV (rms)	790
5	Minimum Corona extinction voltage at 50 Hz AC system under dry condition	kV (rms) phase to earth.	154 (Min)
6	Radio interference voltage at one MHz for phase to earth voltage of 154 KV under dry condition.	Micro Volts	1000 (Max)

4 Details of line Material:

4.1 Details of line Material for 220 kV line

4.1.1 Conductor & Earthwire

Sl. No.	Description	Unit	Earthwire	Conductor
1	Name/Type		Galvanised steel	ACSR DEER
2	Size	mm	7/4.27	30/4.267 Al +7/4.27 Steel
3	Conductor per phase	No.	N.A.	1
4	Configuration		One continuously to run on top of the towers and conductors	Vertical
5	Overall diameter	mm	12.81	29.89
6	Unit mass	Kg/Km	783	1979

7	Min. UTS	KN	93.1	178.4
8	Ruling Design Span	Metres	350	350

4.1.2 Insulator strings with Disc Insulator for 220kV

S. No.	Particulars	Double 'I' Suspension string	Single Suspension Pilot String	Double Tension String
1.	Type of Disc	Standard	Standard	Standard
2.	E&M Strength of each Insulator in the string in KN	120	120	160
3.	Number of insulator disc per string	2x25	1x25	2x22
4.	Size of Disc in mm	280x145	280x145	280x170
5.	Size and Designation of pin Ball shank in mm	20	20	20
6.	Minimum Creepage distance of each disc in mm	370	370	370

4.2 Insulator String Hardware (As may be applicable)

- a) Anchor Shackle
- b) Chain Link
- c) Ball Clevis
- d) Arcing horn holding plate
- e) Yoke plate
- f) Socket clevis
- g) Arcing horns
- h) Corona control ring/grading ring.
- i) Clevis Eye
- j) Free center type/Armour grip suspension clamp for suspension strings.
- k) Compression type dead end clamp for tension string.

4.3 Accessories for Conductor & Earth wire (As may be applicable)

- a) Preformed Armour rods
- b) Mid Span compression joint
- c) Repair Sleeves
- d) Flexible copper bonds
- e) Vibration dampers
- f) Suspension clamp for earth wire.
- g) Tension clamp for earth wire.

5 Service Condition

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

Maximum ambient temperature (Degree Celsius):	35
Minimum ambient temperature (Degree Celsius) :	(-) 45
Relative humidity (% range):	10-100
Maximum annual rainfall & snowfall (Cm) :	as per published Meteorological/ climatologically data
Wind zone (as per IS: 875) :	6
Maximum wind velocity (m/sec.)	55 m/s
Maximum altitude above mean sea level (Meters):	3000-5000m for Drass to Padum
Isokeraunic level (days/years)	60

Climate varies from moderately cold to severe cold climate.

6 General Climatic Conditions:

The transmission line from Drass to Padum in Leh & Ladakh region is passing through steep snow bound hills / difficult terrain and remote locations. Because of high altitude severe cold and snow bound conditions, a working season of only 5 – 6 months is available during the year.

The maximum temperature during summer shall be of the order of 35 deg. C and the minimum temperature in the winter shall be of the order of (-) 45 deg. C. Normal everyday temperature is 0 – 5 deg. C.

7 Working Season:

Working season shall be approximately 5 – 6 months/year.

**FORM OF JOINT UNDERTAKING BY THE LICENSOR ALONG WITH
THE LICENSEE**

On Non-Judicial Stamp Paper of Appropriate Value

THIS DEED OF UNDERTAKING executed this day of Two Thousand by a Company incorporated under the laws of and having its Registered Office at (hereinafter called the "Licensor" which expression shall include its successors, executors and permitted assigns) and a Company incorporated under the Companies Act, 1956 having its Registered Office at (hereinafter called the "Licensee" which expression shall include its successors, executors and permitted assigns) in favour of REC Transmission Projects Company Ltd., having its Registered Office at , New Delhi (hereinafter called the "Employer" which expression shall include its successors, executors and permitted assigns).

WHEREAS the Employer invited Bids as per its Specification No. for the construction of transmission line which inter alia include design, manufacture, testing, supply on Final Destination delivery at site basis for Hardware Fittings and Accessories for Conductor & Earthwire for Transmission Lines.

AND WHEREAS Clause 2.0 (d) (ii) (e) of Section-I, Vol-II, forming part of the Bidding Document inter alia stipulates that the Licensee along with its Licensor must fulfill the Qualifying Requirements and be jointly and severally bound and responsible for the successful performance of the equipment and shall be fully responsible for the design, manufacture, testing, supply and final destination delivery at site basis in the event the Bid is accepted by the Employer resulting in a "Contract".

AND WHEREAS a company incorporated Companies Act 1956, having its Registered Office at (hereinafter called the "Bidder"/"Contractor" which expression shall include its successors, executors and permitted assigns) the Bidder has submitted its Bid for the Employer for Transmission Line having Specification No. vide Proposal No. dated based on the License of the Licensor.

8 NOW THEREFORE THIS UNDERTAKING WITNESSETH AS UNDER:

- 1.0 In consideration of the award of Contract by the Employer to the Bidder (hereinafter referred to as the "Contract") we, the Licensor and the Licensee do hereby declare that we shall be jointly and severally bound unto the REC Transmission Projects Company Ltd. (Employer)/the Bidder for the successful performance of the equipment and shall be fully responsible for the design, manufacture, testing, supply and final destination delivery at site basis and successful performance of equipment in accordance with the Contract specifications.
- 2.0 Without in any way affecting the generality and total responsibility in terms of this Deed of Undertaking the Licensor in particular hereby agrees to depute their technical experts to the Licensee's works as considered necessary by the Employer, Bidder and the Licensor to ensure proper design, manufacture, Quality Management, testing, supply on final destination delivery at site basis and successful performance of the equipment in accordance with Contract Specifications and if necessary the Licensor shall advise the Licensee suitable modifications of the designs and implement necessary corrective measures to discharge the obligations under the Contract.
- 3.0 As a security, the Licensor shall apart from the Contractor's performance guarantee, furnish a Performance Security from its Bank in favour of the Employer in a form acceptable to Employer. The value of such guarantee shall be equal to 5% of the Contract Price of equipment/material proposed to be manufactured and supplied by the Licensee under the contract awarded by the Employer to the Contractor and it shall be part of guarantee towards the faithful performance/compliance of this Deed of Undertaking in terms of the Contract. The Guarantee shall be unconditional, irrevocable and valid for the entire period of the contract, namely till the end of the warranty period of package under the Contract. The Bank Guarantee amount shall be payable to the Employer on demand without any reservation or demur.
- 4.0 We, the Licensor undertakes to guarantee sequential and timely supply of equipment's and materials and submission of technical information and data as designed of the Employer so as to meet the overall construction schedule.

5.0 We, the Licensor and the Licensee confirm that the License agreement shall be valid for a period of at least five (5) years after the guarantee period of the equipment and materials to be supplied under the Contract is over.

6.0 This Deed of Undertaking shall be constructed and interpreted in accordance with the Laws of India and the courts in Delhi shall have exclusive jurisdiction in all matters arising under the undertaking.

7.0 We the Licensor and the Licensee agree that this undertaking shall be irrevocable and shall form an integral part of the Contract and further agree that this undertaking shall continue to be enforceable till the Employer and the Bidder discharge it. It shall become operative from the effective date of Contract.

IN WITNESS WHEREOF the Licensor and the Licensee have through their authorised Representative executed these presents and affixed Common Seals of their respective Companies, on the day, month and year first above mentioned.

9 WITNESS

FOR LICENSEE

1.
(Signatures)

.....
(Signature of Authorised Representative)

.....
(Name in Block Letter)

.....
(Name)

.....
(Office Address)

Designation
Common Seal of Company

10 WITNESS

FOR LICENSOR

1.
(Signatures)

.....
(Signature of Authorised Representative)

.....
(Name in Block Letter)

.....
(Name)

.....
(Office Address)

Designation
Common Seal of Company

Note: (i) This deed of joint undertaking should be attested by Notary Public of the place of the respective executant.

(ii) To be filled separately for each package.

SECTION-II

SECTION-II

CONTENTS

Clause	Description
1.0	General Technical Conditions
2.0	Employers' Environment and social policy & implementation

TECHNICAL SPECIFICATION SECTION-II

1. General Technical Conditions

1.1. General

The following provisions shall supplement all the detailed technical specifications and requirements brought out herein. The contractor's proposal shall be based on the use of materials complying fully with the requirements specified herein.

1.2. Engineering Data

1.2.1. The furnishing of engineering data by the Contractor shall be in accordance with the Schedule as specified in the Bidding Document. The review of these data by the Employer will cover only general conformance of the data to the specifications and not a thorough review of all dimensions, quantities and details of the materials, or items indicated or the accuracy of the information submitted. This review by the Employer shall not be considered by the Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications.

1.2.2. All engineering data submitted by the Contractor after review by the Employer shall form part of the contract document.

1.3. Drawings

In addition to those stipulated in clause regarding drawings in GCC/SCC, the following also shall apply in respect of Contractor Drawings.

1.3.1. All drawings submitted by the Contractor including those submitted at the time of Bid shall be with sufficient detail to indicate the type, size, arrangement, dimensions, material description, Bill of Materials, weight of each component break-up for packing and shipment, fixing arrangement required, the dimensions required for installation and any other information specifically requested in these specifications.

1.3.2. Each drawing submitted by the Contractor shall be clearly marked with the name of the Employer, the specification title, the specification number and the name of the Project. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be to the scale and in S.I. units.

1.3.3. The drawings submitted by the Contractor shall be reviewed by the Employer as far as practicable within 15 days and shall be modified by the Contractor if any modifications and/or corrections are required by the Employer. The Contractor shall incorporate such modifications and/or corrections and submit the final drawings for approval. Any delays arising out of failure by the Contractor to rectify the drawings in good time shall not alter the contract completion date.

- 1.3.4. The drawings submitted for approval to the Employer shall be in quadruplicate. One print of such drawings shall be returned to the Contractor by the Employer marked "approved/approved with corrections". The contractor shall there upon furnish the Employer additional prints as may be required along with one reproducible in original of the drawings after incorporating all corrections.
- 1.3.5. The work shall be performed by the Contractor strictly in accordance with these drawings and no deviation shall be permitted without the written approval of the Employer, if so required.
- 1.3.6. All manufacturing, fabrication and erection work under the scope of Contractor, prior to the approval of the drawings shall be at the Contractor's risk. The contractor may incorporate any changes in the design, which are necessary to conform to the provisions and intent of the contract, and such changes will again be subject to approval by the Employer.
- 1.3.7. The approval of the documents and drawings by the Employer shall mean that the Employer is satisfied that:
- a) The Contractor has completed the part of the Works covered by the subject document (i.e. confirmation of progress of work).
 - b) The Works appear to comply with requirements of Specifications.

In no case the approval by the Employer of any document does imply compliance with all technical requirements nor the absence of errors in such documents.

If errors are discovered any time during the validity of the contract, then the Contractor shall be responsible for consequences.

- 1.3.8. All drawings shall be prepared using AutoCAD software version 2000 or later only. Drawings, which are not compatible to AutoCAD software version 2000 or later, shall not be accepted. After final approval all the drawings (structural drawings, BOMs, shop sketches and tower accessories drawings) shall be submitted to the Employer in CDs.

A copy of each drawing reviewed will be returned to the Contractor as stipulated herein.

- 1.3.9. Copies of drawings returned to the Contractor will be in the form of a print with the Employer's marking, or a print made from a microfilm of the marked up drawing.
- 1.3.10. The following is the general list of the documents and drawings that are to be approved by the Employer.
- a) Work Schedule (Master Network) Plan.
 - b) Detailed survey report and profile drawings showing ground clearance and tower locations (as applicable).
 - c) Tower schedule and foundation classification for individual tower locations.
 - d) Tower structural drawing and bill of materials.
 - e) Soil Investigation report.
 - f) Foundation working drawings/excavation Plan.
 - g) Tower footing earthing drawing.
 - h) Stub and stub-setting template drawings.
 - i) Stringing procedure
 - j) Tower accessories drawings like danger plate, name plate etc.
 - k) Quality plans for fabrication and site activities including Quality System.

- l) Sub-vendors approval, etc.
- m) Line material drawings.
- n) Type test report for line materials.

1.3.11. All rights of the design/drawing for all types of towers and foundations shall be strictly reserved with the Employer only and any designs/drawings/data sheets submitted by the contractor from time to time shall become the property of the Employer. Under no circumstances, the Contractor shall be allowed to user/offer above designs/drawings/data sheets to any other authority without prior written permission of the Employer. Any deviation to above is not acceptable and may be a cause for rejection of the bid.

1.4. Design Improvements

1.4.1. The Employer or the Contractor may propose changes in the specification and if the parties agree upon any such changes and the cost implication, the specification shall be modified accordingly.

1.5. Design Co-ordination

Wherever, the design is in the scope of Contractor, the Contractor shall be responsible for the selection and design of appropriate material/item to provide the best coordinated performance of the entire system. The basic design requirements are detailed out in this Specification. The design of various components, sub-assemblies and assemblies shall be so done that it facilitates easy field assembly and maintenance.

1.6. Design Review Meeting

The contractor will be called upon to attend design review meetings with the Employer, and the consultants of the Employer during the period of Contract. The contractor shall attend such meetings at his own cost at the Corporate Office of the Employer or at mutually agreed venue as and when required. Such review meeting will be held generally four times in a year.

1.7. Quality Assurance, Inspection & Testing

1.7.1. Quality Assurance

To ensure that the supply and services under the scope of this Contract whether manufactured or performed within the Contractor's works or at his Sub- Contractor's premises or at site or at any other place of work are in accordance with the specifications. The Contractor shall adopt suitable quality assurance programme to control such activities at all points necessary. Such programme shall be broadly outlined by the Contractor and shall be finalised after discussions before the award of Contract. The detailed programme shall be submitted by the contractor after the award of contract and finally accepted by the Employer after discussion. A quality assurance programme of the Contractor shall generally cover but not limited to the following :

- a) His organization structure for the management and implementation of the proposed quality assurance programme.
- b) Documentation control System.
- c) Qualification data for Contractor's key personnel.
- d) The procedure for purchase of materials, parts components and selection of sub-Contractor's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.

- e) System for shop manufacturing including process controls and fabrication and assembly controls.
- f) Control of non- confirming items and system for corrective action
- g) Control of calibration and testing of measuring and testing equipment's.
- h) Inspection and test procedure for manufacture.
- i) System for indication and appraisal of inspection status.
- j) System for quality audits.
- k) System for authorizing release of manufactured product to the Employer.
- l) System for maintenance of records.
- m) System for handling storage and delivery and
- n) A quality plan detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to critical and important items of supply.

The Quality plan shall be mutually discussed and approved by the Employer after incorporating necessary corrections by the Contractor as may be required.

1.7.1.1. Quality Assurance Documents

The Contractor shall be required to submit all the Quality Assurance Documents as stipulated in the Quality Plan at the time of Employer 's inspection of equipment/material.

- 1.7.1.2. The Employer or his duly authorized representatives reserves the right to carry out Quality Audit and quality surveillance of the systems and procedures of the Contractor's /his vendor's Quality Management and Control Activities.

1.7.2. Employer's Supervision

- 1.7.2.1. To eliminate delays and avoid disputes and litigation to the Contract, all matters and questions shall be resolved in accordance with the provisions of this document.
- 1.7.2.2. The manufacturing of the product shall be carried out in accordance with the specifications. The scope of the duties of the Employer, pursuant to the contract, will include but not be limited to the following.
 - a) Interpretation of all the terms and conditions of these Documents and Specifications
 - b) Review and interpretation of all the Contractor's drawings, engineering data etc.
 - c) Witness or authorize his representative to witness tests at the manufacturer's works or at site, or at any place where work is performed under the contract.
 - d) Inspect, accept or reject any equipment, material and work under the Contract, in accordance with the Specifications.
 - e) Issue certificate of acceptance and/or progressive payment and final payment certificate.
 - f) Review and suggest modification and improvement in completion schedules from time to time, and
 - g) Supervise the Quality Assurance Programme implementation at all stages of the works.

1.8. Inspection and Tests

1.8.1. Inspection

- 1.8.1.1. The Employer, his duly authorized representative and/or outside inspection agency acting on behalf of the Employer shall have, at all reasonable times, access to the premises and /or works of the contractor and/or their sub- contractor(s)/sub-vendors and shall have the right, at all reasonable times, to inspect and examine the materials and workmanship of the product during its manufacture.
- 1.8.1.2. The Contractor shall give the Employer's Inspector fifteen (15) days (in case of domestic testing and thirty (30) days (in case of foreign testing), as the case may be, written

- notice of any material being ready for testing. In case of turnkey contract, the turnkey contractor shall give the notice for inspection and shall associate in the inspection with Employer's inspector. All such inspections shall be to the Contractor's account except for the expenses of the Employer's inspector. The Employer's inspector, unless witnessing of the tests is virtually waived, will attend such tests within fifteen (15) days (in case of domestic testing) and thirty (30) days in (in case of foreign testing) of the date of which the equipment is notified as being ready for test/inspection or on a mutually agreed date, failing which the Contractor may proceed with the test in accordance with the technical specification after informing the Employer's in writing and he shall forthwith forward to the inspector duly certified copies of test reports / certificates in triplicate.
- 1.8.1.3. The Employer's Inspector shall, within fifteen (15) days from the date of inspection, give notice in writing to the Contractor, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Contractor shall give due consideration to such objections and shall make the modifications that may be necessary to meet the said objections.
- 1.8.1.4. When the factory tests have been completed at the Contractor's or Sub- Contractor's works, the Employer's inspector shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Employer's inspector, the certificate shall be issued within fifteen (15) days of receipt of the Contractor's Test Certificate by the Employer' Inspector. The completion of these tests or the issue of the certificate shall not bind the Employer's to accept the equipment should it, on further tests after erection, be found not to comply with the Contract.
- 1.8.1.5. In all cases where the Contract provides for test whether at the premises or works of, the Contractor or of any Sub-Contractor, the Contractor except where otherwise specified shall provide free of charge such item as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Employer's inspector or his authorised representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the Employer's Inspector or to his authorised representative to accomplish testing.
- 1.8.1.6. The inspection by Employer and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the Contract.
- 1.8.1.7. a) The Contractor shall keep the Employer informed in advance about the time of starting and of the progress of manufacture and fabrication of various tower parts at various stages, so that arrangements could be made for inspection.
- b) The acceptance of any part of items shall in no way relieve the Contractor of any part of his responsibility for meeting all the requirements of the Specification.
- 1.8.1.8. The Employer or his representative shall have free access at all reasonable times to those parts of the Contractor's works which are concerned with the fabrication of the Employer's material for satisfying himself that the fabrication is being done in accordance with the provisions of the Specification.
- 1.8.1.9. Unless specified otherwise, inspection shall be made at the place of manufacture prior to dispatch and shall be concluded so as not to interfere unnecessarily with the operation of the work.
- 1.8.1.10. Should any member of the structure be found not to comply with the supplied design, it shall be liable to rejection. No member once rejected shall be resubmitted for

- inspection, except in cases where the Employer or his authorized representative considers that the defects can be rectified.
- 1.8.1.11. Defect which may appear during fabrication shall be made good with the consent of, and according to the procedure proposed by the Contractor and approved by the Employer.
 - 1.8.1.12. All gauges and templates necessary to satisfy the Employer shall be supplied by the contractor.
 - 1.8.1.13. The specified grade and quality of steel shall be used by the Contractor. To ascertain the quality of steel used, the inspector may at his discretion get the material tested at an approved laboratory.

1.8.2. Tests

- 1.8.2.1. The type, acceptance and routine tests and tests during manufacture shall be carried-out on the material and shall mean as follows:
- 1.8.2.2. Type Tests shall mean those tests which are to be carried out to prove the process of manufacture and general conformity of the material to this Specification. These tests shall be carried out on samples prior to commencement of commercial production against the order. The Bidder shall indicate his schedule for carrying out these tests.
- 1.8.2.3. Acceptance Tests shall mean those tests which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purposes of acceptance of that lot.
- 1.8.2.4. Routine Tests shall mean those tests, which are to be carried out on the material to check requirements which are likely to vary during production.
- 1.8.2.5. Tests During Manufacture shall mean those tests, which are to be carried out during the process of manufacture and end inspection by the Contractor to ensure the desired quality of the end product to be supplied by him.
- 1.8.2.6. The norms and procedure of sampling for these tests will be as per the Quality Assurance Programme to be mutually agreed to by the Contractor and the Employer.
- 1.8.2.7. The standards and norms to which these tests will be carried out are listed against them. Where a particular test is a specific requirement of this Specification, the norms and procedure of the test shall be as specified in Annexure-A or as mutually agreed to between the Contractor and the Employer in the Quality Assurance Programme.
- 1.8.2.8. For all type and acceptance tests, the acceptance values shall be the values specified in this Specification or guaranteed by the Bidder, as applicable.

1.9. Standard Technical Particulars

- 1.9.1. The Standard Technical Particulars of the various items are given in the relevant schedule of the specification. The bidder is required to comply with the same.

1.10. Packing

- 1.10.1. All the materials shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing.
- 1.10.2. The Contractor shall include and provide for securely protecting and packing the materials so as to avoid loss or damage during transport by air, sea, rail and road.
- 1.10.3. All packing shall allow for easy removal and checking at site. Wherever necessary, proper arrangement for attaching slings for lifting shall be provided. All packages shall be clearly marked for with signs showing 'up' and 'down' on the sides of boxes, and handling and unpacking instructions as considered necessary. Special precaution shall be taken to prevent rusting of steel and iron parts during transit by sea.

- 1.10.4. The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols, i.e. fragile, handle with care, use no hook etc. wherever applicable.
- 1.10.5. Each package shall be legibly marked by the Contractor at his expenses showing the details such as description and quantity of contents, the name of the consignee and address, the gross and net weights of the package, the name of the Contractor etc.
- 1.10.6. Angle section shall be wire bundled.
- 1.10.7. Cleat angles, gusset plates, brackets, fillet plate, hanger and similar loose pieces shall be tested and bolted together in multiples or securely wired through holes.
- 1.10.8. Bolts, nuts washers and other attachments shall be packed in double gunny bags accurately tagged in accordance with the contents.
- 1.10.9. The packing shall be properly done to avoid losses & damages during transit. Each bundle or package shall be appropriately marked.

1.11. Storage of Material under Transmission Line Package.

Brief guidelines for storage of different type of construction material used in the transmission line projects are as under:

- **Cement Storage:**

Cement received at site should be stored in a building or shed which is dry, leak proof and moisture proof. The building should have minimum numbers of windows. Cement bags stored and stacked off the floor on wooden planks in such a way so as to keep about 150 mm to 200 mm clearance from the ground. The floor may be of lean cement concrete or two layers of dry bricks laid on well consolidated earth. A minimum space of 600 mm shall be kept around and between the exterior walls and the stacks. In stacks, bags shall be kept close together to reduce air circulation. The height of the stack shall not be more than 12 bags and the width of the stack shall not be more than four bags or 3 meters. For extra safety during monsoon, or when it is expected to store for an unusually long period, the stack shall be completely enclosed by a waterproofing membrane such as polyethylene etc. Different type and make of cement shall be stacked and stored separately.

- **Aggregates:**

Aggregates shall be stored at site on a hard dry and level patch of ground. If such a surface is not available, a platform of planks or old corrugated iron sheets, or floor bricks or a thin layer of lean concrete shall be made so as to prevent contamination with clay, dust, vegetable and other foreign matter.

The stacks of fine and coarse aggregates shall be kept in separate stock piles sufficiently removed from each other to prevent the material at the edges of the piles from getting intermixed. Fine aggregate shall be stacked in a place where loss due to the effect of wind is minimum.

- **Reinforcement Steel**

For each classification of steel, separate areas shall be earmarked. It is desirable that ends of bars and sections of each class be painted in distinct separate colors. Steel reinforcement shall be stored in such a way as to avoid distortion and to prevent deterioration and corrosion. It is desirable to coat reinforcement with cement wash before stacking to prevent scaling and rusting in case of storage time exceeding one month. In store, reinforcement bars shall be stacked above ground level by at least 150 mm either on brick/cement/stone platform or concrete/bricks planks.

- **Structural Steel Or Tower Parts**

The structural steel of different classification, sizes and lengths shall be stored separately. These shall be stored above ground level at least 150 mm upon platforms, skids or any other suitable supports to avoid any distortion of sections. Also, in order to prevent white rust formation sufficient care should be exercised while storing, handling and transporting galvanized products. The structural steel/tower parts shall be stored in an adequately ventilated area. The article shall be stored with spacers in between them and kept at an inclination to facilitate easy drainage of any water collected on the structural steel/tower parts.

- **Conductor & Earthwire/OPGW Drums**

It is essential to save the conductor drums from damage during storage and transportation and the wooden battens and main wheel should be intact so that same can be successfully mounted on the conductor jacks to release the conductor during stringing. All the conductor and earthwire/OPGW drums should be stored on a proper hard platform above ground to avoid deterioration of the drum and further avoiding the damage of conductor. The conductor & earthwire/OPGW drums should be stored in such a manner that each drum can be accessed at any time for inspection purposes.

- **Hardware fitting, Accessories & Insulators**

All the hardware fittings, accessories and insulators should be stored on raised platform above ground so as not to damage the packaging and to avoid further damage or denting on the fittings and chipping of insulators. All the aluminum parts should be stored on a plain/raised platform under a cover shed in such a way that the aluminum fittings cannot be distorted during storage.

2. Employer's Environment and Social Policy and its Implementation

2.1. Development and growth of mankind through Industrialization and unwarranted use of natural resources has inflicted considerable impact on Environment and Society. As a result, Environmental and Social issues have emerged as the focal point of global debate.

Employer's activities by their inherent nature and flexibility have negligible impacts on environmental and social attributes. In order to address these issues and to match the rising expectations of a cleaner, safer and healthier environment, Employer has evolved its Environmental and Social Policy and Procedures (ESPP). The key principles of Employer's Environmental and Social Policy are:

- i) Avoidance of environmentally and socially sensitive areas while planning project activities.
- ii) Minimisation of impacts when project activities occur in environmentally and socially sensitive areas.
- iii) Mitigation of any unavoidable adverse impacts arising out of its projects.

2.2. Basic issues to be kept in mind while carrying out construction activities are to

- i. Avoid socially sensitive areas with regard to human habitations and areas of cultural significance.
- ii. Secure the interest of people affected by Employer's projects.
- iii. Involve local people affected by transmission line projects as per requirement and suitability.
- iv. Consult affected people in decisions having implication to them if considered necessary.
- v. Apply, efficient and safe technology/practices.
- vi. Keep abreast of all potential dangers to people's health, occupational safety and safety of environment and the respective migratory measures.

- vii. Establish preventive mechanisms to guarantee safety.
 - viii. Mitigation measures in case of accidents.
 - ix. Avoid unwarranted cutting of trees in forest area.
-
- 2.3. While constructing the lines through forest stretches the contractor will provide alternate fuel to its employee e.g. working labours/supervisors etc. in order to avoid cutting of forest woods.
 - 2.4. Contractor will ensure safety to the wild life, during working/camping near to the National park.
 - 2.5. Contractor during construction of lines in agricultural fields will ensure minimum damages to the crops, trees, bunds, irrigation etc. If the same is un-avoidable, the decision of Engineer-in-charge shall be final.
 - 2.6. The waste/excess material/debris should be removed from the construction site including agricultural field, forest stretches, river etc. immediately after construction work.
 - 2.7. The Contractor will ensure least disturbance to the hill slope and natural drainage so as to avoid soil erosion. Natural drainage in plain area if disturbed is to be trained to the satisfaction of Engineer- in-charge.
 - 2.8. As far as possible existing path/kutchcha road/approach shall be used for the construction.
 - 2.9. The Contractor will ensure supply of stone chips/sand from authorized/approved quarry areas.
 - 2.10. Proper documentation of above, if any.

SECTION-III

SECTION-III

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**TECHNICAL SPECIFICATION
(SECTION – III)**

SURVEY & SOIL INVESTIGATION

1. General Information & Scope Of Work

1.1 The technical specifications covers detailed survey including route alignment, profiling, tower spotting, optimization of locations, check survey, contouring, and soil investigation for the transmission lines / part of the transmission lines covered under this specification as included in the BPS.

1.1.1 The scope of work inter-alia shall include the following:-

- a. Detailed Survey using GPS, Total Work stations, long range scanners & Digital theodolites of reasonable accuracies or alternatively using ALTM (Airborne Laser Terrain Modeling) techniques, inter-alia including :
 - i. Digitised profiling along the selected route along with plan details.
 - ii. Computer aided tower spotting & optimization
 - iii. Soil resistivity measurement along the route
- b. Check survey including digitised contouring at undulated / hilly tower locations.
- c. Soil Investigation
- d. Preparation of Survey reports including estimation of Bill of Quantities, identification and explanation of route constraints (like Forest, Animal/Bird sanctuary, reserve coal belt areas, oil pipe line/underground inflammable pipe lines etc.), infrastructure details available en-route etc.

1.2 The Provisional quantities for the scope of work are indicated in relevant Price Schedules of BPS. The final quantities for route alignment & detailed survey (quantities in “km” unit) shall be the route length along the approved route alignment. For contouring at undulated/hilly tower locations and soil investigations (quantities in “Locations.” unit), the actual quantities to be executed shall be decided by Site Engineer-in-charge during execution stage and the final quantities shall be as approved by Site Engineer-in-charge. The route alignment, detailed survey, including profiling & tower spotting, contouring, soil investigation etc. shall be carried out by the Contractor as per the technical specifications stipulated herein.

1.3 The Contractor must note that the Employer shall not be responsible for loss or damage to properties, trees etc. due to contractor’s work during survey. The Contractor shall indemnify the Employer for any loss or damage to properties, trees etc. during the survey work.

1.4 The Contractor should note that Employer will not furnish topographical maps prepared by survey of India but will make available assistance that may be required in obtaining these by providing letters of recommendation to the concerned authorities. Further, in case the contractor opts for use of ALTM techniques for detailed survey, he shall be responsible for obtaining necessary Clearances / permissions, as may be required from concerned authorities. The Employer will provide assistance that may be required in obtaining these clearances/ permissions

by providing letters of recommendation to the concerned authorities.

- 1.5 The bidder shall give along with their bid clause by clause commentary indicating their confirmation / comments/ observation in respect of all clauses of technical specification.
- 1.6 The work shall be carried out by the contractor using modern surveying techniques. The bidder shall indicate in his offer, the detailed description of the procedure to be deployed. The details of the equipment & facilities including computer aided tower spotting etc. available with the bidder or his associates shall also be furnished with the bid.
- 1.7 The Contractor shall also engage services of a reputed geo-technical consultant or experts from independent educational/research institutions for examining stability aspects of the selected transmission line route/locations in hilly terrain wherever required.
- 1.8 After carrying out the detailed survey and soil investigations, the contractor shall estimate complete BOQ of the transmission lines and submit the same (as per the BOQ format enclosed with the Technical Specifications) to the Employer.

2. Route Alignment

- 2.1 The route Alignment shall be carried out by the contractor using Survey of India topographical maps.
- 2.2 **Requirement of Transmission Line Routing** (for changes if any necessitated on account of site constraints etc.):
 - 2.2.1. The routing of the transmission line shall be most economical from the point of view of construction and maintenance. The contractor shall identify & examine alternative route alignments and suggest to the Employer the optimal route alignment.
 - 2.2.2. Routing of transmission line through protected/reserved forest area should be avoided. In case it is not possible to avoid the forests or areas having large trees completely, then keeping in view of the overall economy, the route should be aligned in such a way that cutting of trees is minimum.
 - 2.2.3. The route should have minimum crossings of Major river, Railway lines, National/State highways, overhead EHV power line and communication lines.
 - 2.2.4. The number of angle points shall be kept to minimum.
 - 2.2.5. The distance between the terminal points specified shall be kept shortest possible, consistent with the terrain that is encountered.
 - 2.2.6. Marshy and low lying areas, river beds and earth slip zones shall be avoided to minimize risk to the foundations.
 - 2.2.7. It would be preferable to utilize level ground for the alignment.

- 2.2.8.** Crossing of power lines shall be minimum. Alignment will be kept at a minimum distance of 300 m from power lines to avoid induction problems on the lower voltage lines.
- 2.2.9.** Crossing of communication line shall be minimized and it shall be preferably at right angle. Proximity and parallelism with telecom lines shall be eliminated to avoid danger of induction to them.
- 2.2.10.** Areas subjected to flooding such as nallah shall be avoided.
- 2.2.11.** Restricted areas such as civil and military airfield shall be avoided. Care shall also be taken to avoid aircraft landing approaches.
- 2.2.12.** All alignment should be easily accessible both in dry and rainy seasons to enable maintenance throughout the year.
- 2.2.13.** Certain areas such as quarry sites, tea, tobacco and saffron fields and rich plantations, gardens & nurseries which will present the Employer problems in acquisition of right of way and way leave clearance during construction and maintenance should be avoided.
- 2.2.14.** Angle points should be selected such that shifting of the point within 100 m radius is possible at the time of construction of the line.
- 2.2.15.** The line routing should avoid large habitations, densely populated areas, Forest, Animal/Bird sanctuary, reserve coal belt areas, oil pipe line/underground inflammable pipe lines etc. to the extent possible.
- 2.2.16.** The areas requiring special foundations and those prone to flooding should be avoided.
- 2.3** For examination of the alternatives & identification of the most appropriate route, besides making use of information/data/details available/extracted through Survey of India Topographical maps and computer-aided processing of NRSA's satellite imagery, the contractor shall also carryout reconnaissance/preliminary survey as may be required for verification & collection of additional information /data /details.
- 2.4** The contractor shall submit his preliminary observations & suggestions along with various information/data /details collected and also processed satellite imagery data, scanned topographical map data marked with the alternative routes etc. The final evaluation of the alternative routes shall be conducted by the contractor in consultation with Employer's representatives and optimal route alignment shall be proposed by the contractor. Site visit and field verification shall be conducted by the contractor jointly with the Employer's representative for the proposed route alignment.
- 2.5** Final route alignment drawing with latest topographical and other details/features including all rivers, railway lines, canals, roads etc. up to 8 kms on both sides of selected route alignment shall be submitted by the contractor for Employer's approval along with report containing other information/details as mentioned above.
- 2.6** Changes in the route alignment, if any, during detail survey, shall be incorporated in the final route alignment drawings.

3. Detailed Survey

3.1 The detailed survey shall be carried out using GPS, Total stations, digital theodolites etc. along the approved route alignment. As an alternative, the contractor may also use ALTM (Airborne Laser Terrain Modeling) techniques of equal or better accuracy for the detailed survey.

3.2 Soil resistivity, along the route alignment shall be measured in dry weather by four electrode method keeping inter-electrode spacing of 50 mtrs. For calculating soil resistivity formula $2\pi ar$ (Where $a=50$ m and r = megger reading in ohms) shall be adopted. Measurement shall be made at every 2 to 3 km along the length of the route. In case soil characteristics changes within 2 to 3 km, values shall have to be measured at intermediate locations also. Megger reading and soil characteristics should also be indicated in the soil resistivity results.

3.3 Route Marking

3.3.1. The route of the transmission line shall be recorded using GPS/DGPS of positional accuracy less than 3m.

3.3.2. The co-ordinates of all the angle points as well as other important crossings, landmarks etc. shall be recorded using GPS for easy relocating.

3.3.3. At the starting point of the commencement of route survey the co-ordinates shall be recorded. A punch mark on the top section of the angle iron shall be made to indicate location of the survey instrument. The co-ordinates of the location of the survey instrument shall also be recorded. Further, the co-ordinates at prominent position at intervals of not more than 750 meter along the transmission line to be surveyed up to the next angle point shall also be recorded. Wooden peg 50 x 50 x 650mm size shall also be driven at prominent position at intervals of not more than 750 meter along the transmission line to be surveyed up to the next angle point. Wire nails of 100mm length should be fixed on the top of these pegs to show the location of instrument. The peg shall be driven firmly into the ground to project 100 mm only above ground. Wherever the line alignment crosses the EHT line, Railway line, P&T line or roads, the contractor shall record co-ordinates on the points of crossing. Wherever line route alignment passes over permanent land marks such as rock, boulders, culverts etc. suitable white paint marks with directional and Employer markings shall be made and co-ordinates recorded. At angle position stone/concrete pillars of 150 x 150 x 100 mm in size with PDD, J&K marked on them shall be embedded into the ground for easy identification.

3.4 Profiling

3.4.1. The complete profiling along the route shall be carried out using modern surveying equipment's viz. total stations, DGPS etc. Reference levels at every 20 metres along the route are to be recorded. R/Ls at other undulations along the route as well as in the route plan and other en-route details viz. crossings, building & structures, trees & other infrastructure etc. shall also be recorded. Areas along the route, which in the view of the contractor, are not suitable for tower spotting, shall also be marked.

3.4.2. The complete profiling details shall be digitized and the data shall be prepared & stored in the format compatible to computer-aided tower spotting software.

- 3.4.3 A printed/plotted output of the digitized profiling shall be submitted by the contractor to Employer's site-in-charge for review before taking up computer- aided tower spotting.

3.5 Optimisation of Tower Location / Tower Spotting

- 3.5.1. Optimisation of tower locations including profiling shall be done by the contractor using computer-aided tower spotting software - PLSCADD and shall furnish sample calculations and manual tower spotting drawings for some typical sections.
- 3.5.2. The sag-tension characteristics of the conductor as well as tower spotting data shall be furnished by the Employer to the contractor during execution stage. Sag template curves, if any required for tower spotting, shall be prepared by the contractor.
- 3.5.3. General description of towers is indicated in Section-I of this specification for information of the Bidders.

3.5.4. Tower Spotting

While profiling & spotting the towers, the following shall be borne in mind:

a) Span

The number of consecutive spans between the section points shall not exceed 15 spans or 5 Km in plain terrain and 10 spans or 3km in hilly terrain. A section point shall comprise of tension point with B/DB type or C/DC type or D/DD type towers as applicable.

b) Extension/Truncation

An individual span shall be as near to the normal design span as possible. In case an individual span becomes too short with normal supports on account of undulations in ground profile, one or both the supports of the span may be extended by inserting standard body/leg extension. In case of locations where the ground clearance is available, truncated towers may be spotted. The provisions kept in the design of towers w.r.t. body/leg extns., truncations shall be intimated to the contractor by the Employer during execution stage.

c) Loading

There shall not be any upward force on suspension towers under normal working conditions and the suspension towers shall support at least the minimum weight span as provided in the designs. In case uplift is unavoidable, it shall be examined if the same can be overcome by adding standard body extensions to the towers failing which tension towers designed for the purpose shall be deployed at such positions.

d) Road Crossing

At all important road crossings, the tower shall be fitted with normal suspension and tension insulator strings depending on the type of tower, but the ground clearance at the roads under maximum temperature and in still air shall be such that even with conductor broken in adjacent span, ground clearance of the conductor from the road surfaces will not be less than specified minimum ground clearance. At all national highways D/DD type towers with double tension insulator strings shall be used and crossing span will not be more than 250 meters.

e) Railway Crossings

All the railway crossings coming en-route the transmission line shall be identified by the Contractor. At the time of detailed survey, the railway crossings shall be finalised as per the regulation laid down by the Railway Authorities. The following are the important features of the prevailing regulations (revised in 1987)

- i) The crossings shall be supported on D/DD type tower on either side depending on the merits of each case.
- ii) The crossing shall normally be at right angle to the railway track.
- iii) The minimum distance of the crossing tower shall be at least equal to the height of the tower plus 6 meters away measured from the centre of the nearest railway track.
- iv) No crossing shall be located over a booster transformer, traction switching station, traction sub-station or a track cabin location in an electrified area.
- v) Minimum ground clearance above rail level of the lowest portion of any conductor under condition of maximum sag shall be maintained at 17.90 m for 220 kV transmission lines.
- vi) The crossing span will be limited to 300 meters.

f) River Crossings

In case of major river crossing, towers shall be of suspension type along with anchor towers of D/DD/QD type tower on either side of the main river crossing. Alternately on the basis of economics and/ or site/ execution constraints crossing of rivers using extended angle towers also shall be considered. For navigable rivers, clearance required by navigation authority shall be provided. For non-navigable river, clearance shall be reckoned with respect to highest flood level (HFL).

g) Power line Crossings

Where the line is to cross over another line of 132 kV or above voltage level, D/DD type towers with suitable extensions shall be used, depending upon merit of the prevailing site condition. For line crossing lower than 132 kV voltage level, suspension/tension tower with suitable extension may be used depending upon the merit of the prevailing site condition. 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 up-to-date. In order to reduce the height of the crossing towers, it may be advantageous to remove the ground- wire of the line to be crossed (if this is possible, and permitted by the Employer of the line to be crossed).

Minimum clearance in metres between lines when crossing each other:

Sr. No.	Nominal System Voltage	22-66kV	110-132kV	220kV	400kV	765kV
1.	66KV	2.44	3.05	4.58	5.49	7.94
2.	110-132KV	3.05	3.05	4.58	5.49	7.94
3.	220KV	4.58	4.58	4.58	5.49	7.94
4.	400KV	5.49	5.49	5.49	5.49	7.94
5.	765KV	7.94	7.94	7.94	7.94	7.94

h) Telecommunication Line Crossings

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

When the angle of crossing has to be below 60 degree, the matter will be referred to the authority in charge of the telecommunication System. On a request from the Contractor, the permission of the telecommunication authority may be obtained by the Employer.

Also, in the crossing span, power line support will be as near the telecommunication line as possible, to obtain increased vertical clearance between the wires.

i) Details En-route

All topographical details, permanent features, such as trees, building etc. 17.5m for 220KV on either side of the alignment shall be detailed on the profile plan.

3.6 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 Contractor shall count, mark and put proper numbers with suitable quality of paint at his own cost on all the trees that are to be cut by the Employer at the time of actual execution of the work as detailed below. Contractor may please note that Employer shall not pay any compensation for any loss or damage to the properties or for tree cutting due to Contractor's work.

3.6.1. To evaluate and tabulate the trees and bushes coming within 17.5m for 220KV line on either side of the central line alignment the trees will be numbered and marked with quality paint serially from angle point 1 (I) onwards and the corresponding number will be painted on the stem of trees at a height of 1 meter from ground level. The trees list should contain the following:

- a) Girth (circumstances) measured at a height of 1 meter from ground level.
- b) Approximate height of the tree with an accuracy of +2 meters.
- c) Name of the type of the species/tree.
- d) The bushy and under growth encountered within the 35m for 220KV line should also be evaluated with its type, height, girth and area in square meters, clearly indicating the growth in the tree/bush statement.

3.6.2. The contractor shall also intimate the Employer his assessment about the likely amount of tree & crop compensation etc. required to be paid by the Employer during execution stage. This assessment shall be done considering prevailing practices/guidelines, local regulations and other enquiries from local authorities.

3.6.3. The Contractor shall also identify the forest/non forest areas involved duly authenticated by concerned authorities.

- a) A statement of forest areas with survey/compartment Nos. (all type of forest RF/PF/Acquired forest/Revenue forest/Private forest/Forest as per dictionary meaning of forest etc.)
- b) A statement of non-forest areas with survey/compartment nos.
- c) Tree cutting details(Girth wise & specie wise)
- d) Marking of forest areas with category on topo sheets 1:2,50,000 showing complete line route, boundaries of various forest divisions and their areas involved.
- e) Village forest maps of affected line and affected forest area and marking of the same.
- f) Forest division map showing line and affected forest area.

3.6.4 The Contractor shall finalize the forest clearance proposal on the prescribed format, as per requirement of the state/MOE&F, duly completed in all respects for submission by the Employer to the Forest Department.

3.7 Preliminary Schedule

The profile sheets showing the locations of the towers together with preliminary schedules of quantities indicating tower types, wind & weight spans, angle of deviation, crossing & other details etc. shall be submitted by the contractor for review & approval by Employer's site-in-charge.

3.8 Check Survey of Tower Locations

3.8.1. The check survey shall be conducted to locate tower locations on ground conforming to the approved profile and tower schedule.

3.8.2. The co-ordinates of all the tower locations shall also be recorded using GPS/DGPS of positional accuracy less than 3m for easy relocating. The position of all tower locations shall be marked in the final digitized route alignment drawing with relative distances from any permanent bench mark area.

3.8.3. The contractor shall also collect required data at each tower location in respect of soil strata, ground water level, history of water table in adjacent areas/surface water, distance from permanent bench mark (these details to be furnished in a tabulated form) and classify the suitable type of foundation at each tower location based on the data collected at each location and detailed soil investigations carried out at selected locations etc.

3.9 Contouring at hilly/undulated locations

3.9.1. The levels up or down of each pit centre with respect to centre of tower location shall be recorded at intervals of 2m using total stations/GPS/digital theodolite and digitized contour plans shall be made. Based on the digitized elevation plans, the quantities of benching & protection work vis-à-vis possible unequal leg extensions shall be optimized using suitable computer-aided techniques/software. Required tower and foundation details, cost data for comparative evaluation for benching & protection work vis-à-vis unequal leg extensions shall be provided by the Employer to the Contractor during execution stage.

3.10 The changes desired by the Employer in the preliminary tower schedule or as may be required based on detailed survey of tower locations & contouring by the contractor, shall be carried out by the contractor and the final tower schedule shall be submitted for approval of Employer. The tower schedule shall show position of all type of towers, span length, type of foundation for each tower, benching & revetment requirement, unequal leg extensions, deviation at all angles, crossings & other details etc.

3.11 Survey Methodology & Precision

3.11.1. All elevations shall be referenced to benchmarks established by the survey of India. Survey operations shall begin and end at benchmarks approved by the Employer.

3.11.2. During the leveling of the profile, check surveys will be effected at intervals not exceeding 50 Kms. with benchmarks of known elevations. The difference in elevations as surveyed by the contractor and as declared by Survey of India for these benchmarks shall not exceed the precision required for 3rd order surveys $e \leq 24k$ where k is the distance between benchmarks in km and e is the difference between elevations in mm.

3.11.3. In the absence of suitable benchmarks the leveling shall be done by two independent leveling parties working in opposite directions along the same line. The difference in elevations between the two surveys shall not exceed the precision required for 3rd order surveys as stated above.

3.11.4. All important objects and features along the transmission line centerline (railways, highways, roads, canals, rivers, transmission lines, distribution lines, telephone lines etc.) shall be surveyed and located with a positional accuracy of 1:2000 between points of known horizontal position.

3.12 Survey Report

3.12.1. Complete BOQ of the transmission lines shall be furnished in the survey report.

3.12.2. Each angle point locations shall be shown with detailed sketches showing existing close by permanent land marks such as specific tree(s), cattle shed, homes, tube wells, temples, electric pole/tower, telephone pole, canal, roads, railway lines etc. The relative distance of land marks from the angle points and their bearings shall be indicated in the sketch. These details shall be included in the survey report.

3.12.3. Information w. r. t. infrastructure details available en-route, identification and explanation of route constraints, etc. shall also be furnished in the Survey report and shall inter-alia include the following:

3.12.3.1. Information regarding infrastructural facilities available along the final route alignment like access to roads, railway stations, construction material sources (like quarry points for stone, sand and availability of construction water), labour, existing transport facilities, fuel availability etc. shall be furnished in the survey report.

3.12.3.2. All observations which the Contractor thinks would be useful to the construction of the transmission lines mentioned under scope of work are to be reported.

3.12.3.3. Suggestions regarding the number of convenient zones (line segments / portions) in which the entire alignment can be divided keeping in view the convenience of corporation are to be given.

- 3.12.3.4. Suggestions regarding location for setting up stores during line construction in consultation with Employer's representative shall also be provided by the contractor.
- 3.12.3.5. Working months available during various seasons along the final route alignment, with period, time of sowing & harvesting of different type of crops and the importance attached to the crops particularly in the context of way leave problems and compensation payable shall be stated by the Contractor.
- 3.12.3.6. Availability of labour of various categories and contractors of civil works shall also be reported.
- 3.12.3.7. Some portions of the line may require clearance from various authorities. The Contractor shall indicate the portion of the line so affected, the nature of clearance required and the name of concerned organizations such as local bodies, municipalities, P&T (name of circle), Inland navigation, Irrigation Department, Electricity Boards and Zonal railways, Divisional Forest Authorities etc.
- 3.12.4. All the requisite data for processing the case for statutory clearances such as PTCC, Forest and Railway shall be provided along with the report.
- 3.12.5. The contractor shall also collect & report (as per Formats enclosed at B) details pertaining to pollution levels envisaged along the transmission line.
- 3.12.6. Six copies of survey reports shall be furnished by the contractor to the Employer.

4. Geotechnical Investigations

4.1 General

- 4.1.1. Employer requires that a detailed Geotechnical investigation be carried out at various tower locations to provide the designer with sufficiently accurate information, both general and specific, about the substrata profile and relevant soil and rock parameters at site on the basis of which the foundation of transmission line towers can be classified and designed rationally.
- 4.1.2. These specifications provide general guidelines for geotechnical investigation of normal soils. Cases of marshy locations and locations affected by salt water or saltpeter shall be treated as special locations and the corresponding description in these specifications shall apply. Any other information required for such locations shall be obtained by Contractor and furnished to Employer.

4.2 Scope

- 4.2.1. The scope of work includes detail soil investigations and furnishing bore log data at various tower locations. The provisional quantities have been indicated in Bill of Quantities. However, during actual execution of work, the quantities shall be decided by the Site Engineer - in - Charge, depending upon the soil strata and terrain. Based on the bore log data / soil parameter /soil investigation results, the Contractor shall recommend the type of foundations suitable for each locations and the same shall be got approved by the Employer.
- 4.2.2. These specifications cover the technical requirements for a detailed Geotechnical investigation and submission of a detailed Geotechnical Report. The work shall include mobilization of all necessary tools and equipment, provision of necessary engineering supervision and technical personnel, skilled and unskilled labour, etc.

as required to carry out the entire field investigation as well as laboratory tests, analysis and interpretation of data collected and preparation of the Geotechnical Report. Contractor shall also collect data regarding variation of subsoil water table along the proposed line route. The aforementioned work shall be supervised by a graduate in Civil Engineering having at least 5 years of site experience in geotechnical investigation work.

4.2.3. Contractor shall make his own arrangements to establish the co-ordinate system required to position boreholes, test pits and other field test locations as per the drawings/sketches supplied by Employer. Contractor shall determine the reduced levels (R.L's) at these locations with respect to benchmarks used in the detailed survey. Two reference lines shall be established based on survey data/details. Contractor shall provide at site all required survey instruments to the satisfaction of the Employer so that the work can be carried out accurately according to specifications and drawings. Contractor shall arrange to collect the data regarding change of course of rivers, major natural streams and nalas etc., encountered along the transmission line route from the best available sources and shall furnish complete hydrological details including maximum velocity discharge, highest flood level (H.F.L), scour depth etc. of the concerned rivers, major streams and nalas (canals).

4.2.4. The field and laboratory data shall be recorded on the proforma recommended in relevant Indian Standards. Contractor shall submit to Employer two copies of field bore logs (one copy each to Employer site and Corporate Office) and all the field records (countersigned by the Employer) soon after the completion of each boreholes/test.

4.2.5. Whenever Contractor is unable to extract undisturbed samples, he shall immediately inform the Employer. Payment for boring charges shall be subject to Employer being satisfied that adequate effort has been made to extract undisturbed samples. Special care shall be taken for locations where marshy soils are encountered and Contractor in such cases shall ensure that specified

number of vane shear tests are performed and the results correlated with other soil parameters.

4.2.6. One copy of all field records and laboratory test results shall be sent to Employer on a weekly basis. Employer may observe, at the laboratory testing procedures.

4.2.7. The Contractor shall interact with the Employer to get acquainted with the different types of structures envisaged and in assessing the load intensities on the foundation for the various types of towers in order to enable him to make specific recommendation for the depth, founding strata, type of foundation and the allowable bearing pressure.

4.2.8. After reviewing Contractor's geotechnical investigation draft report, Employer will call for discussions, to be held normally within one week at Employer's site Office, in order to comment on the report in the presence of Contractor's Geotechnical Engineer. Any expenditure associated with the redrafting and finalising the report, traveling etc. shall be deemed included in the rates quoted for the geotechnical investigations.

4.2.9. Contractor shall carry out all work expressed and implied in these specifications in accordance with requirements of the specification.

4.2.10. The contractor shall prepare and submit soil profile along the transmission line route (in digitized form, with digitized route alignment drawing as base) indicating salient soil characteristics / features, water table etc. based on detailed soil investigations and other details / information collected during detailed survey.

4.3 General Requirements

4.3.1. Wherever possible, Contractor shall research and review existing local knowledge, records of test pits, boreholes, etc., types of foundations adopted and the behavior of existing structures, particularly those similar to the present project.

4.3.2. Contractor shall make use of information gathered from nearby quarries, unlined wells excavation etc. Study of the general topography of the surrounding areas will often help in the delineation of different soil types.

4.3.3. Contractor shall gather data regarding the removal of overburden in the project area either by performing test excavations, or by observing soil erosion or landslides in order to estimate reconsolidation of the soil strata. Similarly, data regarding recent landfills shall be studied to determine the characteristics of such landfills as well as the original soil strata.

4.3.4. The water level in neighboring streams and water courses shall be noted. Contractor shall make enquiries and shall verify whether there are abandoned underground works e.g. worked out ballast pits, quarries, old brick fields, mines, mineral workings etc.

4.3.5. It is essential that equipment and instruments be properly calibrated at the commencement of the work. If the Employer so desires. Contractor shall arrange for having the instruments tested at an approved laboratory at its cost and shall submit the test reports to the Employer. If the Employer desires to witness such tests, Contractor shall arrange for the same.

4.4 Codes and Standards for Geotechnical Investigations

4.4.1. All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions. In case of conflict between the present specifications and those referred to herein, the former shall prevail. Internationally accepted standards which ensure equal or higher performance than those specified shall also be accepted.

4.4.2. All work shall be carried out in accordance with the following Indian Standards and Codes:

Indian Standards (IS)	Title	International Standard/Code
IS:1080-1990	Codes of Practice for Design and Construction of Simple Spread Foundations.	
IS:1498-1992	Classification and Identification of Soils for General Engineering purposes.	ASTM D 2487 ASTM D2488
IS:1892-1992	Code of Practice for Subsurface Investigation for Foundation	
IS:1892-1992	Code of Practice for Subsurface Investigation for Foundation	

Indian Standards (IS)	Title	International Standard/Code
IS:1904-1986	Code of Practice for Design and Construction of Foundation in Soils: General Requirements.	
IS:2131-1992	Method of Standard Penetration Test for Soils	ASTM D 1586
IS:2132-1992	Code of Practice for Thin Walled Tube Sampling of Soils	ASTM D 1587
IS:2720-1992	Method of Test for Soils(Relevant Parts)	ASTM D 420
IS:2809-1991	Glossary of Terms and symbols Relating to Soil Engineering	ASTM D 653
IS:2911-1980	Code of Practice for Design and construction of Pile Foundations (Relevant Parts).	
IS:3025	Methods of Sampling and Testing(Physical and Chemical) for water used in Industry	
IS:3043-1991	Code of Practice for Earthing	
IS:4078-1990	Code of Practice for Indexing and Storage of Drill Cores.	
IS:4091-1987	Code of Practice for Design and Construction of Foundations for Transmission Line Towers and Poles.	
IS:7861(Part-II)	Code of practice for extreme weather concreting	
IS:4434-1992	Code of Practice for In-situ Vane Shear Test for Soils	ASTM D 2573 ASTM D 4648
IS:4453-1992	Code of Practice for Exploration by Pits, Trenches, Drifts and Shafts.	
IS:4464-1990	Code of Practice for Presentation of Drilling information and core description in Foundation investigation	
IS:4968(Part-II)1992	Method for Subsurface sounding for soils, dynamic method using cone and Bentonite slurry.	
IS:5313-1989	Guide for Core Drilling observations.	
IS:6403-1990	Code of Practice for Determination of Allowable Bearing Pressure on Shallow Foundation.	ASTM D 194
IS:6926-1990	Code of Practice for Diamond Core Drilling for Site Investigation for River Valley Projects.	
IS:6935-1989	Method of Determination of Water level in a Bore Hole.	
IS:7422-1990	Symbols Geological Maps Sections and subsurface Exploratory Logs (Relevant parts).	and Abbreviations for use in
IS:8009(Part-I)-1993	Code of Practice for Calculation of Settlements of Foundations (Shallow	

Indian Standards (IS)	Title	International Standard/Code
	Foundations subjected to symmetrical Vertical Loads).	
IS:8764-1991	Method of Determination of Point Load Strength Index of Rocks.	
IS:9143-1991	Method of Determination of Unconfined Compressive Strength of Rock Materials.	ASTM D 2938
IS:9179-1991	Method of Preparation of Rock Specimen for Laboratory Testing.	ASTM D 4543
IS:9259-1992	Specification for Liquid Limit Apparatus.	ASTM D 4318
IS:9640-1992	Specification for Split Spoon Sampler.	ASTM D 1586
IS:10050-1991	Method of Determination of Slake Durability Index of Rocks.	ASTM D 4644
IS:11315(Part-II)-1991	Description of Discontinuities in Rock Mass-Core Recovery and Rock Quality.	

4.5 Field Investigation for Soils

Tentative numbers of detailed soil investigation to be done is given in BPS

4.5.1. Boring

Boreholes are required for detailed soil investigations.

4.5.1.1. General Requirements

- a) Boreholes shall be made to obtain information about the subsoil profile, its nature and strength and to collect soil samples for strata identification and for conducting laboratory tests. The minimum diameter of the borehole shall be 150mm and boring shall be carried out in accordance with the provisions of IS:1892 and the present specification:
- b) All boreholes shall be 10m deep for normal soil conditions. The depth of boreholes at river crossings and special locations shall be 40m. If a strata is encountered where the Standard Penetration Test Records N values greater than 100, with characteristics of rock, the borehole shall be advanced by coring at least 3m further in normal locations and at least 7m further for the case of river crossing locations with prior approval of the Employer. When the boreholes are to be terminated in soil strata, an additional Standard Penetration Test shall be carried out at the termination depth. No extra payment shall be made for carrying out Standard Penetration Tests.
- c) Casing pipe shall be used when collapse of a borehole wall is probable. The bottom of the casing pipe shall at all times be above the test of sampling level but not more than 15cm above the borehole bottom. In case of cohesion-less soils, the advancement of the casing pipe shall be such that it does not disturb the soil to be tested or sampled. The casing shall preferably be advanced by slowly rotating the casing pipe and not by driving.
- d) In-situ tests shall be conducted and undisturbed samples shall be obtained in the boreholes at intervals specified hereafter. Representative disturbed samples shall be preserved for conducting various identification tests in the laboratory. Water table in the bore hole shall be carefully recorded and reported following IS: 6935. No water or drilling mud shall be used while boring above ground

water table. For cohesion less soil below water table, the water level in the borehole shall at all times be maintained slightly above the water table.

- e) The borehole shall be cleaned using suitable tools to the depth of testing or sampling, ensuring least or minimum disturbance of the soil at the bottom of the borehole. The process of jetting through an open tube sampler shall not

be permitted. In cohesive soils, the borehole may be cleaned by using a bailer with a flap valve. Gentle circulation of drilling fluid shall be done when rotary mud circulation boring is adopted.

- f) On completion of the drilling, Contractor shall backfill all boreholes as directed by the Employer.

4.5.1.2. Auger Boring

Auger boring may be employed in soft to stiff cohesive soils above the water table. Augers shall be of helical or post hole type and the cuttings brought up by the auger shall be carefully examined in the field and the description of all strata shall be duly recorded in the field borelog as per IS:1498. No water shall be introduced from the top while conducting auger boring.

4.5.1.3. Shell and Auger Boring

- 4.5.1.3.1. Shell and auger boring may be used in all types of soil which are free from boulders. For cohesion-less soil below ground water table, the water level in the borehole shall always be maintained at or above ground water level. The use of chisel bits shall be permitted in hard strata having SPT-N value greater than 100 Chisel bits may also be used to extend the bore hole through local obstructions such as old construction, boulders rocky formations, etc. The requirements in Clause 4.5.1.2 shall apply for this type of boring also.

- 4.5.1.3.2. Rotary method may be used in all types of soil below water table. In this method the boring is carried out by rotating the bit fixed at the lower end of the drill rod. Proper care shall be taken to maintain firm contact between the bit and the bottom of the borehole. Bentonite or drilling mud shall be used as drilling fluid to stabilise and protect the inside surface of the borehole. Use of percussion tools shall be permitted in hard clays and in dense sandy deposits.

4.5.2. Standard Penetration Test (SPT)

- 4.5.2.1. This test shall be conducted in all types of soil deposits encountered within a borehole, to find the variation in the soil stratification by correlating with the number of blows required for unit penetration of a standard penetrometer. Structure sensitive engineering properties of cohesive soils and sifts such as strength and compressibility shall not be inferred based on SPT values.

- 4.5.2.2. The test shall be conducted at depths as follows:

Location	Depths (m)
Normal Soils	2.0, 3.0, 5.0, 7.0, 10.0
River crossings and special Locations.	2.0, 3.0, 5.0, 7.0, 10.0 and thereafter at the rate of 3m intervals to 40m

4.5.2.3. The spacing between the levels of standard penetration test and next undisturbed sampling shall not be less than 1.0m. Equipment's accessories and procedures for conducting the test and for the collection of the disturbed soil samples shall conform to IS: 2131 and IS: 9640 respectively. The test shall be conducted immediately after reaching to the test depth and cleaning of bore hole.

4.5.2.4. The test shall be carried out by driving a standard split spoon sampler in the bore hole by means of a 650N hammer having a free fall of 0.75 m. The sample shall be driven using the hammer for 450mm recording the number of blows for every 150mm. The number of blow for the last 300mm drive shall be reported as N value.

4.5.2.5. This test shall be discontinued when the blow count is equal to 100 or the penetration is less than 25 mm for 50 blows. At the level where the test is discontinued, the number of blows and the corresponding penetration shall be reported. Sufficient quantity of disturbed soil samples shall be collected from the split spoon sampler for identification and laboratory testing. The sample shall be visually classified and recorded at the site as well as properly preserved without loss of moisture content and labeled.

4.5.3. Sampling

4.5.3.1. General

- a) Sufficient number of soil samples shall be collected. Disturbed soil samples shall be collected for soil identification and for conducting tests such as sieve analysis, index properties, specific gravity, chemical analysis etc. Undisturbed samples shall be collected to estimate the physical bearing capacity and settlement properties of the soil.
- b) All accessories and sampling methods shall conform to IS: 2132 all disturbed and undisturbed samples collected in the field shall be classified at site as per IS: 1498
- c) All samples shall be identified with date, borehole or test pit number, depth of sampling, etc. The top surface of the sample in-situ shall also be marked. Care shall be taken to keep the core and box samples vertical, with the mark directing upwards. The tube samples shall be properly trimmed at one end and suitably capped and sealed with molten paraffin wax. The Contractor shall be responsible for packing, storing in a cool place and transporting all the samples from site to the laboratory within seven days after sampling with probe, protection against loss and damage.

4.5.3.2. Disturbed Samples

- a) Disturbed soil samples shall be collected in boreholes at regular intervals. Jar samples weighing approximately 1 kg shall be collected at 0.5m intervals starting from a depth of 0.5m below ground level and at every identifiable change of strata to supplement the boring records. Samples shall be stored immediately in air tight jars which shall be filled to capacity as much as possible.
- b) In designated borrow areas, bulk samples, from a depth of about 0.5m below ground level shall be collected to establish the required properties for use as a fill material. Disturbed samples weighing about 25kg (250N) shall be collected at shallow depths and immediately stored in polythene bags as per IS: 1892.

The bags shall be sealed properly to preserve the natural moisture content of the sample and placed in wooden boxes for transportation.

4.5.3.3. Undisturbed Samples

In each borehole undisturbed samples shall be collected at every change of strata and at depths as follows: -

Location	Depths (m)
Normal Soils	1.0, 4.0, 6.0, 8.0
Special Locations	1.0, 4.0, 6.0, 8.0, 11.0 and thereafter at the rate of 3 m intervals up to 33m

4.5.3.3.1. The spacing between the top levels of undisturbed sampling and standard penetration testing shall not be less than 1.0m. Undisturbed samples shall be of 100mm diameter and 450mm in length. Samples shall be collected in a manner to preserve the structure and moisture content of the soil. Accessories and sampling procedures shall conform to IS: 1892 and IS: 2132

a) Undisturbed sampling in cohesive soil :

Undisturbed samples in soft to stiff cohesive soils shall be obtained using a thin walled sampler. In order to reduce the wall friction, suitable precautions, such as oiling the surfaces shall be taken. The sampling tube shall have a smooth finish on both surfaces and a minimum effective length of 450mm. The area ratio of sampling tubes shall be less than 12.5%. However, in case of very stiff soils area ratio up to 20% shall be permitted.

b) Undisturbed sampling in very loose, saturated, sandy and silty soils and very soft clays :

Samples shall be obtained using a piston sampler consisting of a cylinder and piston system. In soft clays and silty clays, with water standing in the casing pipe, piston sampler shall be used to collect undisturbed samples in the presence of expert supervision.

Accurate measurements of the sampling depth, dimensions of sampler, stroke and length of sample recovery shall be recorded. After the sampler is pushed to the required depth, the cylinder and piston system shall be drawn up together, preventing disturbance and changes in moisture content of the sample;

c) Undisturbed sampling in cohesion less soils

Undisturbed samples in cohesion less soils shall be obtained in accordance with IS: 8763. Sampler operated by compressed air shall be used to sample cohesion less soils below ground water table.

4.5.4. Ground Water

4.5.4.1. One of the following methods shall be adopted for determining the elevation of ground water table in boreholes as per IS: 6935 and the instructions of the Employer:

- a) In permeable soils, the water level in the borehole shall be allowed to stabilize after depressing it adequately by bailing before recording its level. Stability of sides and bottom of the boreholes shall be ensured at all times.
- b) For both permeable and impermeable soils, the following method shall be suitable. The borehole shall be filled with water and then bailed out to various depths. Observations on the rise or fall of water level shall be made at each depth. The level at which neither fall nor rise is observed shall be considered the water table elevation and confirmed by three successive readings of water level taken at two hours interval.

4.5.4.2. If any variation of the ground water level is observed in any specific boreholes, the water level in these boreholes shall be recorded during the course of the filed investigation. Levels in nearby wells, streams, etc., if any, shall also be noted in parallel.

4.5.4.3. Subsoil water samples

- a) Subsoil water samples shall be collected for performing chemical analysis. Representative ground water samples shall be collected when first encountered in boreholes and before the addition of water to aid boring or drilling.
- b) Chemical analysis of water samples shall include determination of pH value, turbidity, sulphate, carbonate, nitrate and chloride contents, presence of organic matter and suspended solids. Chemical preservatives may be added to the sample for cases as specified in the test methods or in applicable Indian Standards. This shall only be done if analysis cannot be conducted within an hour of collection and shall have the prior written permission and approval of the Employer.

4.5.5. Dynamic Cone Penetration Test (only at Special locations)

- a) With bentonite slurry

Dynamic cone penetration test shall be conducted to predict stratification, density, bearing capacity of granular soils, etc. The test shall be conducted to the specified depth or refusal, whichever comes first. Refusal shall be considered when the blow count exceeds 100 for 300mm penetration. Equipment, accessories test procedures, field observations and reporting of results shall conform to IS: 4968, Part-II. The driving system shall comprise of a 650 N weight hammer having a free fall of 750mm. The cone shall be of 60° and of 65mm diameter provided with vents for continuous flow of bentonite slurry through the cone and rods in order to avoid friction between the rods and soil. On completion of the test the results shall be presented as a continuous record of the number of blows required for every 300mm penetration of the cone into the soil in a suitable chart supplemented by a graphical plot of blow count for 300mm penetration vs. depth. On completion of the test, the results shall be presented on the proforma approved by the Employer.

- b) Without bentonite slurry

This test shall be conducted with 50mm diameter 60° cone fitted loosely to the driving rod through a cone adapter. The cone shall be driven in to the soil by allowing 650 N weight hammer top fall freely through a height of 750mm each time. The number of blows for every 75mm penetration shall be recorded. The

process shall be repeated till the cone is driven to the required depth. The penetration depth shall be limited to 5m in cohesion less soil and 10m in mixed soil with some binding material. The cone driving rods, driving head, hoisting equipment shall conform to IS: 10589. The test report should be prepared as per guidelines of IS: 4968 (Part I).

4.5.6. Vane Shear Test. (required for boreholes where UDS is not possible) (Only at Special Locations)

Field vane shear test shall be performed inside the borehole to determine the shear strength and bearing capacity of cohesive soils, especially of soft and sensitive clays, which are highly susceptible to sampling disturbance.

Equipment, accessories, test procedures, field observations shall correspond to IS: 4434. Tests may also be conducted by direct penetration from ground surface. If the cuttings at the test depth in the borehole show any presence of gravel, sand shells, decomposed wood, etc., which are likely to influence the test results substantially, the test at that particular depth may be omitted with the permission of the Employer. However, the test shall be conducted at a depth where these obstructions cease to occur. On completion of the test, the results shall be reported in an approved proforma as specified in IS: 4434, Appendix - A.

4.6 Field Investigation for Rock

4.6.1. Rock Drilling

4.6.1.1. If, during the investigations, large hard fragments or natural rock beds are encountered, work shall proceed with core drilling methods. The equipment and procedures for this operation shall conform to IS: 1892. The starting depth of drilling in rock shall be certified by the Employer. At the end of the investigation, the hole drilled in rock shall be backfilled with grout consisting of 1 part cement and 3 parts sand by weight.

4.6.1.2. Drilling shall be carried out with NX size tungsten carbide (TC) or diamond tipped drill bits, depending on the type of rock and according to IS: 6926. Suitable type of drill bit (TC/Diamond) and core catchers shall be used to ensure continuous and good core recovery. Core barrels and core catchers shall be used for breaking off the core and retaining it when the rods are withdrawn. Double tube core barrels shall be used to ensure better core recovery and to retrieve cores from layers of bedrock. Water shall be circulated continuously in the hollow rods and the sludge conveying the rock cuttings to the surface shall be collected. A very high core recovery ratio shall be aimed at in order to obtain a satisfactory undisturbed sample. Attempt shall be made to recover cores of 1.5m in length. Normally TC bit shall be used. Change over to a diamond bit shall require the specific written approval of the Employer, and his decision as to whether a TC or a diamond bit is to be used shall be final and binding on Contractor.

4.6.1.3. No drilling run shall exceed 1.5 m in depth. If the core recovery is less than 80% in any run, the length of the subsequent run shall be reduced to 0.75m. During drilling operations observations on return water, rate of penetration etc. shall be made recorded and recorded as per IS: 5313.

- a) The colour of return water at regular intervals, the depth at which any change of colour of return water is observed, the depth of occurrence and amount of flow of hot water, if encountered, shall be recorded.
- b) The depth through which a uniform rate of penetration was maintained, the depth at which marked change in rate of penetration or sudden fall on drill

rod occurs, the depth at which any blockage of drill bit causing core loss, if any, shall be recorded.

- c) Any heavy vibration or torque noticed during the drilling should be recorded together with the depth of occurrence.
- d) Special conditions like the depth at which grouting was done during, drilling, presence of artesian conditions, loss of drilling fluid, observations of gas discharge with return water, etc., shall also be observed and recorded.
- e) All the observations and other details shall be recorded as per daily drill and reported in a proforma as given in IS: 5313, Appendix A.

4.6.2. Core Sampling

4.6.2.1. Core samples shall be extracted by the application of a continuous pressure at one end of the core with the barrel held horizontally without vibration. Friable cores shall be extracted from the barrel directly into a suitably sized half round plastic channel section. Care shall be taken to extrude the samples in the direction of coring to avoid stress reversal.

4.6.2.2. Immediately after withdrawal from the core barrel, the cores shall be placed in a tray and transferred to boxes specially prepared for this purpose. The boxes shall be made from seasoned timber or any other durably material and shall be indexed on top of the lid according to IS: 4078. The cores shall be numbered serially and arranged in the boxes in a sequential order. The description of the core samples shall be recorded as instructed in IS: 4464. Where no core is recovered, it shall be recorded as specified in the standard. Continuous records of core recovery and rock quality designation (RD/DD/QD) are to be mentioned in the bore log in accordance with IS: 11315 (Part-II).

4.7 Laboratory Testing

4.7.1. Essential Requirements

- a) Depending on the types of substrata encountered, appropriate laboratory tests shall be conducted on soil and rock samples collected in the field. Laboratory tests shall be scheduled and performed by qualified and experienced personnel who are thoroughly conversant with the work. Tests indicated in the schedule of items shall be performed on soil, water and rock samples as per relevant IS codes. One copy of all laboratory test data records shall be submitted to Employer progressively every week. Laboratory tests shall be carried out concurrently with the field investigations as initial laboratory test results could be useful in planning the later stages of field work. A schedule of laboratory tests shall be established by Contractor to the satisfaction of the Employer within one week of completion of the first borehole;

- b) Laboratory tests shall be conducted using approved apparatus complying with the requirements and specification of Indian Standards or other approved standards for this type of work. It shall be checked that the apparatus are in good working condition before starting the laboratory tests. Calibration of all the instruments and their accessories shall be done carefully and precisely at an approved laboratory.
- c) All samples, whether undisturbed or disturbed shall be extracted, prepared and examined by competent personnel properly trained and experienced in soil sampling. examination, testing and in using the apparatus in conformance with the specified standards;
- d) Undisturbed soil samples retained in liners or seamless tube samplers shall be removed, without causing any disturbance to the samples, using suitably designed extruders just prior to actual testing. If the extruder is horizontal, proper support shall be provided to prevent the sample from breaking. For screw tube extruders, the pushing head shall be free from the screw shaft so that no torque is applied to the soil sample in contact with the pushing head. For soft clay samples, the sample tube shall be cut by means of a high speed hacksaw to proper test length and placed over the mould before pushing the sample into it with a suitable piston;
- e) While extracting a sample from a liner or tube, care shall be taken to assure that its direction of movement is the same as that during sampling to avoid stress reversal;

4.7.2. Tests

4.7.2.1. Tests as indicated in these specifications and as may be requested by the Employer, shall be conducted. These tests shall include but may not be limited to the following:

- a) Tests of undisturbed and disturbed samples
 - Visual and engineering classification;
 - Sieve analysis and hydrometric analysis;
 - Liquid, plastic and shrinkage limits;
 - Specific gravity;
 - Chemical analysis
 - Swell pressure and free swell index determination
 - Proctor compaction test.
- b) Tests of undisturbed samples:
 - Bulk density and moisture content;
 - Relative density(for sand),
 - Unconfined compression test;
 - Box shear test (for sand);

- Triaxial shear tests (depending on the type of soil and field conditions on undisturbed or remoulded samples):
 - i. Unconsolidated undrained;
 - ii. Consolidated drained test;
- Consolidation.
- c) Tests on rock samples
 - Visual classification;
 - Moisture content , porosity and density;
 - Specific gravity;
 - Hardness
 - Stake durability
 - Unconfined compression test (both saturated and at in-situ water content);
 - Point load strength index;
 - Deformability test (both saturated and dry samples).
- d) Chemical analysis of sub soil water.

4.7.3. Salient Test Requirement

- a) Triaxial shear tests shall be conducted on undisturbed soil samples, saturated by the application of back pressure. Only if the water table is at sufficient depth so that chances of its rising to the base of the footing are small or nil, the triaxial tests shall be performed on specimens at natural moisture content. Each test shall be carried out on a set of three test specimens from one sample at cell pressures equal to 100, 200 and 300 KPa respectively or as required depending on the soil conditions;
- b) Direct shear test shall be conducted on undisturbed soil samples. The three normal vertical stresses for each test shall be 100, 200 and 300 KPa or as required for the soil conditions;
- c) Consolidation test shall have loading stages of 10, 25, 50, 75, 100, 200, 400 and 800 KPa. Rebound curve shall be recorded for all samples by unloading the specimen at its in-situ stress. Additional rebound curves shall also be recorded wherever desired by the Employer;
- d) Chemical analysis of subsoil shall include determination of PH value, carbonate, sulphate (both SO_3 and SO_4), chloride and nitrate contents, organic matter, salinity and any other chemicals which may be harmful to the foundation material. Their contents in the soil shall be indicated as percentage (%);
- e) Chemical analysis of subsoil water samples shall include the determination of properties such as colour, odour, turbidity, PH value and specific conductivity, the last two chlorides, nitrates, organic matter and any other chemical harmful

to the foundation material. The chemical contents shall be indicated as parts per million (PPM) based on weight.

4.8 Geotechnical Investigation Report

4.8.1. General

Contractor shall submit a formal report containing geological information of the region, procedures adopted for geotechnical investigation, field observations, summarised test data, conclusions and recommendations. The report shall also include detailed bore logs, subsoil sections, field test results, laboratory observations and test results both in tabular as well as graphical form, practical and theoretical considerations for the interpretation of test results, supporting calculations for the conclusions drawn, etc. Initially, Contractor shall submit three copies of the report in draft form for Employer's review;

- a) Contractor's Geotechnical engineer shall visit Employer's Corporate Office for a detailed review based on Employer's comments in order to discuss the nature of modifications, if any, to be done in the draft report. Contractor shall incorporate in the report the agreed modifications and resubmit the revised draft report for approval. Ten copies of the detailed final approved report shall be submitted to Employer together with one set of reproducible of the graphs, tables etc.
- b) The detailed final report based on field observations, in-situ and laboratory tests shall encompass theoretical as well as practical considerations for foundations for different types of structures.

4.8.2. Data to be furnished

4.8.2.1. The report shall also include the following

- a) A plot plant/location plan showing the locations and reduced levels of all field test e.g. boreholes, trial pits, static cone penetration tests, dynamic cone penetration tests, etc., properly drawn to scale and dimensioned with reference to the established grid lines;
- b) A true cross section of all individual boreholes and test pits with reduced levels and co-ordinates showing the classification and thickness of individual stratum, position of ground water table, various in-situ tests conducted, samples collected at different depths and the rock stratum, if encountered;
- c) Geological information of the area including geomorphology, geological structure, lithology, stratigraphy and tectonics, core recovery and rock quality designation (RD/DD/QD), etc.,
- d) Observations and data regarding change of course of rivers, velocity, scour depths, slit factor, etc., and history of flood details for mid-stream and river bank locations;
- e) Past observations and historical data, if available, for the area or for other areas with similar soil profile, or with similar structures in the surrounding areas;
- f) Plot of Standard Penetration Test (uncorrected and corrected N values) with depth for each test site;

- g) Results of all laboratory test summarised according to Table 4.0 (i) for each sample as well as (ii) for each layer, along with all the relevant charts, tables, graphs, figures, supporting calculations, conclusions and photographs of representative rock cores,
- h) For all triaxial shear tests, stress vs. strain diagrams as well as Mohr's circle envelopes shall be furnished. If back pressure is applied for saturation, the magnitude of the same shall be indicated. The value of modulus of elasticity (E) shall be furnished for all tests along with relevant calculations;
- i) For all consolidation tests, the following curves shall be furnished
 - i. e vs. log p;
 - ii. e vs. p;
 - iii. Compression vs log t or vs $\sqrt{t}$

depending upon the shape of the plot, for proper determination of coefficient of consolidation.

The point showing the initial condition (e_0 , p_0) of the soil shall be marked on the curves;
- j) The procedure adopted for calculating the compression index from the field curve and settlement of soil strata shall be clearly specified. The time required for 50% and 90% primary consolidation along with secondary settlements, if significant, shall also be calculated.

Table 4.0
SUMMARY OF RESULTS OF LABORATORY TESTS ON SOIL
AND WATER SAMPLES

- 1. Bore-hole test pit. no
- 2. Depth (m)
- 3. Type of sample
- 4. Density(kg/m³)
 - a) Bulk
 - b) Dry.
 - c) **Submerged**
- 5. Water content (%)
- 6. Particle Size (%)
 - a) Gravel
 - b) Sand
 - c) Silt
 - d) Clay
- 7. Consistency properties
 - a) LL
 - b) PL
 - c) PI

- d) LI
- 8. Soil
 - a) Classification -IS
 - b) Description
 - c) Specific gravity
- 9. Strength Test
 - a) Type
 - b) C (Cohesion)
 - c) ϕ (angle of internal friction)
 - d) **Angle of repose**
- 10. Consolidation Test
 - a) e_0
 - b) P_c
 - c) C_c
 - d) DP
 - e) M_v
 - f) C_v
- 11. Shrinkage limit (%)
- 12. Swell Test
 - a) S. Pr
 - b) FS
- 13. Relative Density (%)
- 14. Remarks

Notations:

I. For type of Sample:

- DB - Disturbed bulk soil sample.
- DP - Disturbed SPT soil sample
- DS - Disturbed samples from cutting edge of undisturbed soil sample.
- RM - Remoulded soil sample
- UB - Undisturbed block soil sample
- US - Undisturbed soil sample by sampler
- W - Water sample

II. For Strength Test :

- SCPT - Static Cone Penetration Test
- UCC - Unconfined Compression Test
- VST - Vane Shear Test
- Tuu - Unconsolidated Undrained Triaxial Test

Note: Replace T by D for Direct Shear Test

Tod - Consolidation Drained Triaxial Test

III. For Others :

LL - Liquid Limit (%)

PL - Plastic Limit

PI - Plasticity Index

LI - Liquidity Index

C - Cohesion (kPa)

ϕ - Angle of Internal Friction (degrees)

S-Pr. - Swelling Pressure (kPa)

e_0 - Initial Void Ratio

Pc - Reconsolidation Pressure (kPa)

Cc - Compression Index

DP - Change in Pressure (kPa)

m_v - Coefficient of Volume Compressibility (m^2/KN)

Cv - Coefficient of Consolidation (m^2/hr)

IV. For Chemical Test

As per Specifications - Clause 4.8.4

4.8.3. Recommendations

4.8.3.1. Recommendations shall be provided for each tower location duly considering soil type and tower spotting data. The recommendations shall provide all design parameters and considerations required for proper selection, dimensioning and future performance of tower foundations and the following

- a) The subsurface material must provide safe bearing capacity and uplift resistance by incorporating appropriate safety factors thereby avoiding rupture under ultimate loads;
- b) Movement of the foundation, including short and long term components under transient and permanent loading, shall be strictly controlled with regard to settlement, uplift, lateral translation and rotation:
- c) Co-efficient of permeability of various sub soil and rock strata based on in- situ permeability tests.

Core resistance, frictional resistance total resistance, relation between core resistance, Standard Penetration Test N value, and settlement analysis for different sizes of foundation as specified in para 4.1.8.3 (I) based on static cone penetration test.

- d) For shallow foundation the following shall be indicated with comprehensive supporting calculations:

- i. Net Safe allowable bearing pressure for isolated square footing of sizes 4.0, 5.0, 6.0 & 7.0 m at three different founding depths of 1, 2 and 3 & 3.5m below ground level considering both shear failure and settlement criteria giving reasons for type of shear failure adopted in the calculation.
 - ii. Net safe allowable bearing pressure for raft foundations of widths greater than 5m at 2.0, 3.0 and 4.0m below ground level considering both shear failure and settlement criteria.
 - iii. Rate and magnitude of settlement expected of the structure.
 - iv. Net safe bearing capacity for foundation sizes mentioned in para (i) above, modulus of sub grade reaction, modules of elasticity from plate load test results along with time settlement curves and load settlement curve in both natural and log graph, variation of Modulus of sub grade reaction with size, shape and depth of foundation.
- e) The stable slopes for shallow and deep excavations, active and passive earth pressure at rest and angle of repose for sandy soils shall be furnished. The loading of the foundations shall not compromise the stability of the surrounding subsurface materials and the stability of the foundation shall be ensured against sliding or overturning:-
- f) Depending on the subsurface material, water table level and tower type, either reinforced concrete isolated pad and chimney, cast-in-situ bored pile of special foundations shall be installed at a given location.
- g) Net Safe allowable bearing pressure and uplift resistance shall be provided for the various sizes of isolated square footings founded at various depths below ground level considering both shear failure and movement criteria; rate and magnitude of movement expected of the structure (settlement, uplift, rotation) shall also be given.
- h) In cases where normal open cast/pile foundations appear to be impractical, special pile foundations shall be given due consideration along with the following:
- i. Type of pile foundation and reasons for recommending the same duly considering the soil characteristics.
 - ii. Suitable founding strata for the pile:
 - iii. Estimated length of pile for 500, 750 and 1000 KN and 4500 KN capacities; end bearing and frictional resistance shall be indicated separately:
 - iv. Magnitude of negative skin friction or uplift forces due to soil swelling.
- i) Where the subsoil water and soil properties are found to be chemically aggressive. Contractor shall take suitable precautions during construction including any protective coating to be applied on the foundations; susceptibility of soil to termite action and remedial measures for the same shall be dealt with;
- j) Suitability of locally available soils at site for filling, backfilling and adequate compaction shall be investigated.

- k) If expansive soil such as black cotton soil is encountered recommendation of removal or retainment of the same shall be given in the latter case, detailed specifications of special requirements shall also be given;
- l) Susceptibility of subsoil strata to liquefaction in the event of earthquake and remedial measures, if required, shall be considered.
- m) Any other information of special significance such as dewatering schemes, etc. which may have a bearing on the design and construction shall be provided.
- n) Recommendations for additional soil investigations, beyond the scope of the present work, shall be given if Contractor considers such investigations necessary.

4.8.4. Hydrogeological Conditions

4.8.4.1. The maximum elevation of ground water table, amplitudes of its fluctuations and data on water aggressivity with regard to foundation structure materials shall be reported. While preparing ground water characteristics the following parameters should be specified for each aquifier:

- a) bicarbonate alkalinity mg-eq. / (deg.),
- b) pH value
- c) content of aggressive carbon dioxide, mg/l;
- d) content of magnesia salts. mg/l, recalculated in terms of ions Mg^{+2} ;
- e) content of ammonia salts, mg/l, recalculated in terms of ions NH_4^+
- f) content of caustic alkalis, mg/l, recalculated in terms of ions Na^+ and K^+
- g) contents of chlorides, mg/l recalculated in terms of ions Cl^-
- h) contents of sulphates, mg/l, recalculated in terms of ions SO_4^{2-}
- i) aggregate content of chlorides, sulphates, nitrates, carbonates and other salts. mg/l.

4.9 Rates and Measurements

4.9.1. Rates

The contractor's quoted rates shall be inclusive of making observations, establishing the ground level and co-ordinates at the location of each borehole, test pit etc. No extra payments shall be made for conducting Standard Penetration Test, collecting, packing, transporting of all samples and cores, recording and submittal of results on approved formats.

4.10 Specific Requirements for Geotechnical Investigation at River Crossings.

4.10.1. The entire soil investigation work at river crossing locations (if required) shall be carried out in accordance with the relevant parts of the specifications for geotechnical investigation modified to the extent given below.

4.10.2. Requirements

- 4.10.2.1.** Boreholes shall be executed to specified depth of 40m (refer clause 4.5.1.1 b). If refusal strata is reached (i.e. SPT-N value is greater than 100 continuously for 5m depth) with characteristics of rock the borehole may be terminated at shallower depth i.e. at 5m in refusal strata, with prior approval of the Employer.
- 4.10.2.2.** Laboratory testing shall be conducted on all soil samples to determine grain size distribution, liquid limit and plastic limit of the different soil strata encountered.
- 4.10.2.3.** Geotechnical Report must furnish the following:
- a) Geotechnical investigation scheme;
 - b) Bore-logs indicating soil stratification, with IS classification, sampling details and SPI 'N' values.
 - c) Soil cross-sections along various boreholes in two orthogonal directions indicating soil stratification based on field and laboratory tests;
 - d) Grain size distribution curves.
 - e) IS classification of soils.
 - f) Shear tests (UU) to be done on saturated soil samples;
 - g) Bearing capacity of soil at different levels;
 - h) Highest flood level (H.F.L.);
 - i) Maximum discharge, velocity etc. (from authenticated source such as CWC or appropriate State authorities)
 - j) Recommendations regarding type of foundation to be adopted at the location.
- 4.10.3.** A check list for reporting results of river crossing locational details, detailed soil investigation and river values for river crossing locations is enclosed at Annexure-C.
- 4.11 Special Terms and conditions for Geotechnical Investigation in the River bed**
- 4.11.1.** Contractor is required to mobilise a suitable arrangement (floating pontoon, plant, equipment etc.) to carry out geotechnical investigation work in creek/river locations identified by the Employer.
- 4.11.2.** In the event of storm or stoppage of work, etc., Contractor shall not be paid extra for mobilization / remobilisation of floating pontoon, plant, equipment, etc.
- 4.11.3.** Contractor shall fully satisfy himself about the conditions of creek/river (depth of water, wave currents, wind conditions, etc.) prevailing in the area of proposed investigation and plan the necessary tools and plant to be deployed before quoting. Any claim resulting from lack of data collection in this respect shall not be entertained.
- 4.11.4.** Contractor shall make his own arrangements for locating the coordinates and position of boreholes in creek/river with respect to two grid-lines indicated by Employer.
- 4.11.5.** Boring in creek or river shall be payable only below the bed level and no payment shall be made for lowering the casing in water.

- 4.11.6. Contractor shall arrange for necessary transportation on water (e.g. motor boat) to facilitate the supervision of work by officials of Employer at its own cost.
- 4.11.7. Full details of the construction plant, proposed working method for boring and sampling in water shall be submitted along with the Tender.
- 4.11.8. The unit rate quoted for underwater boring shall include complete work required as per specification and no separate payment shall be made on any account.

5. Statutory regulation and standards

- 5.1 Contractor is required to follow statutory regulations stipulated in Electricity Act 2003, Indian Electricity Rules and other local rules & regulations.
- 5.2 The codes and standards referred to in these specifications shall govern. In case of a conflict between such codes/standards and these specifications, the provisions of the specifications shall prevail. Such codes, standards referred to shall mean latest revisions, amendments, changes adopted and published by relevant agencies.
- 5.3 Other Internationally acceptable standards which ensure equivalent or better performance than those specified shall also be acceptable.

SECTION-IV

SECTION-IV

CONTENTS

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**TECHNICAL SPECIFICATION
(SECTION-IV)
TOWER, FOUNDATION, ERECTION, STRINGING
AND COMMISSIONING OF LINE**

1.0 Transmission Tower

The general description of towers applicable for the package and technical particulars thereof are indicated in Section-I of this Specification.

1.1 Design and Drawings

- 1.1.1 The relevant design for all the towers and their extensions as well as construction drawings for foundations shall be furnished to the Contractor by the Employer. The structural drawings/erection drawings and / or shop fabrication drawings, Bill of Materials for all the towers and their extensions (equal/unequal extension) shall be developed by contractor.
- 1.1.2 The tower members can be directly fabricated from the structural/erection drawings wherever the required fabrication details are provided on the same or shop fabrication drawings. However, if the contractor is required to prepare shop fabrication drawings, of their own, in addition to the structural/ erection drawings with required fabrication details, they may prepare the same without any additional financial implication to Employer. Before taking up mass fabrication, the Contractor shall carry out one number proto-assembly for each type of towers and extensions for their verification and satisfaction.
- 1.1.3 All the drawings shall have a proper name plate clearly displaying the name of EMPLOYER on right hand bottom corner. The exact format of the nameplate shall be handed over to the successful bidder for incorporation of the same on all the drawings. Also all the drawings shall carry the following statement and shall be displayed conspicuously on the drawing:
- WARNING: THIS IS PROPRIETARY ITEM AND DESIGN RIGHT IS STRICTLY RESERVED WITH EMPLOYER. UNDER NO CIRCUMSTANCES THIS DRAWING SHALL BE USED BY ANYBODY WITHOUT PRIOR PERMISSION FROM THE EMPLOYER IN WRITING.**
- 1.1.4 While submitting the structural drawings, bill of materials, shop drawings and any other drawings pertaining to the subject transmission line, the Contractor shall clearly indicate on each drawing Employer Specification No., Name of the specific Transmission line and project, letter reference no. and date on which the submission are made. The same practice is also to be followed while submitting distribution copies.
- 1.1.5 The tower accessories drawings like Number plate, Danger plate, Phase plate, Anti climbing devices, Circuit Plate and Step Bolt have been standardized & are enclosed in the drawing section of this specification. The contractor is required to submit distribution copies of the above drawing after endorsing the package details. However drawing of Bird Guard, D-Shackle etc. shall be prepared by the Contractor and shall submitted to the Employer, in three (3) copies for approval. These drawing shall be prepared in A4 size paper only.
- 1.1.6 The drawings submitted by the Contractor shall be approved/ commented by the Employer as the case may be within fifteen (15) days of receipt of drawings in his office. If the designs/drawings are commented by the Employer, the Contractor shall

submit revised design/drawings duly incorporating all comments within fifteen (15) days of date of issue of comments. The Contractor shall submit 15 copies of all approved structural drawings and BOM for tower extensions as well as for tower accessories for further distribution by the Employer.

The mass fabrication shall be taken up from the approved shop drawings. The overall responsibility of fabricating tower members correctly lies with the Contractor only and the Contractor shall ensure that all the tower members can be assembled/ fitted while erecting without any undue strain on them.

- 1.1.7 Other than the items indicated above some other drawings and documents, such as BOM, Shop drawings, structural drawings for towers/extensions based on single line diagram given by the Employer, which are required for the project shall also be developed by the Contractor. However, no extra cost on this account shall be payable to the Contractor.

1.2 Materials

1.2.1 Tower Steel Sections

IS Steel Sections of tested quality of conformity with IS 062:2006, grade E250 (Designated Yield Strength 250 MPa) and/ or grade 350 (Designated Yield Strength 350 MPa) are to be used in towers, extensions, stubs and stub setting templates. The Contractor can use other equivalent grade of structural steel angle sections and plates conforming to latest International Standards. However, use of steel grade having designated yield strength more than that of EN 10025 grade S355 JR/JO (designated yield strength 355 MPa) is not permitted, unless otherwise indicated in this specification.

Steel plates below 6mm size exclusively used for packing plates/packing washers produced as per IS 1079 -1994 (Grade -0) are also acceptable. However, if below 6mm size plate are used as load bearing plates viz gusset plates , joint splices etc. the same shall conform to IS 2062 or equivalent standard meeting mechanical strength/metallurgical properties corresponding to grade E250 or grade E350 (designated yield strength not more than 355MPa), depending upon the type of grade incorporated into design. Flats of equivalent grade meeting mechanical strength/metallurgical properties may also be used in place of plates for packing plates/packing washers. The chequered plates shall conform to IS 3502 SAILMA 350HI grade plate can also be accepted in place of HT plates (EN 10025 grade S355 JR/JO / IS 2062:2006, as applicable) provide SAILMA 350HI grade plate meet all the mechanical properties of plate as per EN 10025 grade S355 JR/JO (designated yield strength 355 MPa) / IS 2062:2006, grade E350.

For designing of towers, preferably rationalised steel sections have been used. During execution of the project, if any particular section is not available, the same shall be substituted by higher section. Any cost on account of the same shall be borne by the Contractor. However, design approval for such substitution shall be obtained from the Employer before any substitution and records of such substitutions shall be maintained by the Contractor.

1.2.2 Fasteners: Bolts, Nuts and Washers including Anti-theft Bolts & Nuts

- 1.2.2.1 All tower members shall be joined together with Bolts and nuts. All hexagonal bolts and nuts shall conform to IS-12427. They shall have hexagonal head and nuts, the heads being forged out of the solid, truly concentric, and square with the shank, which must be perfectly straight.

All bolts and nuts shall be galvanised as per IS 1367 (Part-13)/IS 2629.

- 1.2.2.2 The bolt shall be of 16/24 mm diameter and of property class 5.6 as specified in IS 1367 (Part-III) and matching nut of property class 5.0 as specified in IS 1367 (Part-VI).
- 1.2.2.3 Bolts up to M16 and having length up to 10 times the diameter of the bolt should be manufactured by cold forging and thread rolling process to obtain good and reliable mechanical properties and effective dimensional control. The shear strength of bolts for 5.6 grade should be 310 MPa minimum as per IS 12427. Bolts should be provided with washer face in accordance with IS 1363 (Part-I) to ensure proper bearing.
- 1.2.2.4 Nuts for hexagonal bolts should be double chamfered as per the requirement of IS 1363 Part-III. It should be ensured by the manufacturer that nuts should not be over tapped beyond 0.4mm oversize on effective diameter for size up to M16.

Nuts for anti-theft bolts should be round tapered with hexagonal shear nuts. The hexagonal portion of shear nuts shall break away at specified torque recommended by the supplier to ensure proper tightening of members and the fasteners shall not be opened subsequently with tools. The tightening torque and shearing of anti-theft nuts shall be verified during proto-assembly.
- 1.2.2.5 Fully threaded bolts shall not be used. The length of bolts shall be such that the threaded portion will not extend into the place of contact of the members.
- 1.2.2.6 All bolts shall be threaded to take the full depth of the nuts and threaded for enough to permit firm gripping of the members, but not further. It shall be ensured that the threaded portion of each bolt protrudes not less than 3mm and not more than 8mm when fully tightened. All nuts shall fit tight to the point where the shank of the bolt connects to the head.
- 1.2.2.7 Flat and tapered washers shall be provided wherever necessary. Spring washers shall be provided for insertion under all nuts. These washers shall be steel electro-galvanised, positive lock type and 3.5mm in thickness for 16mm dia. bolt and 4.5 mm for 24 mm bolt.
- 1.6.2.8 To avoid bending stress in bolts or to reduce it to minimum, no bolt shall connect aggregate thickness of members more than three (3) times its diameter.
- 1.2.2.9 The bolt positions in assembled towers shall be as per structural drawing.
- 1.2.2.10 Bolts at the joints shall be so staggered that nuts shall be tightened with spanners without fouling.
- 1.2.2.11 To ensure effective in-process Quality control it is desirable that the manufacturer should have in house testing facility for all tests like weight of zinc coating, shear strength and other tests etc. The manufacturer should also have proper Quality Assurance System which should be in line with the requirement of this specification and IS: 14000 series Quality System Standard.

1.3 Tower Accessories

Arrangement shall be provided for fixing of all tower accessories to the tower, at a height between 2.5 meters and 3.5 meters above the ground level.

1.3.1 Step Bolts & Ladders

Each tower shall be provided with step bolts as per drawing enclosed in the section of drawing. The contractor shall submit distribution copies of the same endorsing the package details (i.e. line name, NOA No. etc.). The step bolts conforming to IS 10238 of not less than 16mm diameter and 175 mm long, spaced not more than 450 mm apart and extending from 2.5 meters above the ground level to the top of the tower. However, the head diameter shall be 50mm as indicated in the enclosed drawing. For Single circuit tower the step bolt shall be fixed on one leg up to waist level and on two diagonally opposite legs above waist level up to top of the towers. For double circuit tower the step bolt shall be fixed on two diagonally opposite legs up to top of the towers. Each step bolt shall be provided with two nuts on one end to fasten the bolt securely to the tower and button head at the other end to prevent the feet from slipping away. The step bolts shall be capable of withstanding a vertical load not less than 1.5 KN. For special towers, where the height of the super structure exceeds 50 meters, ladders along with protection rings as per the Employer approved design shall be provided in continuation of the step bolts on one face of the tower from 30 meters above ground level to the top of the special structure. From 2.5m to 30m height of super structure step bolts shall be provided. Suitable platform using 6mm thick perforated chequered plates alongwith suitable railing for access from step bolts to the ladder and from the ladder to each cross-arm tip and the ground wire support shall also to be provided. The platform shall be fixed on tower by using counter-sunk bolts.

1.3.2 Insulator Strings Attachments

- a) For the attachment of suspension Insulator string, a suitable dimensioned swinging hanger on the tower shall be provided so as to obtain specified clearances under respective swinging condition of the strings. The hanger, extensions links, D-shackles etc. as required and considered in the design of the tower. The supply of hanger, D-shackles, strain plate, extension link etc. are also in the scope of Contractor.
- b) At tension towers, strain plates of suitable dimensions under each cross-arm tip, shall be provided for taking the hooks or D-shackles of the tension insulator strings. Full details of the attachments shall be provided to the contractor. To achieve requisite clearances, if the design calls for providing extra D-shackles, link plate etc. before connecting the insulator string the same shall be supplied by the Contractor.

1.3.3 Earth wire Clamps Attachments

a) Suspension Clamp

Wherever required, the Contractor shall supply U-bolts, D-Shackles etc. for attachment of Suspension clamp to the tower and take Employer's approval for details of the attachments before the mass fabrication.

b) Tension Clamps

Earth wire peaks of tension towers shall be provided with suitable plates to accommodate the shackle of tension clamps. The contractor shall also supply the U-bolts wherever required and take Employer's approval for details of the attachments before the mass fabrication.

1.3.4 Anti climbing Device

Barbed wire type anti climbing device, as per enclosed drawing shall be provided and installed by the Contractor for all towers and installed by the Contractor for all towers. The barbed wire shall conform to IS-278 (size designation A1). The barbed wires shall be given chromating dip as per procedure laid down in IS 1340.

1.3.5 Danger, Number, Circuit and Phase plate

Danger Plates, circuit Plates, Phase Plates and Number plates shall be provided and installed by the Contractor. The Danger/Number/Phase/Circuit Plate shall be as per the drawing enclosed in the section of drawing. The contractor shall submit distribution copies of the same endorsing the package details (i.e. line name, NOA No. etc.) and installed by the Contractor.

- a) Each tower shall be fitted with a danger plate, number plate, circuit plate and a set of phase plates for single circuit tower and two sets of phase plates for double circuit tower. The transposition towers should have provision of fixing phase plates on both the transverse faces.
- b) The letters, figures and the conventional skull and bones of danger plates shall conform to IS-2551 and shall be in a signal red on the front of the plate.
- c) The corners of the danger, number and circuit plates shall be rounded off to remove sharp edges.
- d) The letters of number and circuit plates shall be red enameled with white enameled background.

1.3.6 Bird Guards

To prevent birds perching immediately above the suspension insulator strings and fouling the same with dropping, suitable bird guards shall be provided at cross arm tips of all suspension towers. The bird guard arrangement shall be such that it shall either prevent bird from perching in position where they are liable to the cause the damages or ensure that if birds do perch, dropping will fall clear of the insulator string.

1.4 Aviation Requirements

1.4.1 Aviation requirements conforming to IS: 5613 shall be in the scope of Contractor, wherever indicated in BPS.

1.4.2 The river crossing towers and any other towers in the vicinity of airport shall be painted and crossing span shall be provided with markers to caution the low flying air-craft. The obstruction lights shall also be provided on towers.

1.4.3 The length of the towers above 45 m shall be painted over the galvanized surface in contrasting bands of orange or red and white as per aviation requirements and with the approval of the Employer. The band shall be horizontal. The width of the colour band shall be as per the relevant aviation regulation clause, prevalent at the time of execution of the project.

a) Surface Preparation

The etching of galvanized surface of erected tower members with suitable etching or wash primer is to be done as per IS 1477 to enhance the adhesion of subsequent applied paint coating. After etching of galvanized surface of tower one coat of zinc primer is to be applied.

b) **Painting of Towers**

Two coats of international orange or red and white paint at alternate interval (bands) as explained above is to be applied. The painting of towers shall generally conform to relevant provisions of IS 1477 (Part- I & II). The paints to be used for painting shall be in accordance with IS 2074 with latest amendments.

c) **Line/span Markers**

Sphere type span marker of 600 mm diameter shall be provided on the earthwire. The sphere shall be divided into two parts and one half shall be painted orange and one half in white. These markers shall be suspended from earthwire at interval of approx. 200 meters. The design of the markers and their fixing arrangements should be such that they can withstand the wind pressure and shall not induce excessive amount of vibrational strain on earthwire. Details of this arrangement shall be submitted by the Contractor along with Bid.

1.4.4 Night Markers (Obstruction lights)

1.4.4.1 The scope of night markers covers the design, manufacture, testing at manufacturers works, if any, supply, delivery, erection, testing and commissioning of medium intensity, low intensity, lights along with storage battery & solar panel, control panel, cables, clamps other accessories etc. as per the provision of IS-5613 (Part-II/section-I), 1989, amendment no. 1, July '94 regarding night & day visual aids for denoting transmission line structures as per the requirement of directorate of flight safety.

1.4.4.2 The detail of each component of medium intensity, low intensity lights & associated accessories to be provided on the towers shall be as per the technical specifications given in the preceding clauses and IS/ICAO, International Standards recommended practices.

1.4.4.3 One set of Aviation Lights shall consist of one medium intensity light & two/four (as applicable) low intensity lights along with all accessories such as solar panel, control panel, batteries, cables etc.

1.4.4.4 **Medium Intensity Light**

Medium Intensity light shall be provided on the top of each tower. The medium light should have a night time intensity as per ICAO requirements in international Standards Recommended Practices. The light on top of the structure should flash at the rate of 20 sequence per minute. The effective intensity during night time for the medium flashing light shall be 1600 CD. The light shall conform to ICAO requirements/BS 3224a and shall have weather protection conforming to IP-55.

The above lights conforming to ICAO specifications flashing red lights shall be DC operated through a suitably sized battery bank at the operating voltage 12V/24V DC. The burning life of the lamps shall be maximum possible in view of the maintenance hazard of H.T. live but in no case it should be less than 15,000 burning hours. In case of failure of the lamp before 15,000 burning hours, the same shall have to be replaced by the Contractor free of cost. The light shall be equipped with radio suppression facility conforming to BS800 in order to avoid any interference with signals of PLCC etc.

1.4.4.5 Low Intensity Lights

Two/four (as applicable) nos. of low intensity lights are required to be put on each of the towers. Placement drawing for the same shall be submitted by the bidder Contractor.

The light shall be stationary lamp with minimum effective intensity of 10 CD. of red light. The lamps shall conform to the ICAO requirement/relevant BS and shall have weather protection of minimum IP-55 class.

Two/four nos. of L.I. lamp required for each tower shall be operated through a suitable size common battery bank solar panel as per the requirement of operating voltage and load current of the type of lamps being offered.

The burning life of the lamps shall be maximum possible in view of the maintenance hazard of H.T live line, but in no case it should be less than 15,000 burning hours. In case of failure of the lamp before 15,000 hrs. the same shall have to be replaced by the Contractor free of cost even if the pendency of contract expires. Performance certificate of the lamps to be offered shall be furnished by the Contractor.

The low intensity lamp shall not generate any R.F. which can interfere with the PLCC signals.

1.4.4.6 Storage Battery

Storage Battery required for the above purpose shall be sealed maintenance free, valve regulate lead acid and suitable for mounting on the top of the transmission line towers. Contractors shall offer the most optimum capacity of the Battery Bank at 120 hour discharge rate (considering 80 % percentage usage) matching with the load requirement of the type of lamps being offered including any power loss in the associated cables. The battery sizing shall conform to JISC 8707/relevant Indian Standard or any other internationally recognized standard. The battery shall be hermetically sealed explosion proof and self-resealing type and free from orientation constraints. The working temperature ranges shall be minimum 0 degree centigrade and maximum 50 degree centigrade. Performance certificate of the offered batteries shall be submitted by the Contractor.

1.4.4.7 Battery Box

The battery box suitable for mounting on power transmission tower shall be robust construction suitable to accommodate desired number of SOLAR BATTERIES WITH proper clearance between the batteries. The sides and the top of the battery box shall be made from MS sheets not less than 14 SWG thickness duly mounted on MS angle frame. The bottom of the battery box shall have suitably designed MS structure to freely hold the total weight of the batteries. The batteries should be placed on insulated base with proper drainage holes. Lifting lugs shall be provided. Dust and vermin proof lockable doors shall be provided for safety and easy access to the batteries for the maintenance. The battery box should incorporate the design for proper ventilation system in order to prevent a gas concentration inside the box. The ventilation opening shall be protected against rain/splash water and dust. The inside of the battery box shall be lined with insulating polyurethane plating and the exterior painted with weather proof polyurethane paint. The cable entry into the battery box shall be through suitable cable glands.

1.4.4.8 Solar Modules

Solar module required for the system shall be suitable for mounting on the transmission line towers and shall be designed for high performance, maximum reliability and minimum maintenance and shall be installed below bottom cross arms levels. The solar modules shall be IP 55 grade protection class. These should be highly resistant to water, abrasion, nail, impact and other environmental factors.

These should be placed on the tower at a most optimum angle so as to harness the maximum solar energy and facilitate self-cleaning and shall conform to relevant Indian/International Standards.

Module mounting frames shall be weather proof suitable for mounting on tall towers. Details of mounting frames shall be furnished by the Contractor.

Junction box shall be provided with weather proof hinged lid with provision for cable glands entry and protections grade of class IP-55.

The Contractor shall submit the basis of selecting the numbers of solar modules.

The provision for design, supply & erection of mounting arrangements for photovoltaic modules on the transmission towers in a suitable manner to harness maximum solar energy shall be in the scope of the Contractor. Provision for design, supply & erection of resting platform for the erection of battery bank in a closed enclosure with safety arrangement on the transmission towers shall also be in the scope of the Contractor the design and load consideration for safety of towers due to additional plate form shall be kept in view while designing, selecting the above.

1.4.4.9 Control Panels

Control panels shall consist of solar charge controller, flasher unit, sensor, isolator, MCB, Voltmeter, Ammeter and other control gears. Panel enclosure shall be fabricated out of 14 SWG CRCA sheet and thoroughly treated and painted. Suitable neoprene rubber gasket and pad locking device shall be provided and the protection class shall be of IP-55 class.

The Solar charge controller shall be most efficient and preferably fully solid state. It shall be provided with protection to load against increase in temperature, Surge, automatic low voltage and automatic disconnection and reconnection during high inrush current and normalcy respectively.

The flash regulator shall be provided for regulating light flashing. The same shall be completely solid state and provided with flash rate set points. The protection against overload current shall also be provided.

Necessary sensor/timer shall be provided in the system to “switch on” the light automatically in the evening and poor visibility period and switch off the same during day time and normal visibility period.

1.4.4.10 Cables, Cable Glands, Conduits and Accessories

The cable to be supplied and erected shall be of multi strands copper conductor, weather proof, PVC insulated PVC sheathed, armoured 1.1 KV grade. The same shall conform to IS: 1554.

All the cable accessories such as thimble, glands etc. shall be in the scope of supply and erection of the Contractor.

Supply and erection of all the PVC conduits and accessories shall be in the scope of the contract. All the conduit and accessories shall be as per the relevant ISS or ISI brand.

The inter-connection cable/conduit will be clamped in a secured manner with the tower members and any interconnection should be made only inside the environmentally protected junction box.

1.4.4.11 Earthing

All the installations on the tower shall be securely and properly earthed with the tower body by using flexible copper braided wire. Cost of earthing material shall deemed to be included in the total cost.

1.5 Tower Fabrication

The fabrication of towers shall be in conformity with the following:

1.5.1 Except where hereinafter modified, details of fabrication shall conform to IS: 802 (Part-II) or the relevant international standards.

1.5.2 The tower structures shall be accurately fabricated to connect together easily at site without any undue strain on the bolts.

1.5.3 No angle member shall have the two leg flanges brought together by closing the angle.

1.5.4 The diameter of the hole shall be equal to the diameter of bolt plus 1.5mm.

1.5.5 The structure shall be such that all parts are accessible for inspection and cleaning. Drain holes shall be provided at all points where pockets of depression are likely to hold water.

1.5.6 All steel sections before any work is done on them, shall be carefully leveled, straightened and made true to detailed drawings by methods which will not injure the materials so that when assembled, the adjacent matching surfaces are in close contact throughout. No rough edges shall be permitted in the entire structure.

1.5.7 Drilling and Punching

1.5.7.1 Before any cutting work is started, all steel sections shall be carefully straightened and trued by pressure and not by hammering. They shall again be trued after being punched and drilled.

1.5.7.2 Holes for bolts shall be drilled or punched with a jig but drilled holes shall be preferred. The punching may be adopted for thickness up to 12mm. Tolerances regarding punch holes are as follows: -

- a) Holes must be perfectly circular and no tolerances in this respect are permissible.
- b) The maximum allowable difference in diameter of the holes on the two sides of plates or angle is 0.8mm. i.e. the allowable taper in a punched holes should not exceed 0.8mm on diameter.
- c) Holes must be square with the plates or angles and have their walls parallel.

- 1.5.7.3 All burns left by drills or punch shall be removed completely. When the tower members are in position the holes shall be truly concentric/ matching to each other. Drilling or reaming to enlarge holes shall not be permitted.

1.5.8 Erection mark

- 1.5.8.1 Each individual member shall have erection mark conforming to the component number given to it in the fabrication drawings. The mark numbers shall be marked with marking dies of 16mm size before galvanising and shall be legible after galvanising,

- 1.5.8.2 Erection Mark shall be A-BB-CC-DDD

A =Employer code assigned to the Contractors - Alphabet

BB =Contractor's Mark-Numerical

CC =Tower Type Alphabet.

DDD =Number mark to be assigned by Contractor - Numerical.

Erection mark for high tensile steel members shall be prefixed by the letter "H"

1.6 Quantities and weights

- 1.6.1 The quantities of the following items have been envisaged in Metric Tonne (MT) in the relevant price Schedules for various types of towers:-

- i) Basic Body.
- ii) Body Extensions.
- iii) Leg Extension.
- iv) Stubs & Cleats
- v) Bolts & Nuts including spring washers and step bolts etc.

During detail engineering, proto corrected shop drawings shall be approved by RECTPCL for fabrication and manufacturing as per the Technical specification. The overall responsibility of fabricating tower members correctly lies with the Contractor only and the Contractor shall ensure that all the tower members can be assembled / fitted while erecting without any undue strain on them.

The manufacturing of the above items shall be taken up in such a manner that the Equipment/Material offered for inspection to Employer on completed tower basis for each type of tower, completed Stubs & Cleats set basis so as to facilitate availability of erectable tower of each type and erectable stubs & cleats set for casting of foundation. After inspection of the offered Equipment/Material by EMPLOYER representative(s), CIP shall be issued by Employer for the material meeting the Technical Specification. However, MICC shall be issued only on Completed Tower Basis for each type of tower (comprising the required Basic Body, body extensions wherever required, four (4) equal or defined unequal Leg Extension, Bolts & Nuts along with Packing and Spring Washers) and on completed Stubs & Cleats set basis for each type of tower foundations (comprising a set of stubs & Cleats, required Bolts and Nuts along with Spring Washers).

Accordingly, the payment shall be released on completed Tower Basis for each type of tower (comprising the Basic Body, body extensions, wherever applicable, bolts & nuts along with spring washer and step bolts, unequal leg extensions wherever applicable for a completed tower) and on completed Stubs and Cleats set basis for each type of foundation (comprising a set of stubs & cleats, required Bolts and nuts along with Spring Washers) based on the weight of the tower parts as calculated as per Clause 1.6.3 and fasteners based on the unit rates incorporated in the contract.

- 1.6.2 The provisional quantities required are mentioned in the respective Schedules of BPS. Final quantities shall be determined after completion and approval of the detailed route survey. The final quantities of tower shall be confirmed by the Employer based on the requirement of quantities of various towers furnished by the Contractor after completion of detailed survey. Hence it will be responsibility of the Contractor to intimate the exact requirement of all towers and various line materials required for line immediately after the survey.

The Employer reserves the right to order the final quantities including reasonable quantities of spares for which the rates quoted in the Bid shall be valid. Regarding quantity variation the provisions of relevant clauses of SCC shall apply.

- 1.6.3 The estimated total weight of tower/tower parts as well as bolts & nuts along with spring washers and step bolts to be supplied by the Contractor under various packages have been envisaged in the relevant Price Schedule. Though fully galvanised tower parts are to be supplied, the weight of tower shall mean the weight of tower calculated by using the black sectional (i.e. un-galvanised) weight of steel members of the size indicated in the approved fabrication drawings and bill of materials, without taking into consideration the reduction in weights due to holes, notches and level cuts etc. but taking into consideration the weight of the D shackles, hangers, strain plates, pack plates, gusset plates and pack washers etc. The weight of stub and cleats also shall be calculated in similar manner. The weight of gusset plates shall mean the weight of its circumscribing rectangle, without taking into considerations the reductions in weight due to holes, notches etc. For bolts and nuts along with spring washers and step bolts, the weight per tower shall be calculated from the bolt schedule applicable to each type of towers and body extensions as approved by the Employer. The rate quoted by the bidder for tower/tower parts supply, is deemed to be inclusive of galvanising charges including the cost of zinc.

- 1.6.4 The contractor is permitted to get inspected and supply up to 2.5% extra fasteners to take care of losses during erection. No payment shall be admissible for these extra supplies.

1.7 Galvanising

1.7.1 Fabricated Tower Parts & Stubs

The tower parts, stubs and pack washers shall be hot dip galvanized .The galvanization shall be done as per requirements of IS: 4759 after all fabrication work is completed. The contractor shall also take guidelines from the recommended practices for hot dip galvanizing laid down in IS: 2629 while deciding and implementing galvanizing procedure. The mandatory requirements however, are specified herein.

Unless otherwise specified the fabricated tower parts and stubs shall have a minimum overall Zinc coating of 610 gms. per sq. m of surface except for plates

& sections below 5mm which shall have Zinc coating of 460 gms. per sq. m. of surface. The average zinc coating for all sections & plates 5mm & above shall be maintained as 87 microns and that for sections below 5mm shall be maintained as 65 microns.

The steel parts of grillage foundation including stub and reinforcement of stub shall have a minimum overall zinc coating of 850 gms. per sq. m. of surface.

The zinc coating shall be adherent, reasonably uniform, smooth, continuous and free from imperfections such as black/ bare spots, ash rust strains, bulky white deposits / wet storage strains and blisters.

The surface preparation for fabricated tower parts and stubs for hot dip galvanizing shall be carried out as indicated herein below:

- (i) Degreasing & Cleaning of Surface: Degreasing and cleaning of surface, wherever required, shall be carried out in accordance with clause 4.1 of IS 2629-1985. After degreasing the article shall be thoroughly rinsed. However, if acidic degreasers are used rinsing is not required.
- (ii) Pickling: Pickling shall be done using either hydrochloric or sulphuric acid as recommended at clause 4.3 of IS: 2629 -1985. The actual concentration of the acids and the time duration of immersion shall be determined by the Contractor depending on the nature of material to be pickled. Suitable inhibitors also shall be used with the acids to avoid over pickling. The acid concentration, inhibitors used, and maximum allowable iron content shall form part of plant standard to be formulated and submitted to employer along with Quality Assurance Program.
- (iii) Rinsing: After pickling, the material shall be rinsed, preferably in running water to remove acid traces, iron particles or any other impurities from the surface. Two rinse tanks are preferable, with water cascading from the second tank to the first to ensure thorough cleaning. Wherever single tank is employed, the water shall be periodically changed to avoid acid contamination, and removal of other residue from the tank.
- (iv) Fluxing: The rinsed article shall be dipped in a solution of Zinc ammonium chloride. The concentration and temperature of the flux solution shall be standardized by the contractor depending on the article to be galvanized and individual circumstances. These shall form part of plant standard to be formulated and submitted to employer along with Quality Assurance Program. The specific gravity of the flux solution shall be periodically monitored and controlled by adding required quantity of flux crystals to compensate for drag-out losses. Free acid content of the flux solution also shall be periodically checked and when it is more than two (2) grams of free acid per litre of the solution, it shall be neutralized. Alternatively, PH value should be monitored periodically and maintained between 5.0 to 5.5.
- (v) Drying: When dry galvanizing is adopted the article shall be thoroughly dried after fluxing. For the purpose of drying, the contractor may use hot plate, air oven or any other proven method ensuring complete drying of the article after

fluxing and prior to dipping in the molten zinc bath. The drying process shall be such that the article shall not attain a temperature at which the flux shall get decomposed. The article thus dried shall be galvanized before the flux coating picks up moisture from the atmosphere or the flux layer gets damaged or removed from the surface. The drying procedure, time duration, temperature limits, time lag between fluxing, drying, galvanizing etc. shall form part of plant standard to be formulated and submitted to employer along with Quality Assurance Program.

- (vi) Quality of Zinc: Any one or combination of the grades of zinc specified in IS: 209 or IS: 13229 or other comparable international standard shall be used for galvanizing. The contractor shall declare the grade(s) of zinc proposed to be used by them for galvanizing. The molten metal in the zinc bath shall contain minimum 98.5 % zinc by mass. It shall be periodically measured and recorded. Zinc aluminum alloy shall be added as per IS 2629.
- (vii) Dipping Process: The temperature of the galvanizing bath shall be continuously monitored and controlled. The working temperature of the galvanizing bath shall be maintained at 450+/- 10 degree C. The article should be immersed in the bath as rapidly as possible without compromising on safety aspects. The galvanizing bath temperature, immersion angle & time, time duration of immersion, rate of withdrawal etc. shall be monitored and controlled depending upon the size, shape, thickness and chemical composition of the article such that the mass of zinc coating and its uniformity meets the specified requirements and the galvanized surface is free from imperfections and galvanizing defects.
- (viii) Post Treatment: The article shall be quenched in water. The quench water is to be changed / drained periodically to prevent corrosive salts from accumulating in it. If water quenching is not done then necessary cooling arrangements should be made. The galvanized articles shall be dipped in chromating solution containing sodium dichromate and sulphuric acid or chromic acid base additive at a predetermined concentration and kept at room temperature to retard white rust attack. The temperature of the chromate solution shall not exceed 65 degree C. The articles shall not be stacked immediately after quenching and dichromating. It shall be ensured that the articles are dry before any further handling operation.
- (ix) Storing, Packing and Handling: In order to prevent white rust formation sufficient care should be exercised while storing handling and transporting galvanized products. The articles shall be stored in an adequately ventilated area. The articles shall be stored with spacers in between them and kept at an inclination to facilitate easy drainage of any water collected on the articles. Similar care is to be taken while transporting and storing the articles at site.

The Contractor shall prepare a detailed galvanizing procedure including Flow Chart with control parameters and all plant standards as required above and submit to EMPLOYER for approval as part of Quality Assurance Plan.

1.7.2. Fasteners.

For fasteners, the galvanizing shall conform to IS: 1367(Part-13). The galvanizing shall be done with centrifuging arrangement after all mechanical operations are completed. The nuts, may however be tapped (threaded) or rerun after galvanizing and the threads oiled. The threads of bolts & nuts shall have a neat fit and shall be such that they can be turned with finger throughout the length of the threads of bolts and they shall be capable of developing full strength of bolts. Spring washers shall be electro galvanized as per Grade-IV of IS-1573.

1.8 Earthing

Each tower shall be earthed. The tower footing resistance shall not exceed 10 ohms. The Contractor shall measure the tower footing resistance (TFR) of each tower during dry weather after it has been erected and before the stringing of the earth wire. Pipe type earthing and counter poise type earthing shall be done as required in accordance with the following standards:

IS: 3043 Code of practice for Earthing.

IS: 5613 Code of practice for Design, Installation and maintenance (Part-II/Section-2) of overhead power lines.

- 1.8.1 The drawings for pipe & counterpoise type earthing are enclosed with this specification.
- 1.8.2 For counterpoise type earthing the earthing will vary depending on soil resistivity. For soil resistivity less than 1500 ohms-meter, earthing shall be established by providing 4 lengths of 30m counterpoise wire. Otherwise, for soil resistivity greater than 1500 ohms meter earthing shall be established by providing 4 length of 70m counterpoise wire.
- 1.8.3 The provisional quantities for pipe type earthing and counterpoise earthing are indicated in the BPS. The bidders are required to quote unit rates for the same in appropriate schedule of BPS. The quoted price shall include fabrication, supply and installation of earthing material including supply of coke, salt etc. In case of counterpoise type earthing, the unit rates shall correspond to 120 meters of counterpoise wire per tower.

1.8.4 Earthing for River Crossing Towers /Pile foundation

Galvanised earthing strip of flat 50 x 6 mm is to be provided in two legs of tower for each location with proper arrangement of connecting these strips by 16mm bolts shall be provided in the stubs. For pile foundation, the strip has to be taken up to scour level along the concrete of pile foundations. Only bolted connections are allowed for connecting this strip to achieve desired length. Contractor shall submit the detailed drawing for approval of Employer before installations.

- 1.8.5 Additional earthing shall be provided at tension tower at every 7 to 8 km distance (exact quantity & location to be decided by Site In-charge) for direct earthing of both shield wires (earthwire/OPGW). Indicative drawing of shield wire earthing arrangement is enclosed at relevant section (Drawing) of technical specification. The scope of work shall inter-alia include supply & installation of PG clamp & down lead clamps and supply & installation of additional earthing (pipe type or counter poise type) depending upon soil resistivity. Additional earthwire bits required for down leads connecting shield wires with the earthing shall be either supplied by Owner

separately (as Owner supplied material) or shall be supplied by contractor (payable as per unit rate of GS Earthwire under the contract),as may be decided by Site In charge.

Tower Load Tests

1.9 Testing of Tower

A Galvanized tower of each type complete with +9M extension for 220kV shall be subjected to design and destruction tests by first applying test loads applied in a manner approved by the Employer. The tower shall withstand these tests without showing any sign of failure or permanent distortion in any part. Thereafter the tower shall be subjected to destruction by increasing the loads further in an approved manner till it fails. The tower shall be tested for all the conditions considered for the design of tower. The Contractor shall submit to the Employer, for approval, the detailed program and proposal for testing the towers showing the methods of carrying out the tests and manner of applying the loads. After the Employer has approved the test procedures and programs, the Contractors will intimate the Employer about carrying out the tests at least 30 days in advance of the scheduled date of tests during which the Employer will arrange to depute his representative to be present at the time of carrying out the tests. Six copies of the test reports shall be submitted. The Contractor shall submit one set of shop drawings along with the bill of materials at the time of prototype tower testing for checking the tower material. Further at the time of submitting test report, the contractor has to submit the final drawings of shop drawings and Bill of materials for Employer's reference and record. The type testing charges shall be released only after approval of test report, structural drawings, bill of material and shop drawings of tower.

- 1.9.1 In case of premature failure the tower shall be retested and steel already used in the earlier test shall not be used again. However, in case of minor failures, the contractor can replace the members with higher section and carry out the testing. The Contractor shall provide facilities to the Employer or their representatives for inspection of materials during manufacturing stage and also during testing of the same.
- 1.9.2 In case of any premature failure even during waiting period, the tower is to be retested with rectified members. However, if the failures are major in nature and considerable portion of tower is to be re-erected, in such cases all the tests which has been carried out earlier are required to be re-conducted again in compliance with Specification.
- 1.9.3 No part of any tower subject to test shall be allowed to be used on the line. The price for the tower tests will be quoted after allowing rebate for the scrap value of the tower material which will be retained by the Contractor.
- 1.9.4 The Contractor shall ensure that the specification of materials and workmanship of all towers actually supplied conform strictly to the towers which have successfully undergone the tests. In case any deviation is detected, the Contractor shall replace such defective towers free of cost to the Employer. All expenditure incurred in erection, to and fro transportation and any other expenditure or losses incurred by Employer on this account shall be full born by the Contractor. No extension in delivery time shall be allowed on this account.

- 1.9.5 Each type of tower to be tested shall be a full scale prototype galvanized tower and shall be erected vertically on rigid foundation of the stub protruding above ground level as provided in the design/drawing between ground level and concrete level. This portion of the stub shall be kept un-braced while testing. The tower erected on test bed shall not be out of plumb by more than 1 in 360.
- 1.9.6 All the measuring instruments shall be calibrated in systematic / approved manner with the help of standard weight / device. Calibration shall be done before commencing the test of each tower up to the maximum anticipated loads to be applied during testing.
- 1.9.7 The suspension tower is to be tested with an arrangement similar to 'I' string. The tension tower is to be tested with strain plate as per approved design / drawings.
- 1.9.8 The sequence of testing shall be decided by the Employer at the time of approving the rigging chart / test data sheet.
- 1.9.9 The Employer may decide to carry out the tensile test, bend test etc. as per the relevant IS on few members of the test tower after completion of the test or in case of any premature failure. The Contractor shall make suitable arrangement for the same without any extra cost to the Employer.
- 1.9.10 Prefix 'T' shall be marked on all members of test tower in addition to the Mark No. already provided.
- 1.10 **Method of Load Application**
- 1.10.1 Loads shall be applied according to the approved rigging arrangement through normal wire attachments angles on bent plates.
- 1.10.2 The various types of loads, transverse, vertical and longitudinal shall be applied in such a way that there is no impact loading on the tower due to jerks from the winches.
- 1.10.3 All the loads shall be measured through a suitable arrangement of strain devices or by using weights. Positioning of the strain devices shall be such that the effect of pulley friction is eliminated. In case the pulley friction cannot be avoided, the same will be measured by means of standards weights and accounted for in the test loads.
- 1.11 **Tower Testing Procedure**
- The procedure for conducting the tower test shall be as follows:
- 1.11.1 **Bolt Slip Test**
- In a bolt slip test the test loads shall be gradually applied up to the 50% of design loads under normal condition, kept constant for two (2) minutes at that loads and then released gradually.
- For measurement of deflection the initial and final readings on the scales (in transverse & longitudinal directions) before application and after the release of Loads

respectively shall be taken with the help of theodolite. The difference between readings gives the values of the bolt slip.

1.11.2 **Normal Broken Wire Load Tests**

All the loads, for a particular load-combination test, shall be applied gradually up to the full design loads in the following steps and shall also be released in the similar manner:

25 percent,
50 percent,
75 per cent,
90 percent,
95 percent and
100 percent

1.11.3 **Observation Periods**

Under normal and broken wire load tests, the tower shall be kept under observation for sign of any failure for two minutes (excluding the time of adjustment of loads) for all intermediate steps of loading up to and including 95 percent of full design loads.

For normal, as well as broken wire tests, the tower shall be kept under observation for five (5) minutes (excluding the time for adjustment of loads) after it is loaded up to 100 percent of full design loads.

While the loading operations are in progress, the tower shall be constantly watched, and if it shows any tendency of failure anywhere, the loading shall be immediately stopped, released and then entire tower shall be inspected. The reloading shall be started only after the corrective measures are taken.

The structure shall be considered to be satisfactory, if it is able to support the specified full design loads for five (5) minutes, with no visible local deformation after unloading (such as bowing, buckling etc.) and no breakage of elements or constitute parts.

Ovalization of holes and permanent deformation of bolts shall not be considered as failure.

1.11.4 **Recording**

The deflections of the tower in transverse and longitudinal directions shall be recorded at each intermediate and final stage of normal load and broken wire load tests by means of a theodolite and graduated scale. The scale shall be of about one meter long with marking up to 5 mm accuracy.

1.11.5 **Destruction Test**

The destruction test shall be carried out under normal condition or broken wire condition. Under which load condition the destruction test is to be carried out shall be intimated to the contractor at the time of approving rigging chart / test data sheet.

The procedure for application of load for normal/broken wire test shall also be applicable for destruction test. However, the load shall be increased in steps of five (5) per cent after the full design loads have been reached.

1.11.5.1 Type test charges for type test indicated above shall be paid as per BPS.

1.12 Standards

1.12.1 The design, manufacturing, fabrication, galvanising, testing, erection procedure and materials used for manufacture and erection of towers, design and construction of foundations shall conform to the following Indian Standards (IS)/International Standards which shall mean latest revisions, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification. In the event of supply of material conforming to Standards other than specified, the Bidder shall confirm in his bid that these Standards are equivalent to those specified. In case of award, salient features of comparison between the Standards proposed by the Bidder and those specified in this document will be provided by the Contractor to establish their equivalence.

1.12.2 The material and services covered under these specifications shall be performed as per requirements of the relevant standard code referred hereinafter against each set of equipment and services. Other internationally acceptable standards which ensure equal or higher performance than those specified shall also be accepted.

Sl. No.	Indian Standard	Title	International Standard
1.	IS:209-1992	Specification for Zinc	ISO/R/752 ASTM B6
2.	IS 278-1991	Galvanised Steel Barbed wire	ASTM A131
3.	IS 800-1991	Code of Practice for General Building Construction in Steel	CSA 6.1
4(a).	IS:802(Part 1) Sec 1-1995 Sec 2-1992	Code of Practice for General Building Construction in Steel in Overhead Transmission Line Tower : Materials, loads and Permissible Stress Section- 1: Materials and loads Section-2 : Permissible stresses	ASCE 52 IEC 826 BS 8100
4(b).	IS:802(Part 2)-1990	Code of Practice for use of structural steel in Overhead Transmission Line : Fabrication, Galvanising, inspection & Packing	ASCE 52
4(c).	IS:802(Part 3)-1990	Code of Practice for use of structural steel in Overload Transmission Line: Tower testing	ASCE 52 IEC 652
5.	IS:808-1991	Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections.	
6.	IS:875-1992	Code of Practice for Design Loads(other than Earthquakes) for Buildings and Structures.	
7.	IS:1363-1990	Hexagon Nuts (size range M5 to M36)	
8.	IS:1367-1992	Technical Supply Conditions for Threaded Steel/ Fasteners	
9.	IS:1477-1990	Code of practice for Painting of Ferrous Metals in Buildings: Part-I: Pre-treatment	

Sl. No.	Indian Standard	Title	International Standard
		Part-II: Painting.	
10.	IS:1573-1991	Electro-Plated Coatings of inc on iron and Steel	
11.	IS:1852-1993	Rolling and Cutting Tolerances of Hot Rolled Steel Products	
12.	IS-1893-1991	Criteria for Earthquake Resistant Design of Structures	IEEE 693
13.	IS:2016-1992	Plain Washers	ISO/R887 ANSI B18-22.1
14.	IS:2062-1992	Steel for general structural purposes	
15.	IS:2074-1992	Ready Mixed Paint. Air Drying, Oxide. Zinc Chrome, Priming Specification.	
16.	IS:2551-1990	Danger Notice Plates	
17.	IS:2629-1990	Recommended Practice for Hot Dip Galvanising of iron and steel.	
18.	IS:2633-1992	Method of Testing Uniformity of Coating of Zinc Coated Articles	ASTM A123 CSA G164
19.	IS:3043-1991	Code of Practice for Earthing	
20.	IS:3063-1994	Single coil Rectangular section Spring Washers for Bolts, Nuts Screws	DIN-127
21.	IS:3757-1992	High Strength Structural Bolts	
22.	IS:4759-1990	Specification for Hot zinc coatings on structural steel and other Allied products	
23.	IS:5369-1991	General Requirements for Plain Washers	
24.	IS:5613-1993	Code of Practice for Design installation and Maintenance of Overhead Power Lines Section-1: Design Part 2, Section-2: Installation and Maintenance	
25.	IS:6610-1991	Specification for Heavy Washers for Steel structures	
26.	IS:6623-1992	High Strength Structural Nuts	
27.	IS:6639-1990	Hexagon Bolts for Steel Structure.	ASTM A394 ASTM A90
28.	IS:6745-1990	Method for Determination of weight of Zinc coated iron and Steel Articles.	ASTM A90
29.	IS:7861 (Part-II)	Concreting under moderate to severe cold climate.	
30.	IS:8500-1992	Specification for Weldable Structural Steel (Medium & High Strength Qualities)	
31.	IS:10238-1989	Step Bolts for Steel Structures	
32.	IS:12427-1988	Bolts for Transmission Line Towers	
33.		Indian Electricity Rules.	
34.	Publication No. 19(N)/700	Regulation for Electrical Crossing of Railway Tracks	

The standards mentioned above are available from

Reference Abbreviation	Name and Address
BIS/IS	Beureau Of Indian Standards. Manak Bhavan, 9, Bahadur Shah Zafar Marg, New Delhi - 110001. INDIA
ISO	International Organisation for Standardization. Danish Board of Standardization Danish Standardizing Sraat, Aurehoegvej-12 DK-2900, Heelestrup, DENMARK.
CSA	Canadian Standard Association 178, Rexdale Boulevard, Rexdale (Ontario) Canada, M9W 1R3
DIN	Deutsches Institute fiir Normung, Burggrafenstrasse 4-10 Post Farh 1107 D-1000, Berlin 30 GERMANI
ASTM	American Society for testing and Material 1916 Race Street Philadelphia. PA 1903-1187 USA
Indian electricity Rules Regulation for electricity crossing of railway Tracks	Kitab Mahal Baba Kharak singh Marg New Delhi-110001 INDIA
ASTM	American Society of civil Engineers 345 East 47th Street New York, NY 10017-2398 USA
IEEE	Institute of Electrical and Electronics Engineers 445 Hoes Lane Piscataway, NJ 0085-1331, USA
IEC	International Electro technical Commission, Bureau Central de la Commission, electro Technique international, 1 Rue de verembe, Geneva SWITZERLAND

2.0 Foundations

2.1

The open cast foundation shall include supply of all labour, tools & machineries, materials such as cement, sand, coarse aggregates and reinforcement steel and all associated activities, such as, excavation, concreting etc. and the grillage foundation shall include supply of all labour, tools & machineries, materials such as fabricated galvanized steel sections & stub reinforcement/frame etc. their bolts & nuts and all associated activities such as excavation etc.

2.2 Type of Foundations

2.2.1 Open cast plain / reinforced concrete foundation

Plain Cement Concrete/Reinforced Cement Concrete footing shall be used for all type of normal towers. All the four footings of the tower and their extensions shall be similar for a particular location, except where soil condition and or water table are different at different legs. The total depth of foundation, below ground level shall generally be 3.0 meters. For Hard Rock type and also where specific site conditions / properties demand foundation of different depths (lower or higher), the same shall be adopted. Further, for river crossing open cast foundations, the foundation depth shall be more than 3.5 meters.

2.2.2 Steel Grillage Foundation

In steel grillage type of foundation, stub member is directly resting over layer of steel beams (I or Channel sections) to transfer axial load (footing reaction). The layer of steel beams shall be acting as a pad to transfer footing reaction through stub to the underneath soil. The stub is also supported by battered angles(frame) to transfer horizontal shear load down to grillage base by truss action. Total depth of grillage foundation below ground level shall not be more than 3.0m. For foundation shape details refer typical drawing enclosed with drawing section of this specification.

2.3 Classifications of Foundations

The foundation designs shall depend upon the type of soil, sub soil water level and the presence of surface water which have been classified as follows (except pile foundations).

2.3.1 Normal dry

To be used for locations where normal dry cohesive or non-cohesive soils are met. Foundations in areas where surface water encountered from rain runoff or agricultural fields (except paddy fields) shall also be classified as normal dry.

2.3.2 Sandy Dry Soil

To be used for locations where cohesion less pure sand or sand with clay content less than 10% met in dry condition.

2.3.3 Wet

To be used for locations:

- a) Where sub-soil water is met between 1.5 meters and the depth of foundation below the ground level.
- b) Which are in surface water for long period with water penetration not exceeding one meter below the ground level e.g. paddy fields.

2.3.4 Partially Submerged

To be used at locations where sub-soil water table is met between 0.75 meter and 1.5 metre below the ground level.

2.3.5 Fully Submerged

To be used at locations where sub-soil water table is met at less than 0.75 meter below the ground level.

2.3.6 Black Cotton Soil

To be used at locations where soil is clayey type, not necessarily black in colour, which shrinks when dry and swells when wet, resulting in differential movement. For designing foundations, for such locations, the soil is considered submerged in nature.

2.3.7 Fissured - Rock

To be used at locations where decomposed or fissured rock, hard gravel, kankar, limestone, laterite or any other soil of similar nature is met. Under cut type foundation is to be used for fissured rock locations.

In case of fissured rock locations, where water table is met at 1.5M or more below ground level, wet fissured rock foundations shall be adopted. Where fissured rock is encountered with subsoil water table less than 0.75 meter below ground level, submerged fissured rock foundations shall be adopted. In case of dry locations dry fissured rock foundations shall be adopted.

2.3.8 Hard Rock

The locations where chiseling, drilling and blasting is required for excavation, Hard rock type foundations are to be used. For these locations rock anchoring is to be provided to resist uplift forces.

2.3.9 Where soil is of composite in nature, classification of foundation shall be according to the type of soil predominant in the footing.

2.4 Design of Foundations

2.4.1 Design of foundations as classified under Cl. 2.3 for all towers and towers with extensions shall be got developed by the Employer. The indicative shape of foundation is also enclosed in this specification.

- 2.4.2 Depending on the site conditions other types of foundations shall also be got designed and provided by the Employer suitable for Intermediate conditions under the above classifications to effect more economy or to suit specific site conditions encountered.
- 2.4.3 The proposal for these types of foundations shall be submitted by the Contractor based on the detailed soil investigation and duly recommended by Engineer-in-charge.
- 2.4.4 The construction drawings /working drawings of all type of foundations classified as in clause 2.3 shall be provided to the contractor progressively during execution stage. The drawings for other foundations designed for specific site conditions shall be provided based on actual site requirements only.
- 2.4.5 The provisional quantities of excavation, concreting and reinforcement steel required for the project are furnished in the BPS.

2.5 Soil Investigation

However, the Contractor may be required to undertake soil investigation as per clause 3.5 of Section III at some tower locations as required by the Employer. The provisional number of soil testing locations are furnished in BPS.

2.6 Properties of Concrete

2.6.1 For open cast type foundation

The cement concrete used for the foundations shall be of grade M-20 having 1:1.5:3 nominal mix ratio with 20mm coarse aggregate for chimney portion and 20/40mm aggregates for pyramid or slab portion. All the properties of concrete regarding its strength under compression, tension, shear, punching and bending etc. as well as workmanship will conform to IS:456.

- 2.6.2 The Quantity of minimum cement to be used per unit quantity of consumption for different mix (nominal mix) of concrete should be as follows:

Sl. No.	Description	Unit	Quantity of minimum Cement to be used per Unit quantity of work (in kgs)
1.	1:1.5:3 nominal mix concrete	Cu.m.	400
2.	1:2:4 nominal mix concrete	Cu.m.	320
3.	1:3:6 nominal mix concrete	Cu.m.	220
4.	Random Rubble Masonry with 1:6 cement mortar	Cu.m.	83

- 2.6.3 Cement used shall be ordinary Portland Cement, unless mentioned otherwise, conforming to the latest Indian Standard Code IS: 269 or IS: 8112 or IS: 12269.

Alternatively, other varieties of cement other than ordinary Portland Cement such as Portland Pozzolana Cement conforming to IS: 1489 (latest edition) or Portland Slag Cement conforming to IS: 455 (Latest edition) can also be used.

Rapid hardening Portland cement shall conform to IS: 8041.

The Contractor shall submit the manufacturer's certificate, for each consignment of cement procured, to the Employer. However Employer reserves the right to direct the Contractor to conduct tests for each batch/lot of cement used by the Contractor and Contractor will conduct those tests free of cost at the laboratory so directed by the Employer. The Contractor shall also have no claim towards suspension of work due to time taken in conducting tests in the laboratory. Changing of brand or type of cement within the same structure shall not be permitted without the prior approval of the Employer. Sulphate Resistant Cement shall be used if Sulphate content is more than the limits specified in IS: 456, as per Geotechnical investigation report.

The curing time of cement will be decided at the time of execution of the work under the contract based on the certificate form a reputed laboratory which will be obtained and submitted by the Contractor.

- 2.6.4 Concrete aggregates shall confirm to IS: 383.

- 2.6.5 The water used for mixing concrete shall be fresh, clean and free from oil, acids & alkalis, organic materials or other deleterious substances. Potable water is generally preferred.

- 2.6.6 Reinforcement shall confirm to IS: 1786 for deformed and cold twisted bars (Fe 500). If mentioned in BPS, epoxy coated reinforcement shall confirm to IS: 13620. Thermo Mechanically Treated (TMT) bars (equivalent grade) in place of cold twisted bars are also accepted. Hard drawn steel wire shall confirm to IS: 432. All reinforcement shall be clean and free from loose mill scales, dust, loose rust and coats of paint, oil or other coatings, which may destroy or reduce bond. Contractor shall supply, fabricate and place reinforcement to shapes and dimensions as indicated or as required to carry out the intent of approved foundation drawings and Specifications.

Spacers, chairs, stays, hangers and annealed steel wire for binding etc. as may be necessary, should be used for proper completion of the foundation job. Spacers or chairs should be placed at a maximum spacing of 1 m and closer spacing shall be provided wherever necessary.

- 2.6.7 For steel grillage foundation, hot rolled steel I-beams (ISMB, ISWB, ISSC or ISHB), channel sections (ISJC, ISLC, ISMC) and angle sections conforming to IS: 808 shall be used.

2.7 Construction of Tower Foundation, Stub Setting and Earthing

2.7.1 Excavation

2.7.1.1 The excavation work for foundations shall be taken up by the contractor progressively stretch wise / section wise after obtaining approval from Employer the proposed stretch wise / section wise tower schedule, profile etc. as per detailed survey along the approved route alignment.

2.7.1.2 Except as specifically otherwise provided, all excavation for footings shall be made to the lines and grades of the foundations. The excavation wall shall be vertical and the pit dimensions shall be based on an assumed clearance of 150mm on all sides of the foundation pad and steel grillage base. For footings with undercut, care shall be taken to carry out excavation as per drawing without any side clearance. All excavation shall be protected so as to maintain a clean sub grade and provide worker safety until the footing is placed, using timbering, shoring, shuttering, dewatering etc. as approved by the Employer. Contractor shall especially avoid disturbing the bearing surface of the pad. Any sand, mud, silt or other undesirable materials which may accumulate in the excavated pit or borehole shall be removed by Contractor before placing concrete & installation of steel grillage.

2.7.1.3 The soil to be excavated for tower foundations shall be classified as follows depending upon the physical state of the soil at the time of excavation irrespective of the type of foundation installed.

a) Dry Soil

Soil removable either manually, by means of a spade and shovel or mechanically by proclams, excavators etc.

Excavation done in dry soil for wet, partially submerged, fully submerged and wet black cotton type of foundations shall also be covered under this

b) Wet Soil

Where the subsoil water table is encountered within the range of foundation depth or land where pumping or bailing out of water is required due to presence of surface water shall be treated as wet soil. The excavation done in wet soil in case of wet, partially submerged, fully submerged and wet black cotton type of foundation shall also be covered under this.

c) Dry Fissured Rock

Limestone, laterite, hard conglomerate or other soft or fissured rock in dry condition which can be quarried or split with crowbars, wedges, pickaxes etc. However, if required, light blasting may be resorted to for loosening the material but this will not in any way entitle the material to be classified as hard rock.

d) Wet Fissured Rock

Above fissured rock, when encountered with subsoil water within the range of foundation depth or land where pumping or bailing out of water is required, shall be treated as wet fissured rock.

e) Hard Rock

Any rock excavation, other than specified under fissured rock above, for which blasting, drilling, chiseling are required. The unit rate quoted for hard rock excavation shall be inclusive of all costs for such drilling (including drilling required for anchoring), chiseling and blasting, etc.

- 2.7.1.4 No extra payment shall be admitted for the removal of fallen earth into a pit or borehole once excavated.
- 2.7.1.5 Where rock is encountered, the holes for tower footings shall preferably be drilled. Blasting where resorted to as an economy measure, shall be done with utmost care to minimise fracturing rock and using extra concrete for filling the blasted area. All necessary precautions for handling and use of blasting materials shall be taken. In cases where unnecessarily large quantities are excavated / blasted, resulting in placement of large volumes of concrete, payment of concrete shall be limited to design volumes of excavation, concreting, reinforcement etc. In case where drilling is done, the stubs may be shortened suitably with the approval of the Employer.
- 2.7.1.6 The Contractor shall arrange & supply requisite blasting material, and be responsible for its storage and use, without any extra cost to the Employer.
- 2.7.1.7 Indian Standard IS: 3764 shall be followed regarding safety of excavation work.

2.8 Unit Rates and Measurement for Foundation

- 2.8.1 The indicative shape of foundations is enclosed in this Specification. The bidder is required to quote the unit rates for different foundation activity namely, excavation for different types of soils, concreting, supply and placement of reinforcement steel and stub setting in the BPS for open cast RCC foundations & activity namely excavation for different types of soil, installation of complete steel grillage which also includes reinforced stub/frame and other associated work etc. under steel grillage type foundation in the relevant Price Schedule.
- 2.8.2 The unit rates of excavation for each type of soil shall include excavation along with all associated activities like shoring, shuttering, dewatering till completion of foundation work stock piling, dressing, back filling of foundations after concreting or placement of grillage foundation with excavated/borrowed earth (irrespective of lead) and consolidation of earth, carriage of surplus earth to the suitable point of disposal as required by the Employer or any other activity required for to completion of foundation work in all respect.

The measurement for excavation shall be made on the basis of design excavation volume arrived at considering dimension of pit leaving 150mm gap around (except for undercut foundations) the base pad & grillage base or actually excavated whichever is less and the unit rate of this item as indicated in Letter of Award. The payment for excavation shall be made as per actual type of soil encountered at the time of excavation, but the total payment for excavation portion shall not exceed the amount as payable for excavation considering the soil type same as that of foundation classification. The decision of the Employer shall be final and binding with respect to classification of soil and foundations.

- 2.8.3 Form boxes shall be used for casting of foundations. The unit rate of concreting shall include the cost of supply, fabrication and placement of form boxes, cement,

water, coarse and fine aggregates mixing and placing of concrete, curing of concrete and any other activities related / required for completion of concreting works of foundation. The payment for this item shall be made as per the actual volumes of concreting completed but limited to design volume based on unit rates indicated in the letter of award.

2.8.4

The unit rate of 'Reinforcement Steel' shall include supply and placement of reinforcement steel, stirrups, wire for binding the reinforcement, chairs, bolsters and spacers etc. as required to complete the foundation work. The payment of reinforcement steel shall be made based on the working drawing. Wastage, overlaps, spacer bars, chairs, stays, hanger and annealed steel wire shall not be measured for the payment and cost of these items shall be deemed to be included in the rates for reinforcement.

2.9 **Setting of Stubs**

2.9.1

The stubs shall be set correctly and precisely in accordance with approved method at the exact location, alignment and levels with the help of stub setting templates and leveling instruments. Stubs setting shall be done in the presence of Employer's representative available at site where required and for which adequate advance intimation shall be given to Employer by Contractor. Tolerances as per provisions of IS: 5613 shall be allowed for stub setting.

2.9.2

Setting of stub at each location shall be approved by Employer.

2.9.3

However, in hilly region for towers with unequal leg extensions, for river crossing towers and for foundations in highly collapsible soils, props may be used with complete accuracy and high skilled supervision, subject to prior approval from Employer.

2.9.4

For all towers the Contractor shall submit for approval the proposed method for setting of stubs.

2.9.5 **Stub Setting Templates/ Props**

2.9.5.1

Stub setting templates shall be arranged by the Contractor at his own cost for all heights of towers. Stub templates shall be of adjustable type. The Contractor shall also arrange for props for setting of stubs at specific locations where use of prop is approved by the Employer. Stub templates / props should be painted.

2.9.5.2

The Contractor shall deploy sufficient number of templates / props for timely completion of the line without any extra cost to Employer.

	Templates for tower type	Nos. to be deployed
i)	A/DA	5
ii)	For each type of B/DB, C/DC and D/DD type	5
iii)	For A/DA +18/25 M	1
iv)	for D/DD+18/25 M	1

However, if more templates are required for timely completion of the lines, the Contractor shall deploy the same without any extra cost to Employer.

The number of sets of prop (if permitted) to be supplied, will depend as per actual site condition and completion schedule of line.

- 2.9.5.4 One set of each type of stub setting template / props (if used) shall be supplied to the Employer, on completion of the project, at no extra cost to Employer.

2.10 Mixing, Placing and Compacting of Concrete

- 2.10.1 The concrete shall be mixed in the mechanical mixer. However, in case of difficult terrain, hand mixing may be permitted at the discretion of the Employer. The water for mixing concrete shall be fresh, clean and free from oil, acids and alkalis. Salty or blackish water shall not be used.
- 2.10.2 Mixing shall be continued until there is uniform distribution of material and mix is uniform in colour and consistency, but in no case the mixing be carried out for less than two minutes. Normal mixing shall be done close to the foundation but exceptionally, in difficult terrain, the concrete may be mixed at the nearest convenient place. The concrete shall be transported from the place of mixing to the place of final deposit as rapidly as practicable by methods which shall prevent the segregation or loss of any ingredient. The concrete shall be placed and compacted before setting commences.
- 2.10.3 To avoid the possibility of reinforcement rods being exposed due to unevenness of the bottom of the excavated pit in case of open cast type and also to avoid direct contact of steel parts to ground in case of steel grillage type foundation, a pad of lean concrete 50mm thick and corresponding to a 1:3:6 nominal mix shall be provided at the bottom of the pad and steel grillage base. The coarse aggregate shall be of 20 mm size and shall conform to IS: 383.
- 2.10.4 Form boxes shall be used for casting all types of foundations except at an undercut interface for which the adjoining subsurface material shall provide adequate support.
- 2.10.5 The concrete shall be laid down in 150mm layers and consolidated well, so that the cement cream works, up to the top and no honey-combing occurs in the concrete. A mechanical vibrator shall be employed for compacting the concrete. However, in case of difficult, terrain, manual compaction may be permitted at the discretion of the Employer. Monolithic casting of foundations must be carried out. However, in case of unavoidable circumstances, a key construction joint can be provided at the chimney-pad interface subject to approval of the Employer. However nothing extra shall be paid to the Contractor for providing such construction joints. After concreting the chimney portion to the required height, the top surface should be finished smooth with a slight slope towards the outer edge for draining rain water.

- 2.10.6 Wet locations shall be kept completely dewatered, both during and 24 hours after placing the concrete, without disturbance of the concrete.
- 2.10.7 If minor defects in concrete surface is found after the form work has been removed, the damage shall be repaired with a rich cement sand mortar to the satisfaction of the Employer before the foundation is back filled.
- 2.10.8 Further to above clauses, the protection, delivery and placement of the concrete shall also be conforming to IS: 7861 (part-II).

2.11 Curing

The concrete shall be cured by maintaining the concrete wet for a period of at least 10 days after placing. Once the concrete has set for 24 hours the pit may be backfilled with selected moistened soil and well consolidated in layers not exceeding 200mm thickness and thereafter both the backfill earth and exposed chimney shall be kept wet for the remainder of the prescribed 10 days. The exposed concrete chimney shall also be kept wet by wrapping gunny bags around it and wetting the bags continuously during the critical 10 days period. Further, curing of the concrete shall also be conforming to IS: 7861 (part-II).

2.12 Backfilling and Removal of Stub Templates

- 2.12.1 After opening of formwork and removal of shoring, shuttering etc. or complete installation of steel grillage foundation, backfilling shall be done with the excavated soil, unless it is a clay type or it consists of large boulders/stones, in which case the boulders shall be broken to a maximum size of 40 mm or disposed off. At locations where borrowed earth is required for backfilling, Contractor shall bear the cost of the borrowed earth irrespective of leads & lift.
- 2.12.2 The backfilling materials shall be clean and free from organic or other foreign materials. The earth shall be deposited in maximum various layers, leveled, wetted if necessary and compacted before another layer is deposited. Some extra earth shall be placed over the filled in pit to allow further settlement, if any, by gravity. One proctor compaction test shall be carried out for every pit at the ground level before stringing, to verify that the minimum field density achieved is 1440 kg/cum.
- 2.12.3 The backfilling and grading shall be carried to an elevation of about 75mm above the finished ground level to drain out water. After backfilling 50mm high, earthen embankment (band) will be made along the sides of excavation pits and sufficient water will be poured in the backfilling earth for at least 24 hours. After the pits have been backfilled to full depth the stub template can be removed.

2.13 Benching

When the line passes through hilly/undulated terrain, leveling the ground may be required for casting of tower footings. All such activities shall be termed benching and shall include cutting of excess earth and removing the same to a suitable point of disposal as required by Employer. Benching shall be resorted to only after approval from Employer. Volume of the earth to be cut shall be measured before cutting and approved by Employer for payment purposes. Further, to minimize benching, unequal leg extensions shall be considered and provided if found economical. The proposal shall be submitted by the Contractor with detailed justification to the Employer.

2.14 Protection of Tower and Tower Footing

- 2.14.1 Tower shall be spotted such that the quantity of revetment is optimum. For tower locations in undulated terrain such as hill / mountain slopes, options like use of unequal leg extensions for towers, unequal chimney extensions etc. shall be explored by the contractor for optimizing the need for revetment & benching.
- 2.14.2 The work shall include all necessary stone revetments, concreting and earth filling above ground level, the clearing from site of all surplus excavated soil, special measures for protection of foundation close to or in nalas, river bank/ bed, undulated terrain, protection of uphill/ downhill slopes required for protection of tower etc., including suitable revetment or galvanised wire netting and meshing packed with boulders. The top cover of stone revetment shall be sealed with M-15 concrete (1:2:4 mix.). Contractor shall recommend protection at such locations wherever required. Details of protection of tower/tower footing are given in drawing enclosed with these specifications for reference purpose only.
- 2.14.3 Tower footings shall generally be backfilled using soil excavated at site unless unsuitable for backfilling. In the latter case, backfilling shall be done with borrowed earth of suitable quality irrespective of leads and lift. The unit rate for backfilling quoted in BPS shall include the required lead and consolidation and leveling of earth after backfilling.
- 2.14.4 The provisional quantities for protection work of foundations are furnished in BPS. The unit rates shall also be applicable for any quantity variations during execution. The same unit rates shall hold good for protection work carried out on down hills or up hills slopes applicable for the tower locations.
- 2.14.5 The unit rates for random rubble masonry revetment quoted in price schedule shall also include excavation & (1:6) random masonry and unit rate for top sealing with M-15 concrete. For payment purposes the volume of random rubble masonry revetment shall be measured from bottom to top sealing coat and paid at the unit rates indicated in the Letter of Award.
- No extra payment shall be made for allied works such as excavation for revetment, packed stone at head of weep holes etc. However, no deduction shall be made for the volume enclosed by weep holes.
- 2.14.6 For some of the locations in nalas, river bed or undulated terrain etc., boulders of minimum 150mm size bounded and packed in galvanised wire net/mesh of 8 SWG wire and 152 square (maxm.) mesh are to be provided. These stones shall be provided in crates size of 2.0mx2.0m or as deemed suitable for a particular location. Measurement shall be taken in cubic meters and 15% deduction will be made for void from cage/stack measurements.
- 2.14.7 The provisional quantities for protection work of tower structure/footing/foundation from snow avalanche such as construction of RCC deflection wall conforming to M20 nominal mix and installation of snow deflection pillars of steel frame made of galvanized fabricated MS steel IS channel/angle sections are furnished in price schedule of Bid Proposal Sheet(BPS). The unit rates shall also be applicable for adjusting with the actual quantities of above protection works done. These unit rates shall hold good for protection work carried out on down hills or up hills slopes applicable for the tower locations.

2.14.8 The unit rates for construction of RCC deflection wall quoted in price schedule shall also include supply & installation of all labour, tool & machines, material such as cement, sand, coarse aggregate and reinforcement steel and all other associated work such as excavation, centering, shuttering and scaffolding as per design/drawing and direction of site in charge.

2.14.9 The unit rates for installation/construction of snow avalanche deflection pillars of steel frame made of galvanized fabricated IS channel/angle sections quoted in price schedule shall also include installation of all fabricated galvanized steel MS channel/angle sections, labour, tool & machines and all other associated work for its completion as per design/drawing and direction of site in charge.

3.0 Tower Erection, Stringing and Installation of Line Materials

3.1 General

3.1.1 The scope of erection work shall include the cost of all labour, tools and plant such as tension stringing equipment and all other incidental expenses in connection with erection and stringing work. The stringing equipment shall be of sufficient capacity to string simultaneously the single ACSR DEER conductor.

3.1.2 The Contractor shall be responsible for transportation to site of all the materials to be supplied by the Contractor as well as proper storage and preservation of the same at his own cost, till such time the erected line is taken over by the Employer. Similarly, the Contractor shall be responsible for transportation, proper storage, safe custody, and loss or damage of all Employer supplied items for incorporation in the lines and shall maintain and render proper account of all such materials at all times. The Contractor shall reimburse the cost of any of the materials lost or damaged during storage and erection over and above specified and permitted in clause 3.13.2 of this section.

3.1.3 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 Employer. Employer supplied items shall be dispatched to the railway stations situated nearest to the stores set up by the Contractor. From the railway stations, receipt, unloading and transportation to the stores shall be the entire responsibility of the Contractor.

3.1.4 Payment for stringing shall be done on the basis of per kilometer and irrespective of number of tension/suspension towers. However, stringing for river crossing spans have been given separately in the BPS. The units of measurement for tower erection and other line materials, like, earth wire / OPGW, Hardware fittings and Accessories for conductor & OPGW/earth wire are indicated in the BPS.

3.1.5 The testing (fibre loss and length measurement using OTDR) of OPGW in each drum shall be carried out by contractor/OPGW supplier in presence of RECTPCL/PDD, J&K representative. After installation of OPGW, the testing of each section shall be carried out again by contractor/OPGW supplier in presence of RECTPCL/PDD, J&K representative. In case of any damage / high loss in the fibre, the total length of that particular section of OPGW shall be replaced by the contractor and in such case, the de-stringing & re-stringing shall be carried out by the contractor without any extra cost to RECTPCL/PDD, J&K and cost of additional OPGW cable, fittings & accessories etc. for replacement of damages shall be borne by the contractor.

3.2 Treatment of Minor Galvanisation Damage

Minor defects in hot-dip galvanised members shall be repaired by applying zinc rich primer and two coats of enamel paint to the satisfaction of the Employer before erection.

3.3 Assembly

The Contractor shall give complete details of the erection procedures he proposes to follow.

3.3.1 The method for the erection of towers shall ensure the following:

- a) Straining of the members shall not be permitted for positioning. It may, however, be necessary to match hole positions at joints using tommy bars not more than 450mm in length;
- b) Prior to erection of an upper section, the lower sections shall be completely braced, and all bolts provided tightened adequately in accordance with approved drawings to prevent any mishap during tower erection;
- c) All plan diagonals, oblique bracings etc. for relevant section of tower shall be in place prior to assembly of an upper Section;
- d) The bolt positions in assembled towers shall be as per IS-5613 (Part II/Section 2);
- e) Tower shall be fitted with number, danger, circuit and phase plates as well as anti-climbing device, as described;
- f) After complete erection of the tower, all blank holes, if any, except for universal plates, are to be filled by bolts and nuts of correct size.

3.4 Tightening of Bolts and Nuts

3.4.1 All nuts shall be tightened properly using correct size spanner and torque wrench. Before tightening, it will be verified that filler washers and plates are placed in relevant gap between members, bolts of proper size and length are inserted, and one spring washer is inserted under each nut. In case of step bolts, spring washers shall be placed under the outer nuts. The tightening shall progressively be carried out from the top downwards, care being taken that all bolts at every level are tightened simultaneously. The threads of bolts projecting outside the nuts shall be punched at their position on the diameter to ensure that the nuts are not loosened in course of time. If, during tightening, a nut is found to be slipping or running over the bolt threads, the bolt together with the nut shall be replaced.

3.4.2 The threads of all the bolts except for Anti-theft bolts projected outside the nuts shall be welded at two diametrically opposite places; the circular length of each welding shall be at least 10mm. The welding shall be provided from ground level to waist level for single circuit towers and to bottom cross arm for double circuit towers. However, for towers, with +18 meter, +25 meter extensions and river crossing towers, the welding shall be provided from ground level to 30m height from stub level. After welding zinc-rich primer having approximately 90% zinc content shall be applied to the welded portion. At least two coats of the primer shall be applied. The surface coated with zinc rich primer shall be further applied with two finish coats of high build enamel of the grade recommended by the

manufacturer of the zinc rich primer. The cost of welding and primer including application of primer shall be deemed to be included in the erection price.

3.5 Insulator Hoisting

Suspension insulator strings shall be used on Suspension towers (A/DA) and tension insulator strings on angle and dead end towers. These shall be fixed on all the towers just prior to the stringing. Damaged insulators and strings, if any, shall not be employed in the assemblies. Prior to hoisting, all insulators shall be cleaned in a manner that will not spoil, injure or scratch the surface of the insulator, but in no case shall any oil be used for that purpose. For checking the soundness of insulators, IR measurement using 10 kV (DC) Meager shall be carried out on insulators. Corona control rings/arcing horn shall be fitted in an approved manner. Torque wrench shall be used for fixing various line materials and components, such as suspension clamp for conductor and earth wire/OPGW etc., whenever recommended by the manufacturer of the same.

3.6 Handling of Conductor and Earth wire/OPGW

3.6.1 Running Out of the Conductors

- 3.6.1.1 The conductors shall be run out of the drums from the top in order to avoid damage. The Contractor shall be entirely responsible for any damage to tower or conductors during stringing.
- 3.6.1.2 A suitable braking device shall be provided to avoid damaging, loose running out and kinking of the conductors. Care shall be taken that the conductors do not touch and rub against the ground or objects which could scratch or damage the strands.
- 3.6.1.3 The sequence of running out shall be from the top down i.e. the earth wire shall be run out first followed in succession by the conductors. Unbalanced loads on towers shall be avoided as far as possible. Inner phase of line conductors shall be strung before the stringing of the outer phases is taken up.
- 3.6.1.4 The Contractor shall take adequate steps to prevent clashing of sub conductors until installation of the spacers/spacer dampers. Care shall be taken that sub conductors of a bundle are from the same Contractor and preferably from the same batch so that creep behavior of sub conductors remains identical. During sagging, care shall be taken to eliminate differential sag in sub-conductors as far as possible. However, in no case shall sag mismatch be more than 25mm.
- 3.6.1.5 Towers not designed for one sided stringing shall be well guyed and steps taken by the Contractor to avoid damage. Guying proposal along with necessary calculations shall be submitted by the Contractor to Employer for approval. All expenditure related to this work is deemed to be included in the bid price and no extra payment shall be made for the same.
- 3.6.1.6 When the transmission lines runs parallel to existing energized power lines, the Contractor shall take adequate safety precautions to protect personnel; from the potentially dangerous voltage built up due to electromagnetic and electrostatic coupling in the pulling wire, conductors and earth wires during stringing operations.
- 3.6.1.7 The Contractor shall also take adequate safety precautions to protect personnel from potentially dangerous voltage build up due to distant electrical storms.

3.6.2 Running Blocks

- 3.6.2.1 The groove of the running blocks shall be of such a design that the seat is semicircular and larger than the diameter of the conductor/earth wire/OPGW and it does not slip over or rub against the slides. The grooves shall be lined with hard rubber or neoprene to avoid damage to conductor and shall be mounted on properly lubricated bearings.
- 3.6.2.2 The running blocks shall be suspended in a manner to suit the design of the cross-arm. All running blocks, especially at the tensioning end will be fitted on the cross-arms with jute cloth wrapped over the steel work and under the slings to avoid damage to the slings as well as to the protective surface finish of the steel work.

3.6.3 Repairs to Conductors

- 3.6.3.1 The conductor shall be continuously observed for loose or broken strands or any other damage during the running out operations.
- 3.6.3.2 Repairs to conductor if accidentally damaged, shall be carried out with repair sleeve.
- 3.6.3.3 Repairing of the conductor surface shall be carried out only in case of minor damage, scuff marks, etc. The final conductor surface shall be clean, smooth and free from projections, sharp points, cuts, abrasions, etc.
- 3.6.3.4 The Contractor shall be entirely responsible for any damage to the towers during stringing.

3.6.4 Crossings

Derricks or other equivalent methods ensuring that normal services need not be interrupted nor damage caused to property shall be used during stringing operations where roads, channels, telecommunication lines, power lines and railway lines have to be crossed. However, shut down shall be obtained when working at crossings of overhead power lines. The Contractor shall be entirely responsible for the proper handling of the conductor, earth wire and accessories in the field.

3.7 Stringing of Conductor and Earth wire/OPGW

- 3.7.1 The stringing of the conductor for the 220kV line shall be done by the control tension method. The equipment shall be capable of maintaining a continuous tension per conductor such that the sag for each conductor is about twenty percent greater than the sags specified in the stringing sag table.
- 3.7.2 The bidder shall give complete details of the stringing methods he proposes to follow. Prior to stringing the Contractor shall submit the stringing charts for the conductor and earthwire / OPGW showing the initial and final sags and tension for various temperatures and spans along with equivalent spans in the lines for the approval of the Employer
- 3.7.3 A controlled stringing method suitable for stringing of the conductors shall be used. Conductors or OPGW/earth wires shall not be allowed to hang in the stringing blocks for more than 96 hours before being pulled to the specified sag.

Conductor creep are to be compensated by over tensioning the conductor at a temperature as indicated in Section-I of this specification lower than the ambient temperature or by using the initial sag and tensions indicated in the tables.

3.8 Jointing

- 3.8.1 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 specifications.
- 3.8.2 Conductor splices shall not crack or otherwise be susceptible to damage in the stringing operation. The Contractor shall use only such equipment/methods during conductor stringing which ensures complete compliance in this regard.
- 3.8.3 All the joints on the conductor and earth wire shall be of the compression type, in accordance with the recommendations of the manufacturer, for which all necessary tools and equipment like compressors, dies etc., shall be obtained by the Contractor. Each part of the joint shall be cleaned by wire brush till it is free of dust or dirt etc., and be properly greased with anti-corrosive compound. If required and as recommended by the manufacturer, before the final compression is carried out with the compressors.
- 3.8.4 All the joints of splices shall be made at least 30 meters away from the tower structures. No joints or splices shall be made in spans crossing over main roads, railways, power lines and small river spans up to 650m. Not more than one joint per sub 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 smoothened.
- 3.8.5 During stringing of conductor to avoid any damage to the joint, the Contractor shall use a suitable protector for mid span compression joints in case they are to be passed over pulley blocks/aerial rollers. The pulley groove size shall be such that the joint along with protection can be passed over it smoothly.

3.9 Tensioning and Sagging Operations

- 3.9.1 The tensioning the sagging shall be done in accordance with the approved stringing charts or sag tables. The "initial" stringing chart shall be used for the conductor and final stringing chart for the earth wire. The conductors shall be pulled up to the desired sag and left in running blocks for at least one hour after which the sag shall be rechecked and adjusted, if necessary, before transferring the conductors from the running blocks to the suspension clamps. The conductor shall be clamped within 96 hours of sagging in.
- 3.9.2 The sag will 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. The sag shall also be checked when the conductors have been drawn up and transferred from running blocks to the insulator clamps.

3.9.3 The running blocks, when suspended from the transmission structure for sagging, shall be so adjusted that the conductors on running blocks will be at the same height as the suspension clamp to which it is to be secured.

3.9.4 At sharp vertical angles, conductor and earth wire sags and tensions shall be checked for equality on both sides of the angle and running block. The suspension insulator assemblies will normally assume verticality when the conductor is clamped.

3.9.5 Tensioning and sagging operations shall be carried out in calm whether when rapid changes in temperature are not likely to occur.

3.10 Clipping In

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

3.10.2 Jumpers at section and angle towers shall be formed to parabolic shape to ensure maximum clearance requirements. Pilot suspension insulator strings shall be used, if found necessary, to restrict jumper swing to design values.

3.10.3 Fasteners in all fittings and accessories shall be secured in position. The security clip shall be properly opened and sprung into position.

3.11 Fixing of Conductors and Earthwire / OPGW accessories

Conductor and earthwire/OPGW accessories including spacers and vibration dampers shall be installed by the Contractor as per the design requirements and manufacturer's instruction within 24 hours of the conductor/earth wire clamping. 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. Torque wrench shall be used for fixing the Dampers, Suspension Clamps etc. and torque recommended by the manufacturer of the same shall be applied.

3.12 Replacement

If any replacement is to be effected after stringing and tensioning or during maintenance, leg member and bracing shall not be removed without first reducing the tension on the tower by proper guying techniques or releasing of the conductor. For replacement of cross arms, the conductor shall be suitably tied to the tower at tension points or transferred to suitable roller pulleys at suspension points.

3.13 Permitted Extra Consumption of Line materials

3.13.1 The quantity of conductor and earth wire to be incorporated in the line shall be worked as per the following norms.

Quantify of Conductor	=	Line length* as per detailed survey x 3 phases x Nos. of conductor per bundle (for Single Circuit Line)

	=	Line Length* as per detailed survey x 3 phases x Nos. of conductor per bundle x 2 (for Double Circuit Line)
Quantity of Earth wire	=	Line length* as per detailed survey x nos. of ground wires

* For calculation of conductor & Earth wire/OPGW requirement in hilly stretches, inclined distance between the towers may be considered instead of horizontal distance (considered for line length).

- 3.13.2 The Contractor shall make every effort to minimize breakage, losses and wastage of the line materials during erection. However, the Contractor shall be permitted an extra consumption of line materials up to the limits specified in Table below and shall be permitted to dispose of the scrap, if any at the end.

Permitted extra consumption of line materials	
Item	% of permitted extra consumption
Conductor & earth wire	1

- 3.13.3 In case of conductor and earth wire, the permitted extra consumption limit of one percent is inclusive of sag, jumpering, damage, loss and wastage etc.
- 3.13.4 The Contractor shall not be required to return to the Employer empty conductor and earth wire drums and shall dispose off the same at his cost.
- 3.13.5 Any conductor and earth wire drum which has been opened by the Contractor shall not be taken back by Employer and the unused conductor or earth wire in such drums may be treated as waste permissible within the overall limits specified in clause 3.13.2.
- 3.13.6 The Contractor shall return to the Employer all Employer supplied material not incorporated in the works, except those permitted by Employer as scrap in terms of Table 5.1. Otherwise, the Contractor shall pay in respect of such excess materials which he is unable to return at rates corresponding to the actual cost of procurement plus (i) 15% for OSM procured under domestically funded packages; and (ii) 26.5% for OSM procured against packages funded by multilateral funding agencies. The "cost of procurement" for the above purpose shall be F O R destination site cost of OSM as per LOA of the respective packages plus taxes & duties plus price variation (if positive) applicable as on the date of issuance of TOC for Tower Package. In case of contract in Foreign currency, Bills clearing (BC) Selling, Market Rate of Exchange (MRE) established by State Bank of India (SBI) as prevalent on date of TOC shall be applicable for converting into Indian Rupees.
- 3.13.7 For calculation of conductor & earth wire consumption in hilly (mountainous) stretches inclined distance between towers may be considered, instead of horizontal distance between them.
- 3.13.8 The quantities of line materials to be supplied by the contractor (i.e. Conductor, earth wire / OPGW, Disc Insulators, Hardware fittings & accessories) as indicated in the bill of quantities are provisional and the actual quantity shall depend upon

detailed survey. Contractor shall be responsible for regulating the supplies of contractor supplied materials on the basis of actual requirements. The Employer shall have right, not to take any surplus contractor supplied line materials.

- 3.13.9 OPGW shall be supplied as per the drum schedule finalized by the contractor and length of OPGW in each drum shall take care of extra length required for sag, jointing, and down leads etc. Therefore, no extra consumption of OPGW shall be permitted.

3.14 Final checking, Testing and Commissioning

After completion of the works, final checking of the line shall be carried out by the Contractor to ensure that all foundation works, tower erection and stringing have been done strictly according to the specifications and as approved by the Employer. All the works shall be thoroughly inspected in order to ensure that:

- a) Sufficient backfilled earth covers each foundation pit and is adequately compacted;
- b) Concrete chimneys and their copings are in good condition and finely shaped.
- c) All tower members are used strictly according to final approved drawing and are free of any defect or damage whatsoever.
- d) All bolts are properly tightened, punched, tack welded and painted with zinc rich paint;
- e) The stringing of the conductors and earth wire / OPGW has been done as per the approved sag and tension charts and desired clearances are clearly available;
- f) All conductor and earth wire accessories are properly installed;
- g) All other requirements for completion of works such as fixing of danger plate, phase plate, number plate, anti-climbing device, aviation signal have been fulfilled.
- h) Wherever required, that proper revetment (erosion protection) is provided;
- i) The original tracings of profile and route alignment as well as tower design, structural drawings, bill of material and shop drawings of all towers are submitted to the Employer for reference and record.
- j) The insulation of the line as a whole is tested by the Supplier through provision of his own equipment, labour etc., to the satisfaction of the Employer.
- k) All towers are properly grounded.
- l) The line is tested satisfactorily for commissioning purpose.

- 3.14.1 The contractor should also fulfill the requirements of pre-commissioning procedure as given in Appendix-I to this Specification.

4.0 Field Quality Plan

All field activity shall be carried out in accordance with Standard Field Quality plan as given in Appendix-II to this section of the Specification.

5.0 Manufacturing Quality Plan

Tower manufacturing shall be carried out in accordance with Standardized Manufacturing Quality plan as given in Appendix-III to this section of the Specification.

STANDARD MANUFACTURING QUALITY PLAN FOR TOWER PARTS

Doc. No.: RECTPCL/MQAP/TL/00

Appendix-III

INSTRUCTION FOR CODE ALLOCATION

Code 1	Indicates place where testing is planned to be performed i.e. Inspection location	Code 2	Indicates who has to perform the test i.e. Testing Agency
A	At Equipment Manufacturer's work (Fabricator)	J	The Equipment Manufacturer
B	The Component Manufacturer's work (Re-roller)	K	The Component Manufacturer
C	At Authorized Distributor's place	L	The Third Party
D	At Independent Lab	M	The Turnkey Contractor
E	At Turnkey Contractor's		
F	Not specified		
Code 3	Indicates who shall witness the tests i.e. Witnessing Agency	Code 4	Review of Test Reports/Certificates
P	Component Manufacturer itself	W	By Equipment Manufacturer during raw material/bought out component inspection
Q	Component Manufacturer and Equipment Manufacturer	X	By Contractor during product/process inspection
R	Component Manufacturer Equipment Manufacturer and Contractor	Y	By RECTPCL during product/process inspection
S	Equipment Manufacturer itself	Z	By Contractor and/or RECTPCL during product/process inspection
T	Equipment Manufacturer and Contractor		
U	Equipment Manufacturer Contractor and RECTPCL		
V	Third Party itself		
Code 5	Whether specific approval of sub-vendor/Component make is envisaged	Code 6	Whether test records required to be submitted after final inspection for issuance of CIP/MICC
E	Envisaged	Y	Yes
N	Not envisaged	N	No

A. Raw material Inspection (Indigenous)

STANDARD MANUFACTURING QUALITY PLAN FOR TOWER PARTS

Doc. No.: RECTPCL/MQAP/TL/00

Sr. No.	Components/operation & Description of Test	Type of Check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
1.1	Structural Steel (Sections and Plates)										E		Structural Steel to be procured from RECTPCL approved sources. For re-rollers specific approval of RECTPCL is to be ensured and CIP for every lot at re-rollers works.
(a)		Test for Ultimate Tensile Strength	2 – Samples for cast/heat size up to 100 MT 3- Samples for cast/heat size between 100-200 MT 4- Samples for cast/heat size over 200 MT	IS : 2062 :2006 Grade E250A RECTPCL Specn. IS:2062:2006 Grade E350A	410N/mm2 (Min) 490 N/mm2 (Min)	Manufacturer's format of record (MFOR)	B	K	U	Z		Y	Customer Inspection Point (CIP) at reroller's works. However in case of mix, three samples 50MT/lot to be taken.
(b)		Yield Stress	2 – Samples for cast/heat size up to 100 MT 3- Samples for cast/heat size between 100-200 MT 4- Samples for cast/heat size over 200 MT as per IS 2062 : 2006	IS : 2062 :2006 Grade E250A RECTPCL Specn IS : 2062 :2006 Grade E250A RECTPCL Specn	i) <20mm thick 250N/mm2 min ii) 20 to 40 mm thick 240N/mm2 min iii) >40mm thick 230 N/mm2 min. Below 20mm min 350	(MFOR)	B	K	U	Z		Y	CIP at reroller's works

STANDARD MANUFACTURING QUALITY PLAN FOR TOWER PARTS

Doc. No.: RECTPCL/MQAP/TL/00

Sr. No.	Components/operation & Description of Test	Type of Check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
					N/mm ² 20-40 mm min 330N/mm ² above 40 mm min 320N/mm ²								
(c)		Percentage Elongation at 5.65 $\sqrt{\text{area}}$	2 – Samples for cast/heat size up to 100 MT 3- Samples for cast/heat size between 100-200 MT 4- Samples for cast/heat size over 200 MT as per IS 2062 : 2006	IS : 2062 :2006 Grade E250A RECTPCL Specn IS : 2062 :2006 Grade E250A RECTPCL Specn	23% min 22% min	(MFOR)	B	K	U	Z		Y	CIP at reroller's works
(d)		Bend Test	1Sample for 50 MT per Section per cast as per IS 2062-2006	IS : 2062 :2006 Grade E250A RECTPCL Specn IS : 2062 :2006 Grade E250A RECTPCL Specn	Piece at room temp. shall with stand bending through 180 degree to an internal dia i)not greater than 2t for 25mm, ii)3t for 25mm, with both sid parallel, without	(MFOR)	B	K	U	Z		Y	CIP at reroller's works

STANDARD MANUFACTURING QUALITY PLAN FOR TOWER PARTS

Doc. No.: RECTPCL/MQAP/TL/00

Sr. No.	Components/operation & Description of Test	Type of Check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
					cracking Piece at room temp. shall with stand bending through 180 degree to an internal dia not greater than 2t								
1.1.2	Chemical Composition	Chemical Analysis	2 - Samples for cast/heat size up to 100 MT 3- Samples for cast/heat size between 100-200 MT 4- Samples for cast/heat size over 200 MT as per IS 2062 : 2006	IS2062:2006 As per Annexure-I on Page 09		(MFOR) /TPL Reports	B / D	K / L	U / V	Z		Y	CIP at reroller's works
1.1.3	Visual Inspection	Visual	IS 2500, Level II, AQL-1.5 as per Table 1 on page 28	IS : 2062 :2006 Grade E250A RECTPCL Specn	Material to be free from surface defects like laminations, rough/jagged and imperfect edges, cracks, rounded apex, deep roll marks, pipy and any harmful defects	(MFOR)	B	K	U	Z		Y	CIP at reroller's works

STANDARD MANUFACTURING QUALITY PLAN FOR TOWER PARTS

Doc. No.: RECTPCL/MQAP/TL/00

Sr. No.	Components/operation & Description of Test	Type of Check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
1.1.4	Dimensional Inspection	Measurement	IS 2500, Level II, AQL-1.5 as per Tabel 1 on page 28	IS 808/IS 1730/IS 1852 & RECTPCL Spec.		(MFOR)	B	K	U	Z		Y	CIP at reroller's works
	Angle section a) Tolerances for Leg Length of Angles Equal/Un Equal		IS 2500, Level II, AQL-1.5 as per Tabel 1 on page 28	Is 1852/IS 808	Equal: (i) Up to 45mm Leg Length ± 1.5 mm (ii) >45 to 100mm Leg Length ± 2.0 mm (iii) > 100mm Leg Length $\pm 2.0\%$ of Leg Length Difference between Leg Length of Equal Angles shall be limited to 75% of Total Tolerance (Plus & Minus) Unequal: tolerance as per		B	K	U	Z		Y	CIP at reroller's works

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Sr. No.	Components/operation & Description of Test	Type of Check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
					IS								
	b) Out of Square ness	Measurement	IS 2500, Level II, AQL-1.5 as per Table 1 on page 28	IS 1852 RECTPCL Spec.	± 1 degree	TPL/TM U/QA-01	B	K	U	Z		Y	CIP at reroller's works
	c) Camber	Measurement	IS 2500, Level II, AQL-1.5 as per Tabel 1 on page 28	IS 1852 RECTPCL Spec.	(i) For Flange Less than 100mm Reasonably Straight (ii) For Flange 100 mm & above Max 0.2% of length		B	K	U	Z		Y	CIP at reroller's works
	d) Weight Tolerance for Angle Sections	Unit Weight Test	One sample for 50 MT/Section or part thereof	IS 1852/IS 808	i) Up to 3mm thick $\pm 5\%$ ii) >3mm thick +5%,-3% over weights specified in IS 808	TPL/TM U/QA-01	B	K	U	Z		Y	CIP at reroller's works
	Plate a) Weight Tolerances	Unit Weight Test	One sample for 50 MT/Section or part thereof	IS 1852/IS1730	+5% -2.5% over weights specified in IS 1730	TPL/TM U/QA-01	B	K		Z		Y	P/U as per RECTPCL approval
	b) Thickness Tolerance	Measurement	IS 2500, Level II, AQL-1.5 as per Table 1 on page 28	IS 1852/IS1730	<8mm thick +12.5%,-5% 8mm -12mm +7.5%,-5% over 12 mm $\pm 5\%$	TPL/TM U/QA-01	B	K		Z		Y	P/U as per RECTPCL approval

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Sr. No.	Components/operation & Description of Test	Type of Check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
1.2	Zinc To be procured from RECTPCL approved sources or Imported LME registered source chemical composition	Chemical Analysis	Every Consignment	IS 209/IS 13229	IS 209 IS 13229	Zinc Manufacturer TC					E		
	chemical composition	Chemical Analysis	One sample for 100 MT or Part Thereof	IS 209/IS 13229	IS 209 IS 13229	TPL Reports	B	L	V	W	N		

ANNEXURE-I

Chemical Composition (Laddle Analysis) Indigenous

As Per IS 2062:2006	C % max.	Mn % max.	S % max.	P %max.	Si % max.	CE Max.
Grade E 250A	0.23	1.50	0.045	0.045	0.40	0.42
Grade E 350A	0.20	1.50	0.045	0.045	0.45	0.42

Permissible Variation as per product Analysis

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Element grade	C % max.	Mn % max.	S % max.	P %max.	Si % max.	CE Max.
As Per IS 2062:2006	0.03	0.05	0.005	0.005	0.03	--

For Grade E350, micro alloying elements like Nb, Ti and B shall be added singly or in combination. Total micro-alloying elements shall not be more.

1A. Raw Material Inspection (Imported)

Sr. No.	Components/op eration & Description of Test	Type of Check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
1A. 1 1a.1 .1	Structural Steel angle section Mechanical Properties										E		
(a)		Ultimate Tensile	One sample for every 20 MT/Section/lot or part	BSEN 10025-2:	For acceptance	Manufa cturer	A	J	S	Z		N	

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Sr. No.	Components/operation & Description of Test	Type of Check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
		Strength	thereof One sample for 40 MT/Sec./Cast/or part thereof	2004/RECT PCL Spec.	norms, please refer to Annex. II on Page 16	test certificate, internal test record and packing list of contractor							
(b)		Yield Stress	One sample for every 20 MT/Section/lot or part thereof One sample for 40 MT/Sec./Cast/or part thereof	BSEN 10025-2: 2004/RECT PCL Spec	For acceptance norms, please refer to Annex. II on Page 16	Do	A	J	S	Z		N	
(c)		Percentage on Test	One sample for every 20 MT/Section/lot or part thereof One sample for 40 MT/Sec./Cast/or part thereof	BSEN 10025-2: 2004/RECT PCL Spec	For acceptance norms, please refer to Annex. II on Page 16	do	A	J	S	Z		N	
(d)		Bend Test	BSEN 10025-2: 2004 2 sample/Sec./Lot	BSEN 10025-2: 2004/RECT PCL Spec	For acceptance norms, please refer to Annex. II on Page 16	do	A	J	S	Z		N	
(e)		'V' notch impact test	One sample for every 20 MT/Section/lot or part	BSEN 10025-2:	For acceptance	do	A	J	S	Z		N	

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Sr. No.	Components/operation & Description of Test	Type of Check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
			thereof One sample for 40 MT/Sec./Cast/or part thereof	2004/RECT PCL Spec	norms, please refer to Annex. II on Page 16								
1.A. 1.2	Chemical Composition	Chemical Analysis	One sample for every 40 MT per section per heat or part thereof	BSEN 10025-2: 2004/RECT PCL Spec	For acceptance norms, please refer to Annex. II on Page 16	TPL report/TMFOR (Tower manufacturer format of record)	D / A	L / J	V / S	Z		N	
1.A. 1.3	Visual Inspection	visual	IS 2500 Level II AQL 1.5 as per Table I on Page 29	BSEN 10025-2: 2004/RECT PCL Spec		TMFOR	A	J	S	Z		N	
1A. 1.4	Dimensional Inspection	Measurement	do	BSEN 10056-1		do	A	J	S	Z		N	
	a)Tolerance for Leg Length		do	BSEN 10056-1	Leg Length upto 50mm $\pm$ 1mm, 50 to 100 mm, $\pm$ 2mm, 100 to 150 mm $\pm$ 3mm, 150 to 200 $\pm$ 4mm	do	A	J	S	Z		N	
	b)out of square ness		IS 2500 Level II AQL 1.5 as per Table 1 on page 29	BSEN 10056-2	BSEN 10056-2 Leg Length	do	A	J	S	Z		N	

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Sr. No.	Components/operation & Description of Test	Type of Check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
					100 ± 1mm Above 100 upto 150 ± 1.5mm >150 upto 200 mm ± 2mm								
	c)Camber		Do	BSEN 10056-2	BSEN 10056-2 2Leg Length 150mm 0.4% of length >150 to 200 mm 0.2% of Length >200mm 0.1% of length	do	A	J	S	Z		N	
	d)Weight Tolerance		One sample for 20MT per lot or part thereof	BSEN 10056-2	BSEN 10056-2 ≤ 4mm ±6% ≥ 4mm +/- 4%	do	A	J	S	Z		N	
	e)Thickness Tolerance		IS 2500 Level II AQL 1.5 as per Table 1 on Page 29 IS 2500 Level II AQL 1.5 as per Table 1 on Page	BSEN 10056-2	≤5mm thick ± 0.5 mm >5 to 10 mm ±0.75mm	do	A	J	S	Z		N	

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Sr. No.	Components/operation & Description of Test	Type of Check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
			29		>10 to 15mm ± 1.0 mm >15mm thick ± 1.20 mm For length more than 130 mm Under 6.3 mm ± 0.7 mm 6.3 to < 10mm ± 0.8 mm 10 to < 16 mm ± 1.0 mm 16 to 25 mm ± 1.2 mm >25mm ± 1.5 mm								

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Annexure II

Section - Raw Material Inspection (Imported Steel) (Page 1)

Properties/Grades	UTS N/mm2	Yield N/mm2	% elongation at 5.65 A Min.	Bend Test	Min. Charpy v- notch Impact test*
BSEN 10025-2:2004					
Grade S275 JR	410-560	< 16mm 275 >16 mm < 40 mm 265	23%	Not Specified	20 °C-27J
Grade S275 JO	410-560	< 16mm 275 >16 mm < 40 mm 265	23%	Not Specified	0 °C-27J
Grade S355 JR	470-630	< 16mm 355 >16 mm < 40 mm 345	22%	Not Specified	20 °C-27J
Grade S355 JO	470-630	< 16mm 355 >16 mm < 40 mm 345	22%	Not Specified	0 °C-27J

*For sample size

10X10X55mm = 27 Joules min

7.5X10X55mm = 20 Joules min

5.5X10X55mm = 14 Joules min

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Annexure II

Page 2

Element Grades	C %max.	Si %max.	Mn %max.	P %max.	S %max.	N %max.	Cu %max.
BSEN 10025- 2:2004							
Grade S275 JR (Ladle)	0.21	--	1.50	0.035	0.035	0.012	0.55
(Product)	0.24	--	1.60	0.045	0.045	0.014	0.60
Grade S275 JO(Ladle)	0.18	--	1.50	0.030	0.030	0.012	0.55
(Product)	0.21	--	1.60	0.040	0.040	0.014	0.60
Grade S355 JR(Ladle)	0.24	0.55	1.60	0.035	0.035	0.012	0.55
(Product)	0.27	0.60	1.70	0.045	0.045	0.014	0.60
Grade S355 JO(Ladle)	0.20	0.55	1.60	0.030	0.030	0.012	0.55
(Product)	0.23	0.60	1.70	0.040	0.040	0.014	0.60

For HT steel micro-alloys are as follows:

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Micro alloying elements like Nb,V,Tr and B shall be added singly or in combination. Total micro-alloying elements shall not be more than 0.25

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
2.0	IN PROCESS INSPECTION Fabrication of Tower Parts			IS 802 Part II/IS 7215/ RECTPCL Approved Drwg.,Shop Sketches									
(a)	Straightening	Visual	100%										
(b)	Cropping (Cutting)	Dimensional	1st piece and every 50th Piece		Length Tolerance +/- 2mm. The cut surface to be clean, reasonable square & free from distortion	TMF QR	A	J	S	Z		N	
(c)	Stamping	Visual	1st piece and every 50th Piece		Letter size as per RECTPCL Specn/ TPL norms	-do-	A	J	S	Z		N	

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
(d)	Punching/Drilling	Dimensional	1st piece and every 50th Piece		Holes for bolts shall be drilled or punched with a jig but drilled holes shall be preferred. The Punching may be adopted for thickness up to 16mm Tolerances regarding punch holes should be as follows : a) Holes must be perfectly circular and no tolerances in this respect are possible. b) The maximum allowable difference in diameter of the holes on the two sides of the plates or angle is 0.8 mm i.e. the allowable taper in a punched hole should not exceed 0.8mm on diameter. c) Holes must be square with the plates or angles and have their walls parallel.	-do-	A	J	S	Z		N	

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
(e)	Edge Security	Dimensional	1st piece and every 50th Piece	IS 802 Part II/IS 7215/ RECTPCL Approved Drwg., Shop Sketches		-do-	A	J	S	Z		N	
(i)	For 13.5 mm dia hole				Sheared 20mm Min. Rolled 16mm Min.								
(ii)	For 17.5 mm dia hole				Sheared 23mm Min. Rolled 20mm Min.								
(iii)	For 21.5 mm dia hole				Sheared 28mm Min. Rolled 25mm Min.								
(iv)	For 25mm & 25.5 mm dia hole				As per approved Drawing								
(f)	Drilling & Punching Hole to Hole distance		1st piece and every 50th Piece		Tolerance cumulative and between consecutive hole shall be within +/- 2mm and +/- 1mm respectively	-do-	A	J	S	Z		N	

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
(g)	Notching Flange Cut Corner Cut Bevel Cut		Ist piece and every 50th Piece		+5mm on specified length of cut operationally shearing up to 12 mm thick by gas cutting for material above 12mm thick.	-do-	A	J	S	Z		N	
(h)	Heel Cutting	Dimensional	Ist piece and every 50th Piece	RECTPCL Approved Drwg., Shop Sketches	For Members > 12mm thick gas cutting to be adopted followed by Grinding /Machine cutting. Tolerance on heel cutting length +10mm (1) HT Sections /Plates All Sections & all plates to be bent.	-do-	A	J	S	Z		N	

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
(i)	Bending		100% pieces	IS 802 Part II/IS 7215/ RECTPCL Approved Drwg.,Shop Sketches	(1) HT Sections /Plates All Sections & all plates to be bent.	-do-							
					(2) MS Section i) Cold - Section upto 75 x 75 x 6 - Angle upto 10° (ii) Cold - Section upto 100 x 100 x 8 - Angle above 5°	-do-	A	J	S	Z		N	
					(3) MS Plates i) Cold - upto 12mm thick upto 15° (ii) Hot - Others	-do-							

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
(j)	Welding	(a) WPS Approval (Welding procedure specification) (b) PQR/WQR Approval (Procedure/Welder Qualification record)	Random basis	As per RECTPCL Technical specn./approved Drg./RECTPCL approved Welding procedure & Welder's qualification	-do -	-do-	A	J	U	Y		N	WPS approval by RECTPCL

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
3.1	Degreasing	Chemical	One sample daily	IS 2629	Manufacturer's plant standard/IS	-do-	A	J	S	Z		N	
3.2	Pickling	Chemical	One sample daily	IS 2629	Manufacturer's plant Standard/IS Iron contents 100 to 120 g/L max.	-do-	A	J	S	Z		N	
3.3	Rinsing	Chemical	One sample daily	IS 2629	Manufacturer's plant standard/ IS	-do-	A	J	S	Z		N	
3.4	Pre-Fluxing	Chemical	One Sample daily	IS 2629	IS 2629	-do-	A	J	S	Z		N	WPS approval by RECTPCL

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
3.5	Pre-Heating	Measurement	One check per day	IS 2629	IS 2629	-do-	A	J	S	Z		N	
3.6	Dipping After drying is over the material is dipped in molten zinc. Following parameters are controlled					-do-	A	J	S	Z		N	
	a) Zinc bath temperature Recording is done by graphical manner QR sensors with digital display.		Hourly check	IS 2629	450 +/- 10°C	-do-	A	J	S	Z		N	

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
(a)	Visual checking	Visual	100%	IS 2629	Surface to be free from defects like bare/black spots, (except when small and suitable for patching) heavy ash & flux inclusions, lumps, pimples, runs etc	-do-	A	J	S	Z		N	
(b)	Thickness of Zinc Coating	Measurement	8 samples/shift	IS 4759	The minimum average zinc coating for all section and plates shall be 87 microns for thickness $\geq 5\text{mm}$ & 65 microns for thickness $< 5\text{mm}$.	-do-	A	J	S	Z		N	
(c)	Weight of Zinc coating	Measurement	3 samples/shift	IS 4759 IS 6745	(a) For thickness below 5mm, but not less than 2mm - Average mass of coating = 460	-do-	A	J	S	Z		N	
(d)	Uniformity of Zinc coating	Measurement	3 samples/shift	IS 2633	Material to withstand 4 dips of one minute each without showing signs of copper deposits.	-do-	A	J	S	Z		N	
(e)	Adhesion Tests of Zinc coating	Pivoted Hammer Test	3 samples/shift	IS 2629	No removal or lifting of coating in areas between hammer impressions.	-do-	A	J	S	Z		N	

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
5.0	FINAL INSPECTION & TESTING (Inspection Engineer to check/ensure compliance to notes/General Requirements given on Page (28, 29 & 30) of MQP.												
(a)	VISUAL & DIMENSIONAL INSPECTION For Fabrication(as per approved dwg.) & Galvanizing		As per Table 2 on Page 27		Please refer Cl. No. 2(a) to 2(j) & Cl. No. 4.3 (a)	-do-	A	J	U	Z		Y	CIP

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
(b)	MECHANICAL PROPERTIES	UTS Test, Yield stress Test, Percentage elongation test, bend test	One sample for every 100 MT/section/Lot or part thereof.	Please refer (for test values) Cl. No. 1.1.1(a),(b), (c), (d) & 1A. 1.1 (a), (b), (c), (d)		-do-	A	J	U	Z		Y	CIP
		Charpy 'V' notch impact test for imported steel if applicable		RECTPCL Specification	1A. 1.1 (e)								
(c)	GALVANIZING TESTS	Thickness of Zinc Coating, Weight of Zinc coating, Uniformity of Zinc coating (i) Adhesion Tests	One sample for every 100 MT/section/Lot or part thereof.	IS 2629/ IS 4759/ IS 6745/ IS 2633	Please refer Cl. No. 4.0		A	J	U	Z		Y	CIP

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Sr. No	Components/ Operation & Description of Test	Type of check	Quantum of Check/Sampling with basis	Reference document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
6.0	Packing, Storing, Bundling and Handling	100%			IS 802/RECTPCL Specn./Packing list to be submitted along with dispatch documents.	Tower manufacturer's Log Book/Form at No.							Pieces of light sections to be wire bundled and heavy sections to be supplied loose. Stacking to have proper ventilation and kept inclined. Damage to galvanization coating to be avoided while handling, to ensure sequential supplies and other details as per RECTPCL Technical Specification.

STANDARD MANUFACTURING QUALITY PLAN FOR TOWER PARTS**Doc. No.: RECTPCL/MQAP/TL/00**

TABLE I
Sampling Plan For
Visual & Dimensional Characteristics of Structural Steel FOR RAW MATERIAL
ONLY
Sampling Plan as per IS 2500, Level -II, AQL 1.5 NUMBER OF PIECES

Lot Size	Sample Size	Acceptance No.	Rejection No.
2 to 8	100 % Inspection	0	0
9 - 15	8	0	1
16 - 25	8	0	1
26 - 50	8	0	1
51 - 90	8	0	1
91 - 150	32	1	2
151 - 280	32	1	2
281 - 500	50	2	3
501 - 1200	80	3	4
1201 - 3200	125	5	6
3201 - 10000	200	7	8
10001 - 35000	315	10	11
35001 - 150000	500	14	15
150001 and above	800	21	22

TABLE 2

Sampling Plan For Visual & Dimensional Characteristics of Structural Steel For Final inspection (Dimension Checks) (Refer Para 5 (c) Final inspection & Testing) Sampling Plan as per IS 2500, Level -II, AQL 1.5 NUMBER OF PIECES

Lot Size	Sample Size	Acceptance No.	Rejection No.	Sorted Out and Re- Offered
2 to 8	100 %	0	0	0
9 - 15	8	0	1	0
16 - 25	8	0	1	0
26 - 50	8	0	1	0
51 - 90	8	0	1	0
91 - 150	32	0	2	1
151 - 280	32	0	2	1
281 - 500	50	0	3	2
501 - 1200	80	0	4	3
1201 - 3200	125	0	6	5
3201 - 10000	200	0	8	7
10001 - 35000	315	0	11	10
35001 - 150000	500	0	15	14
150001 and above	800	0	22	21

Annexure to Standard Field Quality plan (FQP) for transmission line, Clause no. 3:
ENGINEERING GUIDE LINE FOR CHECKING/ACCEPTING SOIL INVESTIGATION REPORT

Following are the guide line for checking and accepting the soil investigation report:

The soil investigation shall be carried out in line with the Technical Specification. The detailed soil Investigation Report should be signed by the soil investigating agency, Line Contractor and PDD/J&K Site Engineer and following points should be checked in the soil investigation report:-

1) Normal Locations :

- a) Soil investigation report should contain the bore Log sheet indicating the variation of different soil strata.
- b) The Bearing capacity, Bulk density (γ), Submerged Density (γ_{Sub}) and Angle of internal friction (ϕ) for different soil layers including at 3m depth shall be indicated in the Soil investigation report.
- c) Present water table and history of variation of water table at the tower location shall be indicated in the soil investigation report.
- d) Classification of foundation should be indicated based on the water table, Bearing capacity, Swelling Index, Soil type and the value of internal friction (ϕ) in line with parameters indicated in the standard foundation drawings.

2) River Crossing Locations:-

- a) A sketch indicating profile of river crossing locations with borehole positions shall be indicated in the soil investigation report.
- b) Maximum discharge, Maximum velocity and Highest Flood Level (HFL) data (authenticated) of the river shall be enclosed in the Soil Investigation Report.
- c) Comprehensive Bore log Sheet indicating the depth of different Strata, Soil type, SPT value & water table for each bore hole is to be indicated in the soil investigation report.
- d) Natural Ground Level (GL) for all the locations is to be indicated. ***Note that the GL & HFL should be with respect to same reference. For example if HFL is given in RL, the ground level should be in terms of RL only. Mixing of level with respect to MSL (Mean Sea level) & RL should be avoided.***
- e) Whether the river is navigable or not is to be indicated in the soil investigation report.
- f) Silt factor calculation based on the laboratory test along with the relevant soil test results for different layers of the soil shall be furnished in the soil investigation report.

- g) Bulk density (γ), Submerged Density (γ_{Sub}), Value of Cohesion (C) and Angle of Internal Friction (ϕ) for different soil layers based on laboratory test results shall be indicated in the soil investigation report.
- h) If Rock is encountered prior to termination of bore hole (40m below existing Ground Level), core drilling should be done. The details of core recovery (Run wise) and calculation of Rock Quality Designation (RQD) together with the photograph of core sample properly placed in a core Box are to be enclosed in the soil investigation report.
- i) If the refusal is not obtained or the type of soil encountered at 40m depth below existing ground level is very poor (like loose clay, organic deposit etc.) further boring should be continued upto a depth of 50m below Ground Level or refusal whichever is earlier and all relevant data upto termination depth of bore holes shall be furnished in the Soil Investigation Report as detailed above.

APPENDIX-I

**PRE-COMMISSIONING PROCEDURES FOR
TRANSMISSION LINES**

PRE-COMMISSIONING PROCEDURES FOR TRANSMISSION LINES

INTRODUCTION

Over all procedure, safety rules, Statutory Requirements, dispatch procedures, switching sequences, observations, passing criteria and documentation of test results have been documented in this report.

The detailed inspection and handing over documents are required to be checked for the entire length of transmission line before energization.

The detailed inspection/test procedures for each activity have been elaborated in separate section of this documentation. The contents of this report are as following:

1. Definition
2. Overall Procedures
3. Safety procedures
4. Inspection
5. Statutory Requirements
6. Handing over
7. Protective system
8. Dispatch procedures
9. Switching procedures
10. Testing
11. Energization
12. De-energization
13. Observations and duration
14. Passing criteria
15. Documentation

1.0 DEFINITION

"Main Transmission Lines" means all high pressure cables and overhead lines (not being an essential part of the distribution system of a licensee) transmitting electricity from a generating station to another generating station or a sub-station, together with any step-up and step-down transformers, switch-gear and other works necessary to and used for the control of such cables or overhead lines, and such buildings or part thereof as may be required to accommodate such transformers, switch-gear and other works and the operating staff thereof;

"Power System" means a system under the control of the Government or any Board of Generating Company or other agency and having one or more-

- i) generating station; or
- ii) main transmission lines and sub-stations; or
- iii) generating stations and main transmission lines and substations;

"Regional Electricity Board" means any of the Boards as constituted immediately before the commencement of the Electricity Laws (Amendment) Act, 1991, by resolution of the Central Government for ensuring integrated operation of constituent system in the region;

"Regional Load Dispatch Centre" means the Centre so designated where the operation of each of the Regional Electricity Grids constituting the country's power system is coordinated;

"Sub-Station" means a station for transforming or converting electricity for the transmission or distribution thereof and includes transformers, convertors, switch-gear, capacitors, synchronous condensers, structures cables and other appurtenant equipment's and any buildings used for that purpose and the site thereof, a site intended to be used for any such purpose and any buildings used for housing the staff of the sub section;

"Tie-Line" means a line for the transfer of electricity between two power systems together with switchgear and other works necessary to and used for the control of such line.

2.0 OVERALL PROCEDURE

First it is to be ascertained that the transmission line to be energized is ready for operation and has been properly handed over (released) in writing. This will include all safety aspects, Electrical inspector clearance, PTCC clearance, statutory clearance, and final inspection, if any.

Instructions for the work and supervision are given by the test leader (Line in charge). However all switching and all operational activities will be executed by the regular operators.

Line charging instructions received from Engineering are clearly understood by the Line in charge and doubts, if any, are to be got clarified prior to the energisation of the line.

Once the line is handed over for charging no work shall be permitted without a valid WORKPERMIT.

When the whole system has been energized, including the AC line, it will be kept in this state for 8 hours or more for "soaking" with continuous inspection and monitoring. However, recommendations of the Engineering may be checked. Otherwise it may be put into continuous operation.

3.0 SAFETY PROCEDURES

Energization implies an abrupt and serious change of the working conditions in the plant.

In order to avoid serious accidents, thorough information must be imparted to all personnel involved in the construction of transmission line. Incharge of the Transmission line must ensure that due publicity has been made to the public in all the villages/areas along the line route cautioning them against climbing the towers etc. and that the line is proposed to be charged on so and so date. It is also to be confirmed that the AGENCIES involved in the construction activities shall not carry out any job on the said line without a valid WORK PERMIT.

It shall be ensured before charging that all men, material, Tools and plants and any temporary earthing on any part of the entire length of line are removed.

It must be ensured that any power supply / low voltage charging used as anti-theft measure must be disconnected and isolated to avoid accidental connection.

All equipment tests and pre-commissioning tests must have been completed, re-terminated (in case cables were isolated for testing purpose) and documented.

The system must be formally declared ready for energization and handed over for operation in writing.

4.0 INSPECTION

Before the line is scheduled to be handed over for the pre- commissioning /energization the same shall be inspected by representatives of PDD, J&K and Construction Agency as follows:

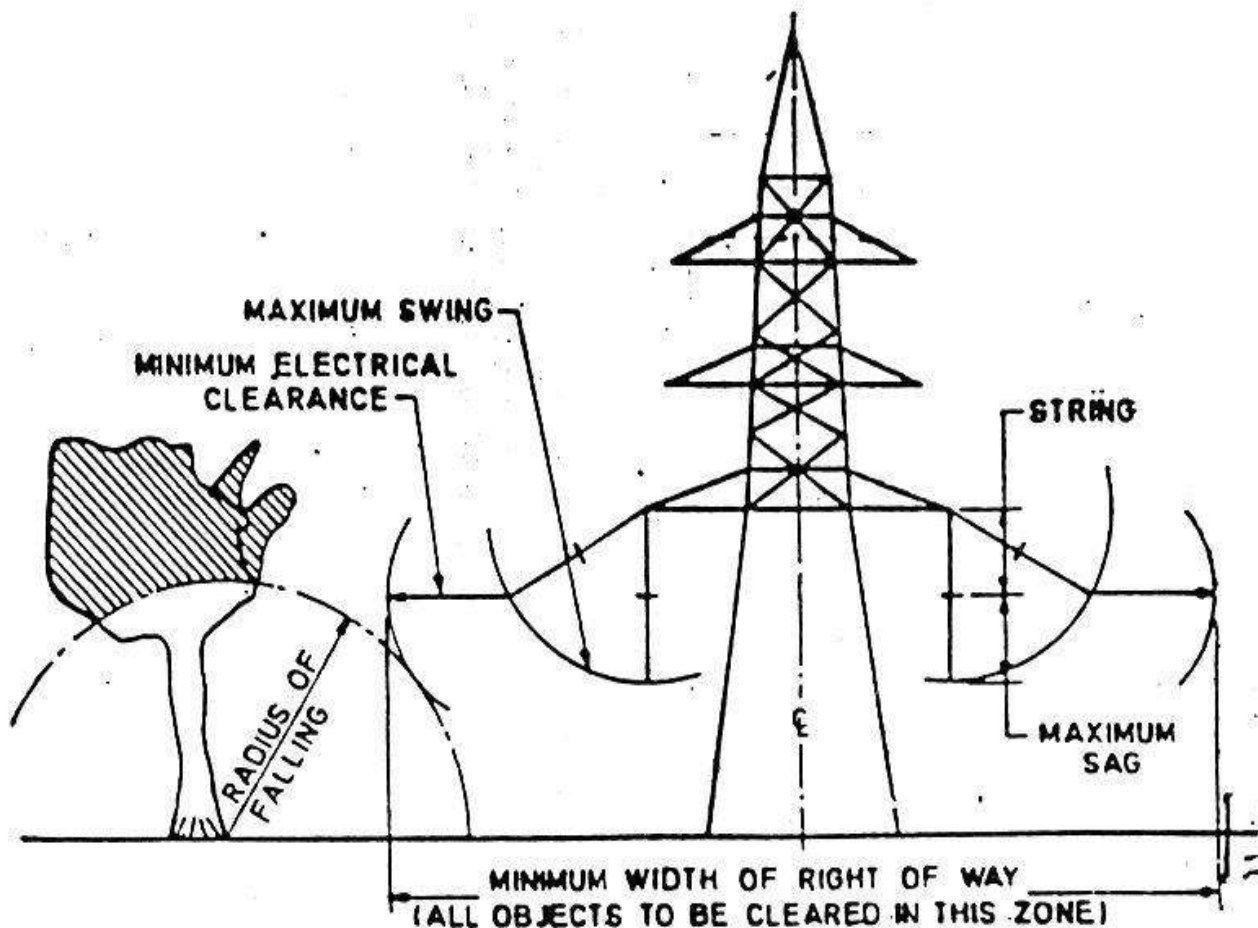
Such an inspection shall include:

- i) Right of way/way leave/electrical clearance
- ii) Foundation and Revetments/Protection Work
- iii) Tower and Tower accessories
- iv) Hardware Fittings
- v) Insulators
- vi) Conductors and Earthwire
- vii) Accessories for conductor and Earthwire
- viii) Aviation Warning Signals (Lights/globules/painting)

4.1 RIGHT OF WAY/WAY LEAVE/ELECTRICAL CLEARANCE

4.1.1 Right of way/Way leave clearance

Ensure that no tree/tree branches are falling within the zone of minimum clearance specified as per Fig. 1.



NOTE — Portion of tree falling within clearance zone to be lopped or trimmed.

FIG. 1 LINE CLEARANCE (RIGHT-OF-WAY) REQUIREMENTS

Guidelines of forest/environmental rules shall be followed to avoid excessive tree cutting i.e. all the trees should be cut from ROUTE level in the 3 meter corridor below each line Conductor/Earthwires. In the balance corridor, Trees branches are only to be lopped to attain the specified clearance as per Table no

TABLE NO. 1
CLEARANCE FOR RIGHT OF WAY

TRANSMISSION VOLTAGE IN KV	MINIMUM RIGHT OF WAY (IN MTRS)
66	18
132	27
220	35
400	52 (S/C)
400	46 (D/C)

4.1.2. Electrical Clearance

In case of line crossings, clearance between lowest conductor of line and top conductor of the other line shall be adequate as follows:

(Minimum clearances in mm between lines when crossing each other)

Sl. No.	Nominal System Voltage	66 kV	132 kV	220 kV	400 kV	765kV
1	66 kV	2480	3050	4580	5490	7940
2.	132 KV	3050	3050	4580	5490	7940
3.	220 KV	4580	4580	4580	5490	7940
4.	400 KV	5490	5490	5490	5490	7940
5.	765kV	7940	7940	7940	7940	7940

Jumpers in the tension tower are properly intact with conductor and form a parabolic shape in order to achieve adequate clearance from super steel structure.

4.1.2.1. Ground clearance

Normally at the time of construction adequate clearance is provided between lowest conductor and ground, but due to delay in charging/commissioning there are chances of dumping/heaping soil, earth and concrete etc. or staking bricks etc. which may cause reduction in ground clearance. In such cases the stored materials shall be removed.

Ensure that there is no temporary or permanent construction of houses or shades below the line. If the same has been constructed they shall be removed before charging.

The various clearances are given below as guidance however all the clearances indicated in Approved Drawings by Engineering is to be referred.

The ground profile at the time of commissioning shall be checked with the profile approved at the time of check survey.

Ground clearance of lowest conductors at critical points/where ever the lowest conductor is touching the ground shall be checked in the field from any of the prevalent method and the values of ground clearance at these critical points shall be recorded in the prescribed format.

In case of hilly Terrain and for building clearance, the side clearance from conductors and jumpers at critical points shall also be checked and recorded for all phases of conductor/earthwire towards hill/ building side.

The permissible minimum ground clearances for different voltages are as given below.

VOLTAGE (KV)	GROUND CLEARANCE (MM)
66	6100
132	6100
220	7015
400	8840

4.1.2.2. Clearance for Telephone line crossings

The minimum clearances between the conductors of the power line and telecommunication lines are specified as follows:

VOLTAGE (KV)	CLEARANCE (MM)
66	2440
132	2745
220	3050
400	4880

The vertical clearances between conductors and between conductor and earth-wire shall be checked randomly say in any one span of all sections and 10 sections of hilly areas from single line diagram of the towers.

4.2. FOUNDATION AND REVETMENTS / PROTECTION WORK

FOUNDATION:

There shall not be any damage/uneven settlement of foundations. For this, tolerances in levels of all four stubs should not exceed the criteria provided in the Annexure-C of IS -5613 (Part -3/Section 2):1989.***

It is to be ensured that back filling of foundation is properly done. Soil shall be filled over all legs up to ground level.

Extra surface earth after foundation back filling shall be removed from legs of the tower beyond a lead distance of 30 mtrs.

Any crack or break in chimney, if found, shall be repaired.

REVETMENTS / PROTECTION:

Cracks/damages to revetments shall be repaired.

Wherever revetments are provided, weep holes shall have slope such as to flush out the deposited water away from tower platform.

In case of hill terrain, the benching area should be leveled properly. The area around tower shall have proper slope for drainage of rain water.

SPECIAL FOUNDATION

4.3 TOWER AND TOWER ACCESSORIES

4.3.1. Normal Tower

After completion of a transmission line, all the towers shall be thoroughly checked before charging the line. Special attention shall be given to the points as mentioned below: -

Deformed/Buckled/missing/Rusted Members and Nuts and Bolts

It is to be ensured that no members are bend, deformed or rusted have been used in towers and if so, the same shall be replaced.

If any members is found missing, a new member shall be Fixed as per erection drawing of Towers.

Nuts shall be sufficiently tightened for the required Torque specified by Engineering/Approved Drawing.*** Minimum 2/3 complete threads shall be outside the nut. All bolts shall have their nuts facing outside of the tower for Horizontal connection and Downwards for Vertical connections.

Nuts & bolts shall be properly tack welded/punched as per the specification and proper zinc rich paint shall be applied. It shall be ensured that the circular length of each welding shall be at least 10mm.

It shall also be ensured that all extra blank holes provided on tower members are filled with correct size of nuts & bolts.

4.3.2 Special Towers

In addition to the above checks for towers, ladders and platforms provided in special towers shall be properly tightened and no foreign material shall be left out on such platforms.

Earthing of Towers

Ensure that proper earthing of tower has been done and earthing strip is neither damaged nor broken and is properly fixed to the stub.

In case of counter poise earthing, it is to be ensured that earthwire is sufficiently buried in the ground and no where it has drag out during cultivation. The length of counter-poise is normally 30 mtrs. as per TS.

Before charging of the line, ensure that resistance is below 10 ohms. If the value (before stringing) has been recorded higher than 10 ohm, earthing shall be changed to counterpoise type.

Earthing of special towers shall be verified as per approved drawings applicable for special towers/special foundation. (In case of anchor foundation bolt/anchor plate welded with last leg of special tower.)

4.3.3. Tower accessories

All the danger plates, number plates, circuit plates, and phase plates shall be in position & as per the specification.

All plates shall be properly tightened.

It shall be ensured that phase plates are fixed in correct phase sequence. Especially at transposition towers, the phase plates in the correct phase sequence shall be provided at each towers or end tower as per the specification of the line.

It shall be ensured that the anti-climbing device (ACD) is provided, at the suitable height of tower. In case of barbed wire ACD, barbed wire shall be tightly fixed. In case of spike type ACD, all spikes shall be properly fixed and oriented towards outer face of tower.

It shall be ensured that the step bolts (for normal towers) are provided up to the peak of tower. Any missing step bolts shall be replaced.

Fixing of birds guards (up to 220 kV/wherever applicable) shall be ensured.

4.4. HARDWARE FITTINGS

Tightening of all bolts and nuts are to be checked up to specified torque.

Check the fixing of all security clips (W/R type clips).

Surface condition of corona control rings and distance/alignment between Tower side arcing horn (wherever applicable) and line side arcing horn/corona control ring to be checked as per approved drawings.

Ensure that, no. of insulators per string is lesser by one number as compared to no. of discs in normal string (up to 220 kV) at approach spans to the terminal ends (approx.. last 1.5 KM).

To restrict the swing of jumpers, the provision of Pilot strings in case of Tension Towers shall be verified from the approved drawings.

4.5 INSULATORS

All the damaged/broken insulator discs shall be replaced.

Unusual deflection in suspension strings if observed shall be rectified.

The insulators shall be cleaned before charging.

IR value of individual disc of at least 5 insulators at random shall be checked by 5/10 kV Megger.

4.6. CONDUCTORS and EARTHWIRES

Surface Condition

Surface of the conductors shall be free from scratches/rubs

Ensure that conductor strands are not cut and opened up. Wherever strands are found cut/damaged/scratched, they must be repaired with repair sleeves/repair protective rods in case the nos. of damaged strands are within specified limits (normally up to 1/6th nos. of strands in the outer layer). ***

4.7. ACCESSORIES FOR CONDUCTOR AND EARTHWIRES

4.7.1. Joints

All joints on conductor/earthwires shall be away from the tower at a distance of at least 30 metres or as provided in the Technical specification (TS).

Ensure that not more than one joint in a conductor is provided in one span or provided.

Ensure that no mid span joint is provided in major crossings for main roads, railway crossing and major rivers etc. or provided in TS.

Ensure that all mid span joints on conductors/earthwire and repair sleeves of compression type are free from sharp edges, rust and dust. Wherever grease is specified the same shall be applied in the joints.

4.7.2. Clipping

Ensure that conductor is not over tightened in the suspension clamps.

4.7.3 Spacers, vibration dampers and copper bonds

Placement and no. of dampers on each phase shall be verified as per damper placement chart.

Damaged/missing spacers shall be replaced and loose/displaced spacers shall be tightened / relocated.

Spacing of Vibration dampers from the tower and spacing between damper to damper in case two Vibration Dampers (VD) are provided, shall be verified as per the damper placement chart. All loose/ displaced VD shall be properly tightened / relocated and missing VDs shall be provided.

To be ensured that no copper bond is loose/missing.

4.7.4 Jumpers

Verify Electrical clearance of jumpers to tower body as per design.

All the jumpers shall be checked properly. In case, jumpers (conductor /earthwire) is found loose, it shall be tightened sufficiently.

4.7.5 Foreign material

Ensure that all foreign materials viz. dead bird, fallen tree branches, bird nests etc. on conductors, earthwires, Jumper, insulator string, cross arms are removed.

4.7.6. Others

It shall be ensured that all temporary/local earthing, guys, T & P (Tools and Plants), foreign material and other loose material which were used during stringing/tower erection have been removed.

In case there is any change in the ground profile before commissioning of line from the approved profile, the extra earth/obstruction /temporary sheds/any other construction shall be removed.

4.8 AVIATION WARNING/ OBSTRUCTION SIGNAL (LIGHTS/ GLOBULES /PAINTING).

It shall be ensured that following measures have been taken in the line/ Towers falling within obstruction zone of civil aviation and defense establishments as per their requirement and our specification.

Day markers

Painting of Full / Top portion of Towers with Red/Orange and White Paint.

Globules on earth wires have been provided.

Night markers

It shall be ensured that proper aviation lights at the peak level/at specified heights of towers have been provided along with Solar panels/Battery banks/Control cubicles and other accessories as per specification. The functioning of lights with simulation is to be checked / verified.

5.0 STATUTORY REQUIREMENT

5.1. The concerned authorities shall be informed before commissioning the lines and their approval obtained in accordance with Indian Electricity Act, 1910 and Indian Electricity Rule, 1956 and Electricity Act 2003.

5.2 Before charging of the line PTCC approval from P&T Dept. shall be obtained.

6.0 HANDING OVER

The transmission line shall be inspected prior to energization and a formal handing over document to be jointly signed by the representative of SUPPLIER (if available), ERECTION AGENCY, PDD, J&K ERECTION. However all contractual taking over has to be resolved separately as per the terms and conditions of the contract. The Handing over shall be limited to the completion of Erection and ready for Energization.

Any outstanding points or remaining activities are to be listed jointly by PDD, J&K and ERECTION and signed jointly. These documents are also to be retained at Site office with a copy to Circle office. The remaining activities/outstanding points are classified in the following category.

Details of the SECTIONS:

- A. List of outstanding activities remaining in any part of the line
- B. A list of temporary arrangements introduced.
- C. Check list records properly documented, completed and signed.
- D. Original tracing of Profile, Route Alignment, Tower Design, Structural Drawings, Bill of Materials, Shop Drawings, Stringing charts (initial and final as applicable) etc. of all towers/line submitted to PDD, J&K. With the outstanding activities mentioned above are solved or with only minor points without influence on the charging remain (minor issues handing over of the transmission line shall be accepted by the pre-commissioning team. This handing over for energization with or without remaining activities shall be made by the group head to the commissioning in charge in writing .

Shortcomings noticed during the inspection, "List of outstanding activities" shall be recorded and a copy of the format is to be given to the responsible parties

like SUPPLIER(s) and ERECTION AGENCY etc. for corrective action to be taken on a time schedule.

7.0 PROTECTIVE SYSTEM

Before energization it must be ascertained that all protective systems for the unit to be energized are operative.

This includes confirmation that the protections have been properly tested and that the tests have been documented.

It also includes verification by inspection or otherwise, if necessary by repetition of trip test, that the protections are actually functionally enabled. This verification serves to prevent that energization takes place of a unit where a protection has been disabled for test or other reason.

8.0 DISPATCH PROCEDURES

All operational activities (switching etc.) must be coordinated and communicated with the system dispatcher.

In this respect the general procedures already established by PDD, J&K will be followed.

9.0 SWITCHING PROCEDURES

For each activity the instructions to the operators and the communications to the dispatchers will be made in writing or by confirmed telephone messages. The switching procedures first to be properly documented step by step and understood by everybody involved in the switching operation prior to the energisation. Any clarification required in the procedures must be resolved. The format established by PDD, J&K for switching orders and operational data logging shall be followed.

The implication of this is that each and every activity must be listed and described, so that complete information is available for detail investigation, if required in future.

10.0 TESTING AND MEASUREMENT PROCEDURES

10.1. Earth Resistance Measurement

Normally Earth tester is used for measuring

- a) soil resistivity.
- b) earth resistance
- a. Prior to the testing of soil resistivity and earth resistance the operation manual of the testing instrument available at site may be referred and procedures to be adopted for measurement of soil resistivity and earth resistance.

A typical Earth tester has 4 terminals. C1, P1, C2, P2 and 4 similar electrodes are driven in the ground at equal distances and connected to the instruments in the order of C1' P1 and P2, C2. Then the handle is rotated or button is pressed and the reading of the resistance is read on the megger scale. If R is the resistance measured then the

Specific resistivity = $2 \pi aR$

Where a is the distance between the electrode and R is the resistance in ohms measured on the megger.

- b) In order to measure earth resistance of electrode of the substation it could be connected to C1 and the value of R could be read in the scale with the rotation of the handle of the megger. This will give the earth resistance. The value as far as possible shall be below 10 Ohm. To improve the value, water shall be sprinkle at the earthing pit.

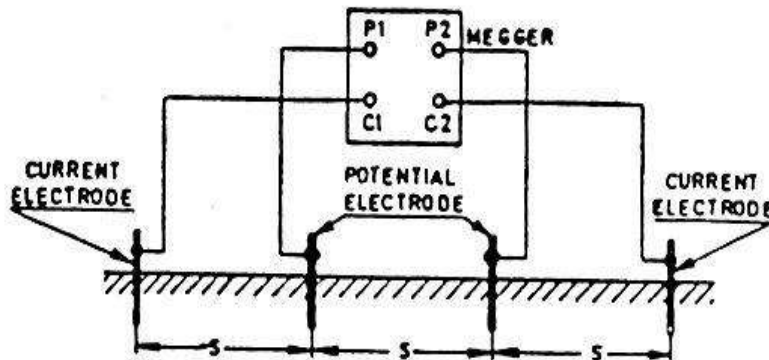


fig : 2 Test connection for a four terminal Megger

10.2 Before commissioning of the lines following tests may be carried out.

10.2.1 Insulation Resistance Test

This test may be carried out with the help of a 10 OR 12 KV megger preferably power driven to ascertain the insulation condition of the line. In case 5 kV megger is used for insulation resistance measurement it shall be ensured that the induced voltage (CVT reading) is LESS than the instrument withstanding capacity otherwise it is likely that the instrument may be damaged.

This Test is to be carried out First prior to the continuity test.

Measurement of Insulation Resistance

One of the most common devices used for testing electrical insulation is the Megger Insulation Tester.

The DC test voltage is generated by a permanent magnet generator. This generator is turned either by hand or by an electric motor. In either case a slip clutch maintains the generator speed at a constant value so long as the slipping speed is exceeded. A constant voltage is important when the insulation under test has a high capacitance. Common generator output voltage are 500, 1000, 2500 and 5000 volts.

Many Meggers have a "guard" terminal as well as "line" and "earth". The guard terminal is useful if one wish to exclude part of the insulation under test from the measurement. This is possible since current flowing to the generator via the guard circuit does not pass through the deflecting coil.

Another use of the guard circuit is to shield the "line" lead between the Megger and the apparatus under test. This prevents leakage to ground from the "line" lead which would invalidate the Megger reading.

Insulation resistance is the ratio V_{DC}/I_{DC} . V_{DC} is applied across two conductors separately by the insulation under test.

I_{DC} is the current flowing through/over the insulation. For a healthy and clean insulation the megger reading is in mega-Ohms to infinity. For dirty insulation and defective, moist insulation the meggers shows a very low insulation resistance value.

Megger test gives clear indication about the health, cleanliness and dryness of the line/equipment insulation.

5 KV megger or 10 KV megger or 12 KV megger may be used for the Transmission line keeping all safety requirements, Permit to work, clearance from statutory bodies and other conditions prevailing at the Sub-station where charging of the line is being co-ordinated.

10.2.2 Conductor Continuity Test

10.2.2.1 The objective of this test is to verify that each conductor of the overhead line properly connected electrically (the value of electrical resistance of line does not vary abnormally from that of a continuous conductor of the same size and length). The electrical resistance of the conductor shall be measured with a Whetstone bridge or other suitable instrument, if available taking the safety aspects of Equipment as well as testing Engineer.

A simple method of continuity test is illustrated below:

Once the insulation test is completed and the results confirms no short circuit carry the following:

SENDING END	RECEIVING END	RESULTS (OHMS)
CLOSE R-Ph GS	MEGGER R- Ph	ZERO/LOW
OPEN Y – Ph GS	MEGGER Y-Ph	HIGH
OPEN B-Ph GS	MEGGER B-Ph	HIGH
OPEN R-Ph GS	MEGGER R-Ph	HIGH
CLOSE Y – Ph GS	MEGGER Y-Ph	ZERO/LOW
OPEN B-Ph GS	MEGGER B-Ph	HIGH
OPEN R-Ph GS	MEGGER R-Ph	HIGH
OPEN Y-Ph GS	MEGGER Y-Ph	HIGH
CLOSE B-Ph GS	MEGGER B-Ph	ZERO/LOW

(ALL GS OPEN CONDITION)

GS means GROUND SWITCH

If the above test results are OK it confirms the continuity of the line.

10.2.2.2 The continuity Test of the line with proper phase indication or phase marking can be checked by continuity test as described below:

SENDING END	RECEIVING END MEGGER BETWEEN	RESULTS (OHMS)
CONNECT R&Y PHASE B-PHASE & ALL GS OPEN	R PHASE & Y PH	ZERO OR LOW
	Y PHASE & B PH	HIGH
	B PHASE & R PH	HIGH
CONNECT R & B PHASE Y PHASE & ALL GS OPEN	R PHASE & Y PH	HIGH
	Y PHASE & B PH	HIGH
	B PHASE & R PH	ZERO OR LOW
CONNECT Y & B PHASE R-PHASE & ALL GS OPEN	R PHASE & Y PH	HIGH
	Y PHASE & B PH	ZERO OR LOW
	B PHASE & R PH	HIGH

If the test results are OK it confirms that marking of the phases are in order.

10.2.2.2 Phase Sequence

Once the line is charged from one end, without closing the Breaker at the other end the Phase sequence is to be checked from the CVT output by the help of Phase Sequence Meter. In case there are other feeders available Phase sequence is to be RECHECKED by the measurement of secondary voltage of both the Feeders (New line & available charged line).

Let the secondary Voltage of CVT is 110 volts (ph to ph) for both the Circuit.
In case of correct Phase Sequence the voltage reading shall be as follows:

NEW CIRCUIT	OLD CIRCUIT	VOLTAGE
R-Phase	R-Phase	0
R-Phase	Y-Phase	110
R-Phase	B-Phase	110
Y-Phase	R-Phase	110
Y-Phase	Y-Phase	0
Y-Phase	B-Phase	110
B-Phase	R-Phase	110
B-Phase	Y-Phase	110
B-Phase	B-Phase	0

In case the results are not matching the phase sequence in to be rechecked and reconfirmed before closing the breaker.

11.0 ENERGIZATION

Execution of the energization is simply the last event in the switching sequence, switching of the close control button for the relevant circuit breaker.

12.0 DE-ENERGIZATION

Instructions about de-energization will be given only if this is part of the test. Otherwise de-energization will be considered part of regular operation.

13.0 OBSERVATION AND DURATION

Visual and audible inspection (look and listen) of the relevant equipment and reading of permanent instrumentation will be made.

The system shall be charged at least for 8 hours. During this time continuous monitoring and inspection will be maintained in control room, auxiliary systems areas and switch yards.

This will include frequent, scheduled inspection of all equipment and reading of all permanent instruments and recorders, and surge arrester counters, especially system parameters as per standard procedures adopted by PDD, J&K.

14.0 PASSING CRITERIA

Neither insulation breakdown nor protective system actions must occur. No irregular equipment behaviour noise, vibration, high temperature is permitted.

Corona discharges may not be “unreasonable”. Local discharges that may be attributable to sharp points shall be carefully located and recorded. After termination of the energization the equipment shall be closely inspected and the points rounded or covered.

No unscheduled changes of system or of equipment are permitted during the 8 hour energized condition.

15.0 DOCUMENTATION

Switching and operational activities will be recorded in regular manner in the operator’s log. Likewise, all readings of permanent instruments are to be recorded. Copies of this log, notes on special observations from inspections and other measurements will constitute the test records.

SECTION-V

TECHNICAL SPECIFICATIONS

SECTION-V

CONTENTS

Clause No.	Description
1.0	Technical Description of ACSR Conductor
2.0	Tests and Standards
3.0	Annexure-A : Tests on Conductor
4.0	Annexure-B : Standard Technical Particulars
5.0	Drum Drawing

TECHNICAL SPECIFICATIONS

SECTION-V

1. Technical Description of ACSR Conductor

1.1 Details of Conductor

1.1.1 The ACSR Conductor shall generally conform to IEC: 1089/ IS: 398 except where otherwise specified herein.

1.1.2 The salient parameters of the ACSR Conductor are indicated below.

ACSR Deer Conductor

a)	Stranding and wire diameter	30/4.27mmAl +7/4.27 mm steel
b)	Number of Strands	
	Steel core	1
	1st steel layer	6
	1st Aluminium layer	12
	2nd Aluminium layer	18
c)	Overall Diameter (mm)	29.89
d)	Sectional area of Aluminium	429.60
e)	Total sectional area	529.80

1.1.3 Standard Technical Particulars

1.1.3.1 The Standard Technical Particulars (STP) of the ACSR conductor are enclosed at Annexure-B of this section. The values indicated in the STP are the minimum and/or maximum values required to be met by the Supplier.

1.2 Workmanship

1.2.1 All the Aluminium and steel strands shall be smooth, uniform and free from all imperfections, such as spills and splits, die marks, scratches, abrasions, etc., after drawing and also after stranding.

1.2.2 The finished conductor shall be smooth, compact, uniform and free from all imperfections including kinks (protusion of wires), wire cross over, over riding, looseness (wire being dislocated by finger/hand pressure and/or unusual bangle noise on tapping), material inclusions, white rust, powder formation or black spot (on account of reaction with trapped rain water etc.), dirt, grit etc.

1.2.3 The steel strands shall be hot dip galvanised and shall have a minimum zinc coating as indicated in the STP. The zinc coating shall be smooth, continuous, of uniform thickness, free from imperfections and shall withstand number of dips in standard Preece test as indicated in STP. The steel wire rods shall be of such quality and purity that, when drawn to the size of the strands specified and coated with zinc, the finished strands and the individual wires shall be of uniform quality and have the same properties and characteristics as prescribed in IEC: 888.

1.2.4 The steel strands shall be preformed and post formed in order to prevent spreading of strands in the event of cutting of composite core wire. Care shall be

taken to avoid, damages to galvanisation during pre-forming and post-forming operation.

1.3 Joints in Wires

1.3.1 Aluminium Wires

1.3.1.1 During stranding, no aluminium wire welds shall be made for the purpose of achieving the required conductor length.

1.3.1.2 No joints shall be permitted in the individual wires in the outer most layer of the finished conductor. However joints are permitted in the inner layer of the conductor unavoidably broken during stranding, provided such breaks are not associated with either inherently defective wire or with the use of short lengths of aluminium wires. Such joints shall not be more than four (4) per conductor length and shall not be closer than 15 meters from joint in the same wire or in any other aluminium wire of the completed conductor.

1.3.1.3 Joints shall be made by cold pressure butt welding and shall withstand a stress of not less than the breaking strength of individual strand guaranteed.

1.3.2 Steel Wires

There shall be no joint of any kind in the finished wire entering into the manufacture of the strand. There shall also be no strand joints or strand splices in any length of the completed stranded steel core of the conductor.

1.4 Tolerances

The manufacturing tolerances to the extent indicated in the STP shall be permitted in the diameter of individual aluminium and steel strands and lay-ratio of the conductor

1.5 Materials

1.5.1 Aluminium

The aluminium strands shall be hard drawn from electrolytic aluminium rods having purity not less than 99.5% and a copper content not exceeding 0.04%. They shall have the same properties and characteristics as prescribed in IEC: 889.

1.5.2 Steel

The steel wire strands shall be drawn from high carbon steel wire rods produced by either the acid or the basic open-hearth process, the electric furnace process, or the basic oxygen process and shall conform to the chemical composition indicated in the STP.

The Steel wire strands shall have the same properties and characteristics as prescribed for regular strength steel wire in IEC: 888.

1.5.3 Zinc

The zinc used for galvanizing shall be electrolytic High Grade Zinc of 99.95% purity as per IS: 209. It shall conform to and satisfy all the requirements of IS: 209.

1.6 Standard Length

- 1.6.1 The standard length of the conductor shall be as indicated in the STP. All lengths outside this limit of tolerance shall be treated as random lengths. Not less than 90% of the total quantity of the conductor shall be supplied in standard lengths.
- 1.6.2 Random lengths will be accepted provided no length is less than 70% of the standard length and the total quantity of such random lengths shall not be more than 10% of the total quantity ordered. When one number random length has been manufactured at any time, five (5) more individual lengths each equivalent to the above random length with a tolerance of +/- 5% shall also be manufactured and all the above six random lengths shall be dispatched in the same shipment. At no point, the cumulative quantity supplied of such random lengths shall not be more than 12.5% of the total cumulative quantity supplied including such random lengths. However, the last 20% of the quantity ordered shall be supplied only in standard lengths as specified.
- 1.6.3 The Employer reserves the right to place orders for the lengths above the standard length on the same terms and conditions applicable for the standard lengths during the pendency of the Contract.

2.0 Tests and Standards

2.1 Type Tests

The following tests shall be conducted once on a sample/samples of conductor from each manufacturing facility:

- a) DC resistance test on stranded conductor
- b) UTS test on stranded conductor
- c) Radio Interference Voltage Test (dry)
- d) Corona Voltage Extinction Test (dry)

As per Annexure-A

2.1.1 Type tests specified under Clause 2.1 shall not be required to be carried out if a valid test certificate is available for a similar design, i.e., tests conducted earlier should have either been conducted in accredited laboratory (accredited based on ISO/IEC vide 25/17025 or EN 45001 by the National accreditation body of the country where laboratory is located) or witnessed by the representative(s) of PDD, J&K or Power utility. The test reports submitted shall be for the tests conducted within last 5 (five) years prior to date of bid opening.

In case the test have been conducted earlier than the above stipulated period or in the event of any discrepancy in the test report (i.e., any test not applicable due to any design/manufacturing change including substitution of components or due to non-compliance with the requirement stipulated in the Technical Specifications), the tests shall be conducted by the Contractor at no extra cost to the Employer.

2.2 Acceptance Tests

- a) Visual and dimensional check on drum

As per Annexure-A

b)	Visual check for joints scratches etc. and length measurement of conductor by rewinding	
c)	Dimensional check on Steel and Aluminium strands	
d)	Check for lay-ratios of various layers	
e)	Galvanizing test on steel strands	
f)	Torsion and Elongation tests on steel strands	
g)	Breaking load test on steel and Aluminium strands	
h)	Wrap test on Steel & Aluminium strands	IEC : 888 & 889
i)	DC resistance test on Aluminium strands	IEC : 889
j)	Procedure qualification test on welded joint of Aluminium strands	Annexure-A
k)	Barrel Batten strength test	Annexure-A

Note: All the above tests except (j) shall be carried out on Aluminium and steel strands after stranding only.

2.3 Routine Test

- a) Check to ensure that the joints are as per Specification
- b) Check that there are no cuts, fins etc., on the strands.
- c) Check that drums are as per Specification
- d) All acceptance test as mentioned above to be carried out on each coil/drum (as applicable)

2.4 Tests During Manufacture

a)	Chemical analysis of zinc used for galvanizing	
b)	Chemical analysis of Aluminium used for making Aluminium strands	As per Annexure-A
c)	Chemical analysis of steel used for making steel strands	

2.5 Testing Expenses

2.5.1 As indicated in clause no. 2.1.1, no type test charges shall be payable.

2.5.2 In case testing is required due to non-availability of valid type test reports, bidder shall indicate the laboratories in which they propose to conduct the type tests. They shall ensure that adequate facilities are available in the laboratories and the tests can be completed in these laboratories within the time schedule guaranteed by them.

2.5.3 In case of failure in any type test the Supplier is either required to manufacture fresh sample lot and repeat the entire test successfully once or repeat that

particular type test three times successfully on the sample selected from the already manufactured lot at his own expenses. In case a fresh lot is manufactured for testing then the lot already manufactured shall be rejected.

2.5.4 The entire cost of testing for the acceptance and routine tests and Tests during manufacture specified herein shall be treated as included in the quoted unit price of conductor, except for the expenses of the inspector/Employer's representative.

2.5.5 In case of failure in any type test, if repeat type tests are required to be conducted, then all the expenses for deputation of Inspector/Employer's representative shall be deducted from the contract price. Also if on receipt of the Supplier's notice of testing, the Employer's representative does not find 'plant' to be ready for testing the expenses incurred by the Employer for re-deputation shall be deducted from contract price.

2.6 Additional Tests

2.6.1 The Employer reserves the right of having at his own expenses any other test(s) of reasonable nature carried out at Supplier's premises, at site or in any other place in addition to the aforesaid type, acceptance and routine tests to satisfy himself that the materials comply with the Specifications.

2.6.2 The Employer also reserves the right to conduct all the tests mentioned in this specification at his own expense on the samples drawn from the site at Supplier's premises or at any other test centre. In case of evidence of non compliance, it shall be binding on the part of Supplier to prove the compliance of the items to the technical specifications by repeat tests, or correction of deficiencies, or replacement of defective items all without any extra cost to the Employer.

2.7 Sample Batch for Type Testing

2.7.1 The Supplier shall offer material for selection of samples for type testing only after getting Quality Assurance Plan approved from Employer's Quality Deptt. The sample shall be manufactured strictly in accordance with the Quality Assurance Plan approved by Employer.

2.7.2 The Supplier shall offer at least three drums for selection of sample required for conducting all type tests.

2.7.3 The Supplier is required to carry out all the acceptance tests successfully in presence of Employer's representative before sample selection.

2.8 Test Reports

2.8.1 Copies of type test reports shall be furnished in at least six copies along with one original. One copy will be returned duly certified by the Employer only after which the commercial production of the material shall start.

2.8.2 Record of routine test reports shall be maintained by the Supplier at his works for periodic inspection by the Employer's representative.

2.8.3 Test Certificates of tests during manufacture shall be maintained by the Supplier. These shall be produced for verification as and when desired by the Employer.

2.9 Inspection

- 2.9.1 The Employer's representative shall at all times be entitled to have access to the works and all places of manufacture, where conductor shall be manufactured and representative shall have full facilities for unrestricted inspection of the Supplier's works, raw materials and process of manufacture for conducting necessary tests as detailed herein.
- 2.9.2 The Supplier shall keep the Employer informed in advance of the time of starting and of the progress of manufacture of conductor in its various stages so that arrangements can be made for inspection.
- 2.9.3 No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested, unless the inspection is waived off by the Employer in writing. In the latter case also the conductor shall be dispatched only after satisfactory testing for all tests specified herein have been completed.
- 2.9.4 The acceptance of any quantity of material shall in no way relieve the Supplier of any of his responsibilities for meeting all requirements of the Specification, and shall not prevent subsequent rejection if such material is later found to be defective.

2.10 Test Facilities

- 2.10.1 The following additional test facilities shall be available at the Supplier's works:
- a) Calibration of various testing and measuring equipment including tensile testing machine, resistance measurement facilities, burette, thermometer, barometer, digital ohm meter etc.
 - b) Standard resistance for calibration of resistance bridges.
 - c) Finished conductor shall be checked for length verification and surface finish on separate rewinding machine at reduced speed (variable from 8 to 16 meters per minute). The rewinding facilities shall have appropriate clutch system and free of vibrations, jerks etc. with traverse laying facilities.

2.11 Packing

- 2.11.1 The conductor shall be supplied in non-returnable, strong, wooden drums provided with lagging of adequate strength, constructed to protect the conductor against all damage and displacement during transit, storage and subsequent handling and stringing operations in the field. The Supplier shall be responsible for any loss or damage during transportation handling and storage due to improper packing. The drums shall generally conform to IS: 1778, except as otherwise specified hereinafter.
- 2.11.2 The drums shall be suitable for wheel mounting and for letting off the conductor under a minimum controlled tension of the order of 5 KN.
- 2.11.3 The general outline of the drum for conductor shall be as in the annexed drawings. The Bidder should submit their proposed drum drawings along with the bid.

- 2.11.4 For conductor, one standard length shall be wound on each drum.
- 2.11.5 All wooden components shall be manufactured out of seasoned soft wood free from defects that may materially weaken the component parts of the drums. Preservative treatment shall be applied to the entire drum with preservatives of a quality which is not harmful to the conductor.
- 2.11.6 The flanges shall be of two ply construction with each ply at right angles to the adjacent ply and nailed together. The nails shall be driven from the inside face flange, punched and then clenched on the outer face. The thickness of each ply shall not vary by more than 3mm from that indicated in the figure. There shall be at least 3 nails per plank of ply with maximum nail spacing of 75mm. Where a slot is cut in the flange to receive the inner end of the conductor the entrance shall be in line with the periphery of the barrel.
- 2.11.7 The wooden battens used for making the barrel of the conductor shall be of segmental type. These shall be nailed to the barrel supports with at least two nails. The battens shall be closely butted and shall provide a round barrel with smooth external surface. The edges of the battens shall be rounded or chamfered to avoid damage to the conductor.
- 2.11.8 Barrel studs shall be used for the construction of drums. The flanges shall be holed and the barrel supports slotted to receive them. The barrel studs shall be threaded over a length on either end, sufficient to accommodate washers, spindle plates and nuts for fixing flanges at the required spacing.
- 2.11.9 Normally, the nuts on the studs shall stand protruded of the flanges. All the nails used on the inner surface of the flanges and the drum barrel shall be counter sunk. The ends of barrel shall generally be flushed with the top of the nuts.
- 2.11.10 The inner cheek of the flanges and drum barrel surface shall be painted with a bitumen based paint.
- 2.11.11 Before reeling, card board or double corrugated or thick bituminised water-proof bamboo paper shall be secured to the drum barrel and inside of flanges of the drum by means of a suitable commercial adhesive material. After reeling the conductor, the exposed surface of the outer layer of conductor shall be wrapped with water proof thick bituminised bamboo paper to preserve the conductor from dirt, grit and damage during transport and handling.
- 2.11.12 A minimum space of 75 mm for conductor shall be provided between the inner surface of the external protective tagging and outer layer of the conductor.
- 2.11.13 Each batten shall be securely nailed across grains as far as possible to the flange, edges with at least 2 nails per end. The length of the nails shall not be less than twice the thickness of the battens. The nails shall not protrude above the general surface and shall not have exposed sharp, edges or allow the battens to be released due to corrosion.
- 2.11.14 The nuts on the barrel studs shall be tack welded on the one side in order to fully secure them. On the second end, a spring washer shall be used.

- 2.11.15 A steel collar shall be used to secure all barrel studs. This collar shall be located between the washers and the steal drum and secured to the central steel plate by welding.
- 2.11.16 Outside the protective lagging, there shall be minimum of two binder consisting of hoop iron /galvanised steel wire. Each protective lagging shall have two recesses to accommodate the binders.
- 2.11.17 The conductor ends shall be properly sealed and secured on the side of one of the flanges to avoid loosening of the conductor layers during transit and handling.
- 2.11.18 As an alternative to wooden drum Bidder may also supply the conductors in non-returnable painted steel drums. After preparation of steel surface according to IS: 9954, synthetic enamel paint shall be applied after application of one coat of primer. Wooden/Steel drum will be treated at par for evaluation purpose and accordingly the Bidder should quote in the package.

2.12 **Marking**

Each drum shall have the following information stenciled on it in indelible ink along with other essential data:

- (a) Contract/Award letter number.
- (b) Name and address of consignee.
- (c) Manufacturer's name and address.
- (d) Drum number
- (e) Size of conductor
- (f) Length of conductor in meters
- (g) Arrow marking for unwinding
- (h) Position of the conductor ends
- (i) Distance between outer-most Layer of conductor and the inner surface of lagging.
- (k) Barrel diameter at three locations & an arrow marking at the location of the measurement.
- (l) Number of turns in the outer most layer.
- (m) Gross weight of drum after putting lagging.
- (n) Tear weight of the drum without lagging.
- (o) Net weight of the conductor in the drum.
- (p) CIP/MICC No.

The above should be indicated in the packing list also.

2.13 **Verification of Conductor Length**

The Employer reserves the right to verify the length of conductor after unreeling. The quantity for verification shall be between a minimum of five percent (5%) to

a maximum of ten percent (10%) of the drums in a lot offered for inspection. The actual quantity will be discussed and mutually agreed to by the Supplier & Employer in the Quality Assurance Programme.

2.14 Standards

2.14.1 The conductor shall conform to the following Indian/International Standards, which shall mean latest revisions, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification.

2.14.2 In the event of the supply of conductor conforming to standards other than specified, the Bidder shall confirm in his bid that these standards are equivalent to those specified. In case of award, salient features of comparison between the standards proposed by the Supplier and those specified in this document will be provided by the Supplier to establish their equivalence.

Sl. No.	Indian Standard	Title	International Standard
1.	IS: 209-1992	Specification for zinc	BS:3436-1986
2.	IS: 398 Part-I -1996	Specification for Aluminium Conductors for Overhead Transmission Purposes	IEC:1089-1991 BS:215-1970
3.	IS:398 Part-II - 1996	Aluminum Conductor Galvanised Steel Reinforced	BS;215-1970 IEC:1089-1991
4.	IS:398 Part-V - 1992	Aluminum Conductor Galvanised Steel-Reinforced For Extra High Voltage (400 KV) and above	IEC:1089-1991 BS:215-1970
5.	IS : 1778-1980	Reels and Drums for Bare Conductors	BS:1559-1949
6.	IS : 1521-1991	Method of Tensile Testing of Steel Wire	ISO 6892-1984
7.	IS : 2629-1990	Recommended Practice for Hot Dip Galvanising of Iron and Steel	
8.	IS : 2633-1992	Method of Testing Uniformity of Coating on Zinc Coated Articles	
9.	IS : 4826-1992	Galvanised Coating on Round Steel Wires	IEC : 888-1987 BS:443-1969
10.	IS : 6745-1990	Methods of Determination of Weight of Zinc Coating of Zinc Coated Iron and Steel Articles	BS:433-1969 ISO 1460 - 1973
11.	IS : 8263-1990	Method of Radio Interference Tests on High Voltage Insulators	IEC:437-1973 NEMA:107-1964 CISPR
12.		Zinc Coated steel wires for stranded Conductors	IEC : 888-1987
13.		Hard drawn Aluminium wire for overhead line conductors	IEC : 889-1987

The standards mentioned above are available from:

Reference Abbreviation	Name and Address
BS	British Standards, British Standards Institution 101, Pentonville Road, N - 19-ND UK
IEC/CISPR	International Electro technical Commission, Bureau Central de la Commission, electro Technique international, 1 Rue de verembe, Geneva SWITZERLAND
BIS/IS	Beureau Of Indian Standards. Manak Bhavan, 9, Bahadur Shah Zafar Marg, New Delhi - 110001. INDIA
ISO	International Organisation for Standardization. Danish Board of Standardization Danish Standardizing Sraat, Aurehoegvej-12 DK-2900, Heeleprup, DENMARK.
NEMA	National Electric Manufacture Association, 155, East 44th Street. New York, NY 10017 U.S.A.

1. Tests on Conductor**1.1 UTS Test on Stranded Conductor**

Circles perpendicular to the axis of the conductor shall be marked at two places on a sample of conductor of minimum 5 m length between fixing arrangement suitably fixed on a tensile testing machine. The load shall be increased at a steady rate up to 50% of minimum specified UTS and held for one minute. The circles drawn shall not be distorted due to relative movement of strands. Thereafter the load shall be increased at steady rate to 100% of the UTS of conductor and held for one minute. The Conductor sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and this value shall be recorded.

1.2 Corona Extinction Voltage Test

The samples of conductor of 5 m length shall be strung at a height not exceeding 7.015 m above ground. The sample assembly when subjected to power frequency voltage shall have a corona extinction voltage of not less than 154 kV (rms) line to ground under dry condition. There shall be no evidence of corona on any part of the samples. The test should be conducted without corona control rings. However, small corona control rings may be used to prevent corona in the end fittings. The voltage should be corrected for standard atmospheric conditions.

1.3 Radio Interference Voltage Test

Under the conditions as specified under (1.2) above, the conductor samples shall have radio interference voltage level below 1000 microvolts at one MHz when subjected to 50 Hz AC voltage of 154 kV line to ground under dry conditions. This test may be carried out with corona control rings and arcing horns.

1.4 D.C. Resistance Test on Stranded Conductor

On a conductor sample of minimum 5m length two contact-clamps shall be fixed with a predetermined bolt torque. The resistance shall be measured by a Kelvin double bridge or digital ohm-metre of sufficient accuracy by placing the clamps initially zero metre and subsequently one metre apart. The test shall be repeated at least five times and the average value recorded. The value obtained shall be corrected to the value at 20°C as per IS: 398. The resistance corrected at 20°C shall conform to the requirements indicated in the STP.

1.5 Chemical Analysis of Aluminium and Steel

Samples taken from the Aluminium and steel ingots/coils/strands shall be chemically/spectrographically analysed. The same shall be in conformity to the requirements stated in this Specification.

1.6 Visual and Dimensional Check on Drums

The drums shall be visually and dimensionally checked to ensure that they conform to the requirements of this Specification.

1.7 Visual Check for Joints, Scratches etc.

Conductor drums shall be rewound in the presence of the Employer. The Employer shall visually check for scratches, joints etc. and that the conductor generally conform to the requirements of this Specification. Five percent (5%) to

ten percent (10%) drums from each lot shall be rewound in the presence of the Employer's representative. The actual quantity will be discussed and mutually agreed to by the Supplier & Employer in the Quality Assurance Programme.

1.8 Dimensional Check on Steel and Aluminium Strands

The individual strands shall be dimensionally checked to ensure that they conform to the requirement of this Specification.

1.9 Check for Lay-ratios of Various Layers

The lay-ratios of various layers shall be checked to ensure that they conform to the requirements of this Specification.

1.10 Procedure Qualification test on welded Aluminium strands.

Two Aluminium wire shall be welded as per the approved quality plan and shall be subjected to tensile load. The breaking strength of the welded joint of the wire shall not be less than the breaking strength of individual strands.

1.11 Chemical Analysis of Zinc

Samples taken from the zinc ingots shall be chemically/ spectrographically analyzed. The same shall be in conformity to the requirements stated in the Specification.

1.12 Galvanizing Test

The test procedure shall be as specified in IEC: 888. The material shall conform to the requirements of this Specification. The adherence of zinc shall be checked by wrapping around a mandrel four times the diameter of steel wire.

1.13 Torsion and Elongation Tests on Steel Strands

The test procedures shall be as per clause No. 10.3 of IEC: 888. In torsion test, the number of complete twists before fracture shall not be less than that indicated in the STP. In case test sample length is less or more than 100 times the stranded diameter of the strand, the minimum number of twists will be proportioned to the length and if number comes in the fraction then it will be rounded off to next higher whole number. In elongation test, the elongation of the strand shall not be less than 4% for a gauge length of 250 mm.

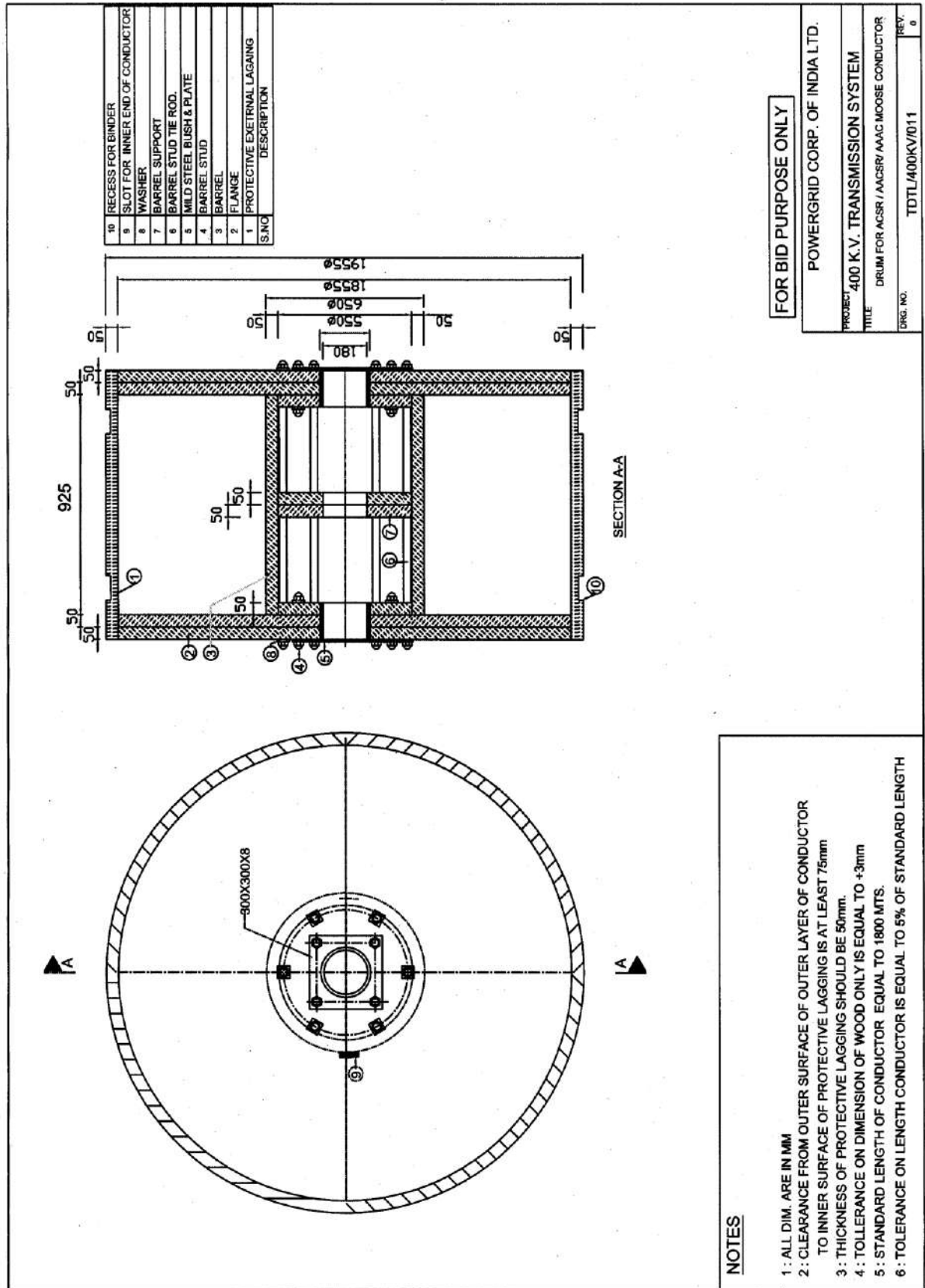
1.14 Check on Barrel Batten strength of Drums

The details regarding barrel batten strength test will be discussed and mutually agreed to by the Supplier & Employer in the Quality Assurance Programme.

STANDARD TECHNICAL PARTICULARS OF ACSR DEER CONDUCTOR

Sl.	Description	Unit	Guaranteed Values
1.0	Raw Materials		
1.1	Steel Wire / Rods		
1.1	Aluminium		
a)	Minimum purity of Aluminium	%	99.50
b)	Maximum copper content	%	0.04
1.2	Steel wires/ rods		
a)	Carbon	%	0.50 to 0.85
b)	Manganese	%	0.50 to 1.10
c)	Phosphorous	%	Not more than 0.035
d)	Sulphur	%	Not more than 0.045
e)	Silicon	%	0.10 to 0.35 (Max.)
1.3	Zinc		
a)	Minimum purity of Zinc	.%	99.95
2.0	Aluminum strands after stranding		
2.1	Diameter		
a)	Nominal	mm	4.27
b)	Maximum	mm	4.29
c)	Minimum	mm	4.25
2.2	Minimum breaking load of strand		
a)	Before stranding	KN	2.30
b)	After stranding	KN	2.18
2.3	Maximum resistance of 1 m length of strand at 20 deg. C	Ohm	0.001996
3.0	Steel strand after stranding		
2.1	Diameter		
a)	Nominal	mm	4.27
b)	Maximum	mm	4.33
c)	Minimum	mm	4.21
3.2	Minimum breaking load of strand		
a)	Before stranding	KN	18.48
b)	After stranding	KN	17.54
3.3	Galvanising		
a)	Minimum weight of zinc coating per sq.m.	gm	275
b)	Minimum number of dips that the galvanised strand can withstand in	Nos.	2 dips of one minute & 1 dip of half minute

Sl.	Description	Unit	Guaranteed Values	
	the standard preece test			
c)	Min. No. of twists in guage length equal 100 times the dia. of wire which the strand can withstand in the torsion test (after stranding)	Nos	16	
4.	Stranded Conductor			
4.1	UTS of the conductor	kN	178.40 (Min.)	
4.2	Lay length of outer steel layer	mm	Max	Min
a)	Outer Steel layer	mm	18	16
b)	12 wire Aluminium layer	mm	14	12
c)	18 wire Aluminium layer	mm	13	11
4.3	DC resistance of the conductor at 20°C	oh m/km	0.06854	
4.4	Standard length of the conductor	m	1800	
4.5	Tolerance on Standard length	%	(+/-) 5	
4.6	Direction of lay of outer layer		Right Hand	
4.7	Linear mass of the conductor			
a)	Standard	kg/km	1979	
b)	Minimum	kg/km	1939	
c)	Maximum	kg/km	2019	



SECTION-VI

SECTION-VI

CONTENTS

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**TECHNICAL SPECIFICATION
(SECTION-VI)**

1.0 Galvanised Steel Earth wire

1.1 Details of Earth wire

1.11 The galvanised steel earth wire shall generally conform to the specification of ACSR core wire as mentioned in IS:398 (Part-II)-1976 except where otherwise specified herein.

1.1.2 The basic details of the earth wire are tabulated below:

Sl. No.	Description	Unit	For 220 kV lines
1.	Stranding & Wire diameter	mm	7/4.27 (steel)
2.	Strands		
	a) Steel Core	No.	1 (one)
	b) Outer layer	No.	6 (six)
3.	Total sectional area	Sq. mm.	100.24

Other technical details are furnished in the section-I of this Specification.

1.2 Workmanship

1.2.1 All steel strands shall be smooth, uniform and free from all imperfections, such as spills and splits, die marks, scratches, abrasions and kinks after drawing and also after stranding.

1.2.2 The finished material shall have minimum brittleness as it will be subjected to appreciable vibration while in use.

1.2.3 The steel strands shall be hot dip galvanized and shall have minimum Zinc coating after stranding, as stipulated in annexure-B of this section of the Specification. The zinc coating shall be smooth, continuous, of uniform thickness, free from imperfections. The steel wire rod shall be of such quality and purity that, when drawn to the size of the strands specified and coated with zinc, the finished strands shall be of uniform quality and have the same properties and characteristics as prescribed in ASTM designation B498-M.

1.2.4 The steel strands shall be preformed and post formed in order to prevent spreading of strands while cutting of composite earth wire. Care shall be taken to avoid damage to galvanisation during preforming and post forming operation.

1.2.5 To avoid susceptibility towards wet storage stains (white rust), the finished material shall be provided with a protective coating of boiled linseed oil.

1.3 Joints in Wires

There shall be no joint of any kind in the finished steel wire strand entering into the manufacture of the earth wire. There shall be no strand joints or strand splices in any length of the completed stranded earth wire.

1.4 Tolerances

The manufacturing tolerance to the extent of the limits as stipulated in annexure- B of this section of the Specification only shall be permitted in the diameter of the individual steel strands and lay length of the earth wire:

1.5 Materials

1.5.1 Steel

The steel wire strands shall be drawn from high carbon steel rods and the chemical composition shall conform to the requirements as stipulated in Standard Technical Particulars attached herewith.

1.5.2 Zinc

The zinc used for galvanising shall be electrolytic High Grade Zinc and shall conform to the requirements of IS: 209.

1.6 Standard Length

1.6.1 The standard length of the earth wire shall be as stipulated in annexure-B of this section of the Specification with the specified tolerance on standard length.

1.6.2 Random length will be accepted provided no length is less than 70% of standard length and the total quantity of random lengths is not more than ten (10) percent of the total quantity in each shipment.

2.0 Standard technical Particulars

2.1 The Standard Technical Particulars to be adhered by the contractor/ manufacturer are furnished in Annexure-B of this section.

3.0 Tests and Standards

3.1 Type Tests on Earthwire

The following tests shall be conducted once on a sample / samples of earthwire from each manufacturing works:-

a)	UTS test	: As per Annexure - A
b)	DC resistance test	: As per Annexure - A

3.1.1 Type tests specified under Clause 3.1 shall not be required to be carried out if a valid test certificate is available for a similar design, i.e., tests conducted earlier should have either been conducted in accredited laboratory (accredited based on ISO/IEC vide 25/17025 or EN 45001 by the National accreditation body of the country where laboratory is located) or witnessed by the representative(s) of PDD, J&K or Power utility. The test reports submitted shall be for the tests conducted within last 5 (five) years prior to date of bid opening.

In case the test have been conducted earlier than the above stipulated period or in the event of any discrepancy in the test report (i.e., any test not applicable due to any design/manufacturing change including substitution of components or due to non-compliance with the requirement stipulated in the Technical Specifications), the tests shall be conducted by the Contractor at no extra cost to the Employer.

3.2 Acceptance Tests on Earthwire

a)	Visual and dimensional check on drum	: As per Annexure - A
b)	Visual check for joints scratches etc. and lengths of earthwire	: As per Annexure - A
c)	Dimensional check	: As per Annexure - A
d)	Lay length check	: As per Annexure - A
e)	Galvanising test	: As per Annexure - A
f)	Torsion test	: As per Annexure - A
g)	Elongation test	: As per IS:398 (Part-II)
h)	Wrap test	: As per IS:398 (Part-II)
i)	DC resistance test	: As per IS:398 (Part-II)
j)	Breaking load test	: As per IS:398 (Part-II)
k)	Chemical Analysis of steel	: As per Annexure - A

3.3 Routine Tests on Earthwire

a)	Check for correctness of stranding	: As per Annexure - A
b)	Check that there are no cuts, fins etc. on the strands.	: As per Annexure - A
c)	Check that drums are as per Specification	: As per Annexure - A

3.4 Tests During Manufacture Earthwire

- a) Chemical analysis of zinc used for galvanising : As per Annexure - A
- b) Chemical analysis of steel : As per Annexure - A

3.5 Testing Expenses

- 3.5.1 As indicated in clause no. 3.1.1, no type test charges shall be payable
- 3.5.2 Bidders shall indicate the laboratories in which they propose to conduct the type tests. They shall ensure that the tests can be completed in these laboratories within the time schedule guaranteed by them.
- 3.5.3 In case of failure in any type test the Contractor is either required to manufacture fresh sample lot and repeat all the test successfully once or repeat that particular type test three times successfully on the sample selected from the already manufactured lot at his own expenses. In case fresh lot is manufactured for testing then the lot already manufactured shall be rejected. The decision of the Purchaser in this regard shall be final and binding on Contractor.
- 3.5.4 The entire cost of testing for the acceptance and routine tests and tests during manufacture specified herein shall be treated as included in the quoted unit price except for the expenses of the inspector/ Employer's representative.
- 3.5.5 In case of failure in any type test, repeat type tests are required to be conducted, then all the expenses for deputation of Inspector/ Employer's representative shall be deducted from the contract price. Also if on receipt of the Contract's notice of testing the Employer's representative/Inspector does not find 'materials and facilities' to be ready for testing, the expenses incurred by the Employer for re-deputation shall be deducted from the contract price.

3.6 Additional Tests

- 3.6.1 The Employer reserves the right of having at his own expenses any other test(s) of reasonable nature carried out at Contractor's premises, at site, or in any other place in addition to the aforesaid type, acceptance and routine tests to satisfy himself that the materials comply with the Specifications.
- 3.6.2 The Employer also reserves the right to conduct all the tests mentioned in this specification at his own expense on the samples drawn from the site at Contractor's premises or at any other test center. In case of evidence of non compliance, it shall be binding on the part of Contractor to prove the compliance of the items to the technical specifications by repeat tests, or correction of deficiencies, or replacement of defective item all without any extra cost to the Employer.

3.7 Sample Batch For Type Testing

- 3.7.1 The Contractor shall offer material for selection of samples for type testing only after getting Quality Assurance Plan approved from Employer's Engineering Deptt. The sample shall be manufactured strictly in accordance with the Quality Assurance Plan approved by Employer.
- 3.7.2 The Contractor shall offer at least three drums for selection of sample required for conducting all the type test.
- 3.7.3 The Contractor is required to carry out all the Acceptance tests successfully in presence of Employer's representative before sample selection.

3.8 Test Reports

- 3.8.1 Copies of type test reports shall be furnished in at least six copies along with one original. One copy will be returned duly certified by the Employer only after which the commercial production of the material shall start.
- 3.8.2 Record of routine test reports shall be maintained by the Contractor at his works for periodic inspection by the Employer's representative.
- 3.8.3 Test Certificates of tests during manufacture shall be maintained by the Contractor. These shall be produced for verification as and when desired by the Employer.

3.9 Inspection

- 3.9.1 The Employer 's representative shall at all times be entitled to have access to the works and all places of manufacture, where earth wire shall be manufactured and representative shall have full facilities for unrestricted inspection of the Contractor's works, raw materials and process of manufacture for conducting necessary tests as detailed herein.
- 3.9.2 The Contractor shall keep the Employer informed in advance of the time of starting and of the progress of manufacture of earth wire in its various stages so that arrangements can be made for inspection.
- 3.9.3 No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested, unless the inspection is waived off by the Employer in writing. In the latter case also the earth wire shall be dispatched only after satisfactory testing for all tests specified herein have been completed.
- 3.9.4 The acceptance of any quantity of material shall in no way relieve the Contractor of any of his responsibilities for meeting all requirements of the Specification, and shall not prevent subsequent rejection if such material is later found to be defective.

3.10 Test Facilities

- 3.10.1 The following additional test facilities shall be available at the Contractor's works:

- a) Calibration of various testing and measuring equipment including tensile testing machine, resistance measurement facilities, burette, thermometer, barometer etc.
- b) Standard resistance for calibration of resistance bridges.
- c) Finished Earth wire shall be checked for length verification and surface finish on separate rewinding machine at reduced speed (variable from 8 to 16 meters per minute). The rewinding facilities shall have appropriate clutch system and free of vibrations, jerks etc., with traverse laying facilities.

3.11 Packing for Earth wire

- 3.11.1 The Earth wire shall be supplied in non-returnable, strong, wooden drums and provided with lagging of adequate strength, constructed to protect the Earth wire against all damage and displacement during transit, storage and subsequent handling and stringing operations in the field. The Contractor shall be responsible for any loss or damage during transportation handling and storage due to improper packing. The drums shall generally conform to IS:1778-1980, except as otherwise specified hereinafter.
- 3.11.2 The drums shall be suitable for wheel mounting and for letting off the earth wire under a minimum controlled tension of the order of 5 kN
- 3.11.3 The general outline of the drum for Earth wire shall be as per annexed drawing. The Contractor should submit their proposed drum drawings along with the bid.
- 3.11.4 For Earth wire, two standard length shall be wound on each drum.
- 3.11.5 For Earth wire, each strand shall be individually welded to prevent parting of two lengths at a tension less than 15 kN. The two ends where the first length finishes and the second length starts, shall be clearly marked with adhesive tape and no weld should be present outside these marks. The length between the two marks shall be treated as scrap and will not be taken into account for measurement purposes.
- 3.11.6 All wooden components shall be manufactured out of seasoned softwood free from defects that may materially weaken the component parts of the drums. Preservative treatment shall be applied to the entire drum with preservatives of a quality which is not harmful to the earth wire.
- 3.11.7 The flanges shall be of two ply construction with each ply at right angles to the adjacent ply and nailed together. The nails shall be driven from the inside face flange, punched and then clenched on the outer face. The thickness of each ply shall not vary by more than 3 mm from that indicated in the figure. There shall be at least 3 nails per plank of ply with maximum nail spacing of

75 mm. Where a slot is cut in the flange to receive the inner end of the earth wire the entrance shall be in line with the periphery of the barrel.

- 3.11.8 The wooden battens used for making the barrel of the earth wire shall be of segmental type. These shall be nailed to the barrel supports with at least two nails. The battens shall be closely butted and shall provide a round barrel with smooth external surface. The edges of the battens shall be rounded or chamfered to avoid damage to the earth wire.
- 3.11.9 Barrel studs shall be used for the construction of drums. The flanges shall be holed and the barrel studs shaft be threaded over a length on either end, sufficient to accommodate washers, spindle plates and nuts for fixing flanges at the required spacing.
- 3.11.10 Normally, the nuts on the studs shall stand protruded of the flanges. All the nails used on the inner surface of the flanges and the drum barrel shall be counter sunk. The ends of barrel shall generally be flushed with the top of the nuts.
- 3.11.11 The inner cheek of the flanges and drum barrel surface shall be painted with a bitumen based paint.
- 3.11.12 Before reeling, cardboard or double corrugated or thick bituminous waterproof bamboo paper shall be secured to the drum barrel and inside of flanges of the drum by means of a suitable commercial adhesive material. After reeling the earth wire, the exposed surface of the outer layer of earth wire shall be wrapped with water proof thick bituminous bamboo paper to preserve the earth wire from dirt, grit and damage during transport and handling.
- Medium grade craft/crepe/polythene paper shall be used in between the layers.
- 3.11.13 A minimum space of 50 mm for earth wire shall be provided between the inner surface of the external protective lagging and outer layer of the earth wire.
- 3.11.14 Each batten shall be securely nailed across grains as far as possible to the flange, edges with at least 2 nails per end. The length of the nails shall not be less than twice the thickness of the battens. The nails shall not protrude above the general surface and shall not have exposed sharp edges or allow the battens to be released due to corrosion.
- 3.11.15 The nuts on the barrel studs shall be tack welded on the one side in order to fully secure them. On the second end, a spring washer shall be used.
- 3.11.16 Outside the protective lagging there shall be minimum of two binder consisting of hoop iron/galvanised steel wire. Each protective lagging shall have two recesses to accommodate the binders.

3.11.17 The earth wire ends shall be properly sealed and secured on the side of one of the flanges to avoid loosening of the earth wire layers during transit and handling.

3.12 Marking

Each drum shall have the following information stenciled on it in indelible ink along with other essential data

- (a) Contract/Award letter number.
- (b) Name and address of consignee.
- (c) Manufacturer's name and address.
- (d) Drum number
- (e) Size of earth wire
- (f) Length of earth wire in meters
- (g) Gross weight of drum with earth wire & lagging
- (h) Weight of empty drum with lagging
- (i) Arrow marking for unwinding
- (j) Position of the earth wire ends
- (k) Number of turns in the outer most layer
- (l) Distance between outer most layer of Earth wire and the inner surface of lagging
- (n) Barrel diameter at three locations and an arrow marking at the location of measurement

3.13 Verification of Earth wire Length

The Employer reserves the right to verify the length of earth wire after unreeling atleast ten (10) percent of the drums in a lot offered for inspection.

3.14 Standards

The earth wire shall conform to the following Indian/ International Standards, which shall mean latest revisions, amendments/changes adopted and published, unless otherwise in the Specification.

In the event of the supply of earth wire conforming to standards other than specified, the Contractor shall confirm in his bid that these standards are equivalent to those specified. In case of award salient features of comparison between the standards proposed by the Contractor and those specified in this documents will be provided by the Contractor to establish their equivalence.

4.0 Manufacturing Quality Plan

Earthwire manufacturing shall be carried out in accordance with Standardized Manufacturing Quality plan as given in the Annexure-C of the Specification.

5.0

Standards

The earth wire shall conform to the following Indian/ International Standards, which shall mean latest revisions, amendments/changes adopted and published, unless otherwise in the Specification.

In the event of the supply of earth wire conforming to standards other than specified, the Contractor shall confirm in his bid that these standards are equivalent to those specified. In case of award salient features of comparison between the standards proposed by the Contractor and those specified in this documents will be provided by the Contractor to establish their equivalence.

Sl. No.	Indian Standard	Title	International Standard
1.	IS: 209-1992	Specification for zinc	BS:3436-1986
2.	IS: 398-1990	Specification for Aluminium Conductors for Overhead Transmission Purposes	IEC:1089-1991 BS:215-1970
3.	IS:398-1998 Part-II	Aluminum Conductor Galvanised Steel Reinforced	BS;215-1970 IEC:1089-1991
4.	IS :398-1996 Part-IV	Aluminum Alloy stranded conductor	BS-3242-1970 ASTM-8399 M86 IEC:1089-1991
5.	IS:398-1992 Part-V	Aluminum Conductor Galvanised Steel-Reinforced For Extra High Voltage (400 KV) and above	IEC:1089-1991 BS:215-1970
6.	IS : 1778-1997	Reels and Drums for Bare Conductors	BS:1559-1949
7.	IS : 1521-1991	Method of Tensile Testing of Steel Wire	ISO 6892-1984
8.	IS : 2629-1990	Recommended Practice for Hot Dip Galvanising of Iron and Steel	
9.	IS : 2633-1992	Method of Testing Uniformity of Coating on Zinc Coated Articles	
10.	IS : 4826-1992	Galvanised Coating on Round Steel Wires	IEC : 888-1987 BS:443-1969
11.	IS : 6745-1991	Methods of Determination of Weight of Zinc Coating of Zinc Coated Iron and Steel Articles	BS:433-1969 ISO 1460 - 1973
12.	IS : 8263-1991	Method of Radio Interference Tests on High Voltage Insulators	IEC:437-1973 NEMA:107-1964 CISPR
13.	IS : 9997-1991	Aluminium Alloy Redraw Rods	IEC 104 - 1987
14.		Zinc Coated steel wires for stranded Conductors	IEC : 888-1987
15.		Hard drawn Aluminium wire for overhead line conductors	IEC : 889-1987

The standards mentioned above are available from:

Reference Abbreviation	Name and Address
BS	British Standards, British Standards Institution 101, Pentonville Road, N - 19-ND UK
IEC/CISPR	International Electro technical Commission, Bureau Central de la Commission, electro Technique international, 1 Rue de verembe, Geneva SWITZERLAND
BIS/IS	Beureau Of Indian Standards. Manak Bhavan, 9, Bahadur Shah Zafar Marg, New Delhi - 110001. INDIA
ISO	International Organisation for Standardization. Danish Board of Standardization Danish Standardizing Sraat, Aurehoegvej-12 DK-2900, Heeleprup, DENMARK.
NEMA	National Electric Manufacture Association, 155, East 44th Street. New York, NY 10017 U.S.A.

1.0 Tests on Earth wire

1.1 UTS Test

Circles perpendicular to the axis of the earth wire shall be marked at two places on a sample of earth wire of minimum 5 m length suitably compressed with dead end clamps at either end. The load shall be increased at a steady rate up to 50% of UTS and held for one minute. The circles drawn shall not be distorted due to relative movement of strands. Thereafter the load shall be increased at steady rate to 100% of UTS and held for one minute. The earth wire sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

1.2 D.C. Resistance Test

On a earth wire sample of minimum 5m length two contact clamps shall be fixed with a predetermined bolt torque. The resistance shall be measured by a Kelvin double bridge by placing the clamps initially at zero meter and subsequently one meter apart. The test shall be repeated at least five times and the average value recorded. The value obtained shall be corrected to the value at 20⁰C. The resistance corrected at 20⁰C shall conform to the requirements of this Specification.

1.3 Chemical Analysis of Zinc

Samples taken from the zinc ingots shall be chemically/ spectrographically analysed. The same shall be in conformity to the requirements stated in the Specification.

1.4 Chemical Analysis of Steel

Samples taken from the steel ingots/coils/strands shall be chemically,/spectrographically analysed. The same shall be in conformity to the requirements stated in this Specification.

1.5 Visual and Dimensional Check on Drums and its barrel strength test.

The drums shall be visually and dimensionally checked to ensure that they conform to the requirements of this Specification. The details regarding barrel strength test will be discussed and mutually agreed to by Contractor an Employer in the quality assurance programme.

Visual Check for Joints, Scratches etc. and Length of Earth wire

Ten percent drums from each lot shall be rewound in the presence of the Employer. The Employer shall visually check for scratches, joints etc. and see Specification. The length of earth wire wound on the drum shall be measured with the help of counter meter during rewinding.

1.7 Dimensional Check

The individual strands shall be dimensionally checked to ensure that they conform to the requirement of this Specification.

1.8 Lay Length Check

The lay length shall be checked to ensure that they conform to the requirements of this Specification.

1.9 Galvanising Test

The test procedure shall be as specified in IS:4826- 1979. The material shall conform to the requirements of this Specification. The adherence of zinc shall be checked by wrapping around a mandrel four times the diameter of steel wire.

1.10 Torsion Test

The minimum number of twists which a single steel strand shall withstand during torsion test shall be eighteen for a length equal to 100 times the standard diameter of the strand. In case test sample length is less or more than 100 times the stranded diameter of the strand the minimum number of twists will be proportioned to the length and if number comes in the fraction then it will be rounded off to next higher whole number.

Annexure-B

A) Standard Technical Particulars of 7/4.27 mm Galvanised Steel Earth wire

Sl. no.	Description	Unit	Standard Values
1.0	Raw Materials		
1.1	Steel wires / rods		
a)	Carbon	%	Not more than 0.55
b)	Manganese	%	0.40 to 0.90
c)	Phosphorous	%	Not more than 0.04
d)	Sulphur	%	Not more than 0.04
e)	Silicon	%	0.15 to 0.35
1.2	Zinc		
a)	Minimum purity of Zinc	%	99.95
2.0	Steel strands		
2.1	Diameter		
a)	Nominal	mm	4.27
b)	Maximum	mm	4.36
c)	Minimum	mm	4.18
2.2.	Minimum breaking load of strand		
a)	After stranding	KN	14.36
2.3	Galvanising		
a)	Minimum weight of zinc coating per sq.m. after stranding	Gms.	290
b)	Minimum number of dips that the galvanized strand can withstand in the standard preece test	Nos.	3 dips of 1 minute and one dip of ½ minute
c)	Minimum number of twists in a gauge length equal to 100 times diameter of wire which the strand can withstand in the torsion test, after stranding	Nos.	18
3.0	Stranded Earth wire		
3.1	UTS of Earth wire	KN	93.1
3.2	Lay length of outer steel layer		

Sl. no.	Description	Unit	Standard Values
a)	Standard	mm	211
b)	Maximum	mm	231
c)	Minimum	mm	193
3.3	Maximum DC resistance of earth wire at 20° C	Ohm/km	1.84
3.4	Standard length of earth wire	M	2000
3.5	Tolerance on standard length	%	±5
3.6	Direction of lay for outside layer		Right hand
3.7	Linear mass		
a)	Standard	Kg/km	794
b)	Maximum	Kg/km	814
c)	Minimum	Kg/km	752

SECTION - VII - INSULATOR

SECTION - VII – DISC INSULATOR

CONTENTS

Clause No.	Description
1.0	Technical Description of Disc Insulators
2.0	Equipment Marking
3.0	Bid Drawings
4.0	Tests and Standards
5.0	Annexure-A

1.0 Technical Description of Disc Insulators

1.1 Details of Disc Insulators

- 1.1.1 The insulators of the strings shall consist of standard Discs for a three phase, 50 Hz, effectively earthed 220kV–transmission system application in a lightly polluted environment. The Disc shall be cap and pin, ball and socket type.
- 1.1.2 Supplier may quote for disc Insulator made up of either electro porcelain or toughened glass.
- 1.1.3 The size of disc insulator, minimum creepage distance, the number to be used in different type of strings, their electromechanical strength and mechanical strength of insulator string along with hardware fittings shall be as follows:

S. No	Type of String	Size of disc Insulator (mm)	Minimum Creepage Distance of each disc (mm)	No. of disc per String (Nos.)	Electro-Mechanical Strength of Insulator Unit (kN)	Mechanical Strength of Insulator String along with Hardware Fittings (kN)
For 220 kV AC Transmission lines with single ACSR Deer conductor						
1	Single 'I' Suspension Pilot	255/280 x 145	370	1×25	120	120
2	Double 'I' Suspension	255/280 x 145	370	2×25	120	2×120
4	Double Tension	280x170	370	2x22	160	2x160

1.2 Pin and Cap

- 1.2.1 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, of such design that it will not yield or distort under load conditions.
- 1.2.2 The pin ball shall move freely in the cap socket but without danger of accidental uncoupling during erection or in position. The design of the disc should be such that stresses due to expansion or contraction in any part of the insulator shall not lead to deterioration.

1.3 Security clip

- 1.3.1 Security clip for use with ball and socket coupling shall be of R-shaped hump type which shall provide positive locking of the coupling as per IS: 2486-(Part-III)/IEC: 372. The legs of the security clips shall be spread after installation to prevent complete withdrawal from the socket. The locking device should be resilient, corrosion resistant and of suitable mechanical strength. There shall be no risk of the locking device being displaced accidentally or being rotated when in position. Under no circumstances shall locking device allow separation of insulator units or fittings.
- 1.3.2 The hole for the security clip shall be countersunk and the clip shall be of such design that the eye of clip may be engaged by a hot line clip puller to provide for disengagement under energised conditions. The force required to pull the security

clip into its unlocked position shall not be less than 50N (5 kg) or more than 500N (50 kg).

1.4 Ball and Socket Designation

The dimensions of the Ball and Socket shall be of 20mm designation for 120 kN and 160 kN disc Insulators in accordance with the standard dimensions stated in IEC:60120/IS:2486 (Part-II).

1.5 Dimensional Tolerance of Disc Insulators

It shall be ensured that the dimensions of the disc insulators are within the limits specified below:

a) Diameter of Disc (mm)

	<u>Standard</u>	<u>Maximum</u>	<u>Minimum</u>
120 KN Disc	255/280	266-293	244-267
160 KN Disc	280	293	267

b) Ball to ball spacing between discs

	<u>Standard</u>	<u>Maximum</u>	<u>Minimum</u>
120 KN Disc	145	149	141
160 KN Disc	170	175	165

1.6 Interchangeability

The disc insulators inclusive of the ball & socket fitting shall be of standard design suitable for use with the hardware fittings of any make conforming to relevant Indian/International standards.

1.7 Corona and RI Performance

All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The metal parts shall be so designed and manufactured that it shall not generate any radio interference beyond specified limit and not produce any noise generating corona under the operating conditions.

1.8 Maintenance

1.8.1 The disc insulators offered shall be suitable for employment of hot line maintenance technique so that usual hot line operation can be carried out with ease, speed and safety.

1.8.2 Bidders shall indicate the methods generally used in the routine hot and dead line maintenance of EHV Lines for which similar disc insulators have been supplied by them. Bidders shall also indicate the recommended periodicity of such maintenance.

1.9 Materials

1.9.1 Porcelain

The porcelain used in the manufacture of shells shall be sound, free from defects thoroughly vitrified and smoothly glazed.

1.9.2 Glaze

The finished porcelain shall be glazed in brown colour. The glaze shall cover all exposed parts of the insulator and shall have a good lusture, smooth surface and good performance under the extreme weather conditions of a tropical climate. It shall not crack or chip by ageing under the normal service conditions. The glaze shall have the same coefficient of expansion as of the porcelain body throughout the working temperature range.

1.9.3 Toughened Glass

The glass used for the shells shall be sound, free from defects such as flaws, bubbles, inclusions etc. and be of uniform toughness over its entire surface. All exposed glass surfaces shall be smooth.

1.9.4 Cement

Cement used in the manufacture of the insulator shall not cause fracture by expansion or loosening by contraction. The cement shall not give rise to chemical reaction with metal fittings and its thickness shall be as small and uniform as possible. Proper care shall be taken to correctly centre and locate individual parts during cementing.

1.9.5 Pins and Caps

Pins and Caps shall be made of drop forged steel and malleable cast iron / spheriodal graphite iron/drop forges steel respectively, duly hot dip galvanised and shall not be made by jointing, welding, shrink fitting or any other process from more than one piece of material.

1.9.6 Security Clips

Security clips shall be made of good quality stainless steel or phosphor bronze as per IS: 1385. 2.5% extra Security clip shall be provided.

1.10 Workmanship

1.10.1 All the materials shall be of latest design and conform to the best modern practices adopted in the extra high voltage field. Bidders shall offer only such insulators as are guaranteed by him to be satisfactory and suitable for transmission lines specified and will give continued good service.

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

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

1.10.4 Metal caps shall be free from cracks, seams, shrinks, air holes, burrs and rough edges. All surfaces of the metal parts shall be perfectly smooth with no projecting points or irregularities which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.

1.10.5 All ferrous parts shall be hot dip galvanised to give a minimum average coating of Zinc equivalent to 600 gm/sq.m. and shall be in accordance with the requirement of IS: 2629 and shall satisfy the tests mentioned in IS:2633. The zinc used for galvanising shall be of Grade Zn 99.95 as per IS: 209. The zinc coating shall be uniform, adherent, smooth, reasonably bright, continuous and free from imperfections such as flux, ash, rust stains, bulky white deposits and blisters. The galvanised metal parts shall be guaranteed to withstand atleast six successive dips each lasting for one (1) minute duration under the standard preece test.

- 1.10.6 Before ball fittings are galvanised, all die flashing on the shank surface of the ball shall be carefully removed without reducing the dimensions below the design requirements.
- 1.10.7 The design of the insulators shall be such that the shell shall not engage directly with hard metal. The design shall also be such that when units are coupled together there is no contact between the shell of one unit and metal of the next adjacent unit. The design of the shell ribs shall be such that the security clip of the insulator can be engaged and disengaged easily with hot stick without damaging the shell ribs.
- 1.10.8 Insulator units after assembly shall be concentric and co-axial within limits as permitted by the relevant Indian Standards.
- 1.10.9 The manufacturer of the insulators shall guarantee an insulator failure rate not exceeding 1 (one) per 10000 (ten thousand) per year for disc insulator. In case the annual failure rate during the first ten years of service exceeds the above figure, under normal operating condition, as will be determined by check to be conducted as per mutually agreed procedure and conditions upto ten years, (as permitted by the operating situation), the Supplier shall supply to the Owner free of cost spare insulators equal to 10 time the excess failure.
- 1.10.10 The supplier shall guarantee that there shall not be any de-capping / breaking of insulators on line under normal operating condition. In the event of any de-capping /breaking and subsequent line drop during the first ten years of service, supplier shall have to pay Rs. 1,00,000/- (Rs. one lakh only) per dropped string towards expenditure to be incurred by RECTPCL/PDD, J&K for this line repair.

2.0 Technical Description of Porcelain Long Rod insulators

- 2.1.1 The Insulator strings shall consist of Standard long rod insulators with normal sheds for a three phase, 50 Hz, effectively earthed 220 kV transmission system in a lightly polluted atmosphere. Insulators shall be long rod type with Ball and Socket connections.
- 2.1.2 Insulators shall have normal sheds / alternate sheds with good self-cleaning properties. Insulator shed profile, spacing projection etc. shall be strictly in accordance with the recommendation of IEC – 815.
- 2.1.3 Supplier quoting for long rod Insulators made up of electro porcelain shall also supply intermediate ball pins and intermediate arcing horns along with long rod Insulators.
- The price of these items shall be considered as including in the price of long rod insulators.
- 2.1.4 The size of long rod insulator, minimum creepage distance, the number to be used in different type of strings, their electromechanical strength and mechanical strength of insulator string along with hardware fittings shall be as follows:-

Description of long rod insulator string (equivalent to standard disc Insulator)

S. No.	Type of string	Size of long rod Insulator (mm)	Min. creepage distance of each unit (mm)	No. of Individual units in string	Electro-Mecanical strength of Insulator Unit (KN)	Mechanical strength of Insulator String alongwith hardware

						fitting(KN)
1.	Single Suspension Pilot	60-85	4625	1x3	120	120
2.	Double Suspension	60-85	4625	2x3	120	120
3.	Double Tension	75-85	4070	2x3	160	160

Note: (i) Bidder may quote for the relevant strings.

(ii) Length of long rod insulators strings shall be matching with the corresponding disc Insulator strings.

(iii) The cost of intermediate Ball pin and intermediate arcing horn shall be considered as including in the price of long rod insulators.

2.2 Pin and Cap

2.2.1 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 surface concentric, of such design that it will not yield or distort under load conditions.

2.2.2 The pin shall move freely in the cap pocket but without danger of accidental uncoupling during erection or in position. The design of the long rod should be such that stresses due to expansion or contraction in any part of the insulator shall not lead to deterioration.

2.3 Ball and Socket Designation

The dimension of Ball and Socket shall be of 20mm designation for 120 & 160 kN for Long rod Insulators in accordance with the standard dimension stated in IS 2486 – (Part – II) / IEC / IEC – 120

2.4 Dimensional Tolerance

The tolerance on all dimensions e.g. diameter, length and creepage distance shall be allowed as follows:-

$\pm (0.04d+1.5)$ mm when $d < 300$ mm

$\pm (0.025d+6)$ mm when $d > 300$ mm

Where d being the dimensions in millimeters for diameter, length of creepage distance as the case may be.

However, no negative tolerance shall be applicable to creepage distance.

2.5 Intermediate Ball Pin Designation

The dimension of the intermediate ball pin shall be in accordance with the standard dimension stated in IEC: 471.

2.6 Intermediate Arcing Horn

2.6.1 For Insulator Strings with long rod insulators beside the arcing horn on tower side of Insulator fittings, intermediate arcing horns along with fixtures and fasteners as shown in the specification shall also be provided.

2.6.2 The spark gap shall be so adjusted to ensure effective operation under actual field coordination.

2.7 Inter Changeability

The long rod insulators with ball and socket connection shall be of standard design suitable for use with hardware fittings of any make conforming to relevant IEC standards.

2.8 Corona and RI Performance

All surfaces shall be clean, smooth, without cuts, abrasion or projections. No parts shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating conditions.

2.9 Maintenance

2.9.1 The long rod insulators offered shall be suitable for deployment of hot line maintenance technique so that usual hot line operations can be carried out with ease, speed and safety.

2.9.2 All insulators shall be designed to facilitate cleaning and insulators shall have the minimum practical number of sheds and grooves. All grooves shall be so proportioned that any dust deposit can be removed without difficulty either by wiping with a cloth or by remote washing under line condition.

2.10 Materials

Porcelain

The porcelain used in the manufacture of long rods shall be of alumina type. It shall be sound, free from defects and thoroughly vitrified and smoothly glazed.

2.10.2 Glaze

The finished porcelain shall be glazed in brown colour. The glaze shall cover all exposed parts of the insulator and shall have a good luster, smooth surface and good performance under extreme weather conditions of a tropical climate. It shall not be cracked or chipped by ageing under normal service conditions. The glaze shall have the same co-efficient of expansion as of the porcelain body throughout the working temperature range.

2.10.3 Insulator Cap

The caps of long rod insulators units shall be of malleable cast iron or other suitable material duly hot dip galvanized and shall not be made by jointing, welding, shrink fitting or any other process from more than one piece of material. The design of the unit shall be such that stresses due to expansion and contraction of any part of the insulators shall not lead to deterioration.

2.10.4 Intermediate Ball Pin

The intermediate ball pin shall be made of drop forged steel, duly hot dip galvanized and shall not be made by jointing, welding, shrink fitting or any other process from more than one piece of material.

2.10.5 Intermediate Arcing Horn

Intermediate arcing horn shall be of mild steel tube.

2.10.6 Cement

Cement used in the manufacture of the insulator shall not cause fracture by expansion or loosening by contraction. The cement shall not give rise to chemical reaction with metal fittings and its thickness shall be as small and uniform as possible. Proper care shall be taken to correctly centre and locate individual parts during centering.

2.11 Workmanship

- 2.11.1 All the materials shall be of latest design and conform to the best modern practices adopted in the extra high voltage field. Bidders shall offer only such insulators as are guaranteed by him to be satisfactory and suitable for transmission lines specified and will give continued good service.
- 2.11.2 The design, manufacturing process and material control at various stages shall be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish and elimination of sharp edges and corners to limit corona and radio interference.
- 2.11.3 The design of the insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.
- 2.11.4 Metal caps shall be free from cracks, seams, shrinks, air holes, burrs and rough edges. All surfaces of the metal parts shall be perfectly smooth with no projecting points or irregularities which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.
- 2.11.5 All ferrous parts shall be hot dip galvanised to give a minimum average coating of zinc equivalent to 600 gm /sq. m. and shall be in accordance with the requirement of IS: 2629 and shall satisfy the tests mentioned in IS: 2633. The zinc used for galvanising shall be of Grade Zn 99.95 as per IS: 209. The zinc coating shall be uniform, adherent, smooth, reasonably bright, continuous and free from imperfections such as flux, ash, rust stains, bulky white deposits and blisters. The galvanised metal parts shall be guaranteed to withstand atleast six successive dips each lasting for one (1) minute duration under the standard preece test. The galvanizing shall be carried out only after any machining.
- 2.11.6 The design of the insulators shall be such that the shell shall not engage directly with hard metal.
- 2.11.7 Insulator units after assembly shall be concentric and co-axial within limits as permitted by the relevant Indian /International Standards.
- 2.11.8 The manufacturer of the insulators shall guarantee an insulator failure rate not exceeding 1 (one) per 1500 porcelain long rod units per year. In case the annual failure rate during the first ten years of service exceeds the above figure, under normal operating condition, as will be determined by check to be conducted as per mutually agreed procedure and conditions up to ten years, (as permitted by the operating situation), the Supplier shall supply to the Owner free of cost spare insulators (Porcelain long rod) equal to 10 time the excess failure.
- 2.11.9 The supplier shall guarantee that there shall not be any de-capping and breakage of insulators on line under normal operating condition. In the event of any de-capping or breakage and resulting in line drop during the first ten years of service, supplier shall have to pay Rs. 1,00,000/- (Rs. one lakh only) per dropped string towards expenditure to be incurred by RECTPCL/PDD, J&K for this line repair.

3.0 Equipment Marking

- 3.1 Each insulator disc/ long rod unit shall be legibly and indelibly marked with the trade mark of the manufacturer, name of RECTPCL/PDD, J&K and month & year of manufacture. The guaranteed combined mechanical and electrical strength shall be indicated in kilo Newton followed by the word 'kN' to facilitate easy identification and to ensure proper use.
- 3.2 For porcelain insulator, the marking shall be on porcelain. The marking shall be printed, not impressed and shall be applied before firing. For toughened glass insulators, the marking shall be on metal parts.

One 10 mm thick ring or 20 mm thick spot of suitable quality of paint shall be marked on the cap of each insulator porcelain disc/porcelain long rod of particular strength for easy identification of the type of insulator. The paint shall not have any deteriorating effect on the insulator performance. Following codes shall be used as identification mark:

For 120 kN disc/long rod unit : Yellow

For 160 kN disc/long rod unit : Green

4.0 Bid Drawings

4.1 The Bidder shall furnish full description and illustration of the material offered.

4.2 The Bidder shall furnish along with the bid the outline drawing of each insulator unit including a cross sectional view of the insulator shell. The drawing shall include but not limited to the following information:

(a) Shell diameter and ball to ball spacing with manufacturing tolerances

(b) Minimum Creepage distance with positive tolerance

(c) Protected creepage distance

(d) Eccentricity of the disc

(i) Axial run out

(ii) Radial run out

(e) Unit mechanical and electrical characteristics

(e) Size and weight of ball and socket parts

(f) Weight of unit insulator disc/ long rod units

(g) Materials

(i) Identification mark

(j) Manufacturer's Catalogue number

4.3 After placement of award, the Supplier shall submit full dimensioned insulator drawings containing all the details as given in Clause No. 4.2 above, in four (4) copies to Owner for approval. After getting approval from Owner, the Supplier shall submit 10 more copies of the same drawing along with a soft copy to the Owner for further distribution and field use at Owner's end.

4.4 After placement of award the Supplier shall also submit fully dimensioned insulator crate drawing for different type of insulators.

4.5 After placement of award, the supplier shall submit full dimensioned manufacturing drawings of insulator cap, pin and insulator shell in six (6) copies to the owner reference and record.

5.0 Tests and Standards

5.1 Type Tests

The following type tests shall be conducted on a suitable number of individual standard disc insulators or long rod units, components, materials and complete strings:

On Unit disc Insulators

- a) Verification of Dimension : As per IEC: 60383
- b) Power frequency voltage withstand and flashover : As per IEC: 60383
Test under (i) dry & (ii) wet condition
- c) Impulse voltage withstand and flashover test (dry) :As per IEC: 60383
- d) Visible Discharge test (dry) (for 220kV only) : As per IS:731, Cl. 10.2
- e) RIV test (dry) (for 220kV only) : As per IEC: 60437
- f) Impact Test : As per Annexure – A
- g) Thermal mechanical performance test : As per Annexure - A
- h) Residual strength test : As per Annexure – A
- i) Steep wave front test : As per Annexure - A

On Porcelain long rod Insulator units

- a) Verification of Dimension : As per IEC: 60383
- b) Power frequency voltage withstand and flashover : As per IEC: 60383
Test under (i) dry & (ii) wet condition
- c) Impulse voltage withstand and flashover test (dry) :As per IEC: 60383
- d) Visible Discharge test (dry) (for 220kV only) : As per IS:731, Cl. 10.2
- e) RIV test (dry) (for 220kV only) : As per IEC: 60437
- f) Thermal mechanical performance test : As per Annexure - A

5.1.3 On the complete Disc Insulator String with Hardware Fittings

	Test	Ref	Strings on which test to be conducted 220 kV
(a)	Power frequency voltage withstand test with corona control rings/grading ring and arcing horns under wet condition	IEC:383-1993/	SIP, DIS, DT
(b)	Switching surge voltage withstand test under dry condition	IEC:383-1993	SIP, DIS, DT
(c)	Impulse voltage withstand test under dry condition	IEC:383-1993	SIP, DIS, DT
(d)	Corona and RIV test under dry condition	As per Annexure - A	SIP, DIS, DT
(e)	Mechanical Strength test	As per Annexure - A	SIP, DIS, DT
(f)	Voltage Distribution Test	As per Annexure - A	DIS, DT
(g)	Vibration test	As per Annexure - A	DIS, DT

Note : SIP : Single I Suspension pilot, DIS : Double I suspension, DT : Double Tension

5.1.4 On the complete Porcelain long rod Insulator strings with Hardware Fittings

	Test	Ref.	Strings on which test to be conducted
(a)	Power frequency voltage withstand test with corona control rings/grading ring and arcing horns under wet condition	IEC:383-1993/	SIP, DIS, DT
(b)	Switching surge voltage withstand test under dry condition	IEC:383-1993	SIP, DIS, DT
(c)	Impulse voltage withstand test under dry condition	IEC:383-1993	SIP, DIS, DT
(d)	Corona and RIV test under dry condition	As per Annexure - A	SIP, DIS, DT
(e)	Mechanical Strength test	As per Annexure - A	SIP, DIS, DT
(f)	Vibration test	As per Annexure - A	DIS, DT

5.1.5 **Type tests specified under clause 5.1.1 & clause 5.1.2 above shall not be required to be carried out if a valid test certificate is available for a similar design.** The tests certificate shall be considered valid if:

- Tests conducted earlier is either conducted in accredited laboratory (accredited based on ISO/IEC vide 25/17025 or EN 45001 by the National accreditation body of the country where laboratory is located) or witnessed by the representative(s) of RECTPCL/PDD, J&K or utility and
- Tests have been conducted not prior to 5 (five) years from the date of bid opening.

In case the test have been conducted earlier than the above stipulated period or in the event of any discrepancy in the test report (i.e., any test not applicable due to any design/manufacturing change including substitution of components or due to non-compliance with the requirement stipulated in the Technical Specifications), the tests shall be conducted by the Supplier at no extra cost to the Purchaser.

5.2 Acceptance Tests:

5.2.1 For Disc Insulators (Both porcelain and glass)

- Visual examination : As per IEC: 60383
- Verification of dimensions : As per IEC: 60383
- Temperature cycle test : As per IEC: 60383
- Galvanizing Test : As per IEC: 60383
- Mechanical performance test : As per IEC: 60575 Cl. 4.0
- Test on locking device foe ball and socket coupling : As per IEC: 60372
- Eccentricity test : As per IEC: 60383
- Residual strength test* : As per Annexure – A
- Metallurgical Test (For metal fittings only in black condition) : As per Annexure – A
 - Grain size

- Inclusion rating
- Chemical analysis
- Microstructure
- j) Chemical analysis of Zinc Sleeve : As per Annexure – A
- k) IR Measurement : As per Annexure – A
- l) Impact Test : As per Annexure – A
- m) Steep Wave front test* : As per Annexure – A
- n) Thermal Mechanical performance test* : As per Annexure – A

***Note:** Residual Strength Test shall be performed as acceptance tests once for every supply of 25000 nos. of particular rating and Steep wave front Test & Thermal Mechanical performance test shall be performed as acceptance tests once for every supply of 50000 nos. of a particular rating.

5.2.2 For Porcelain disc Insulators Only

- a) Electro-mechanical strength test : As per Annexure – A
- b) Porosity test : As per IEC: 60383
- c) Puncture test : As per IEC: 60383

5.2.3 For Glass Insulators only

- a) Thermal Shock test : As per IEC: 60383
- b) Steep wave front test/ Puncture test : As per Annexure – A
- c) Mechanical failing test : As per Annexure – A

5.2.4 For Porcelain Long Rod Insulators

- a) Visual examination : As per IEC: 60383
- b) Verification of dimensions : As per IEC: 60383
- c) Temperature cycle test : As per IEC: 60383
- d) Galvanizing Test : As per IEC: 60383
- e) Mechanical performance test : As per IEC: 60575 Cl. 4.0
- f) Test on locking device foe ball and socket coupling : As per IEC: 60372
- g) Eccentricity test : As per IEC: 60383-1
- h) Mechanical failing load test : As per IEC: 60383-1
- i) Porosity test : As per IEC: 60383
- j) Metallurgical Test (For metal fittings only in black condition) : As per Annexure – A
 - Grain size
 - Inclusion rating
 - Chemical analysis
 - Microstructure
- k) Thermal Mechanical performance test# : As per Annexure – A

NOTE: The test specified under 6.3 (k) above shall be performed as acceptance test once for every supply of 6520 nos. long rod insulator units of a particular rating.

5.3 Routine Tests

5.3.1 For Disc Insulator Units

- a) Visual Examination : As per IS: 731, Cl. 10.13
- b) Mechanical routine test : As per IS: 731, Cl. 10.14

- c) Electrical routine test (For Porcelain disc insulator only) : As per IS: 731, Cl. 10.15
- d) Thermal shock routine test (For Glass insulator only): As per IEC: 60383

5.3.2 For Porcelain Long Rod Insulator Units

- a) Visual Examination : As per IEC: 60383
- b) Mechanical routine test : As per IEC: 60383

Tests During Manufacture

On all components as applicable

- a) Chemical analysis of zinc used for galvanizing : As per Annexure-A
- b) Chemical analysis, mechanical, metallographic test and magnetic particle inspection for malleable castings. : As per Annexure-A
- c) Chemical analysis hardness tests and magnetic particle inspection for forgings : As per Annexure-A
- d) Hydraulic Internal pressure test : As per Annexure-A
- e) Autoclave test on cement : As per Annexure-A

5.4 Testing Expenses

- 5.5.1 For Type Tests which involves the tests on the complete insulator string with hardware fitting, similar hardware fittings shall be arranged by the insulator supplier at his own cost.
- 5.5.2 In case of failure in any type test the bidder whose material has failed is either required to modify the design of the material & successfully carryout all the type tests as has been detailed out in Clause 5.1.1 / 5.1.2 or 5.1.3 / 5.1.4 of this specifications or to repeat that particular type test at least three times successfully at his own expenses.
- 5.5.3 Bidder shall indicate the laboratories in which they propose to conduct the type tests. They shall ensure that adequate facilities are available in the laboratory and the tests can be completed in these laboratories within the time schedule guaranteed by them in the appropriate schedule.
- 5.5.4 The entire cost of testing for acceptance and routine tests and tests during manufacture specified herein shall be treated as included in the quoted Ex-works/CIF Price.
- 5.5.5 In case of failure in any type test, if repeat type tests are required to be conducted, then all the expenses for deputation of Inspector/ Owner's representative shall be deducted from the contract price. Also if on receipt of the bidder/Supplier's notice of testing, the Owner's representative does not find the material or test setup / equipment's to be ready for testing, the expenses incurred by the Owner for re-deputation shall be deducted from contract price.
- 5.5.6 The Supplier shall intimate the Owner about carrying out of the type tests along with detailed testing programme at least 3 weeks in advance (in case of testing in India) and at least 6 weeks advance (in case of testing abroad) of the scheduled date of testing during which the Owner will arrange to depute his representative to be present at the time of carrying out the tests.

5.6 Sample Batch for Type Testing

- 5.6.1 The Supplier shall offer material for sample selection for type testing only after getting Quality Assurance Programme approved by the Owner. The Supplier shall offer at

least three times the quantity of materials required for conducting all the type tests for sample selection. The sample for type testing will be manufactured strictly in accordance with the Quality Assurance Programme approved by the Owner.

- 5.6.2 Before sample selection for type testing, the Supplier shall be required to conduct all the acceptance tests successfully in presence of Owner's representative.

5.7 Schedule of Testing

- 5.7.1 The Bidder has to indicate the schedule of following activities in their bids :

- a) Submission of drawing for approval.
- b) Submission of Quality Assurance Programme for approval.
- c) Offering of material for sample selection for type tests.
- d) Type testing.

5.8 Additional Tests

- 5.8.1 The Owner reserves the right of having at his own expenses any other test(s) of reasonable nature carried out at Supplier's premises, at site, or in any other place in addition to the aforesaid type, acceptance and routine tests to satisfy himself that the material comply with the Specifications.

- 5.8.2 The Owner also reserves the right to conduct all the tests mentioned in this specification at his own expense on the samples drawn from the site at Supplier's premises or at any other test centre. In case of evidence of non-compliance, it shall be binding on the part of the Supplier to prove the compliance of the items to the technical specifications by repeat tests or correction of deficiencies or replacement of defective items, all without any extra cost to the Owner.

5.9 Guarantee

The Supplier of insulators shall guarantee overall satisfactory performance of the insulators.

5.10 Test Reports

- 5.10.1 Copies of type test reports shall be furnished in at least three (3) copies along with one original. One copy shall be returned duly certified by the Owner only after which the commercial production of the concerned material shall start.

- 5.10.2 Copies of acceptance test reports shall be furnished in at least three (3) copies. One copy shall be returned duly certified by the Owner, only after which the material shall be dispatched.

- 5.10.3 Record of routine test reports shall be maintained by the Supplier at his works for periodic inspection by the Owner's representative.

- 5.10.4 Test certificates of test during manufacture shall be maintained by the Supplier. These shall be produced for verification as and when desired by the Owner.

5.11 Inspection

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

- 5.11.2 The material for final inspection shall be offered by the Supplier only under packed condition as detailed in clause for 'packing and marking' in the specification. The Owner shall select samples at random from the packed lot for carrying out acceptance tests. Insulators shall normally be offered for inspection in lots not

exceeding 10,000 nos. for disc / 650 units for Long rod Insulators. The lot should be homogeneous and should contain insulators manufactured in 3-4 consecutive weeks.

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

5.11.4 No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested unless the inspection is waived off by the Owner in writing. In the latter case also the material shall be dispatched only after satisfactory testing for all tests specified herein have been completed.

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

5.12 Packing and Marking

5.12.1 All insulators shall be packed in strong season wood crates. The gross weight of crates along with the material shall not normally exceed 200 Kg to avoid handling problems. For marine transportation, crates shall be palletted.

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

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

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

5.13 Standards

The insulator strings and its components shall conform to the following Indian/International Standards which shall mean latest revision, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification.

5.13.1 In the event of supply of insulators conforming to standards other than specified, the Bidder shall confirm in his bid that these standards are equivalent or better to those specified. In case of award, salient features of comparison between the standards proposed by the Bidder and those specified in this document will be provided by the Supplier to establish equivalence.

Sl. No.	Indian Standard	Title	International Standard
1.	IS:209-1992	Specification for zinc	BS:3436
2.	IS:406-1991	Method of Chemical Analysis of Slab Zinc	BS:3436
3.	IS:731-1991	Porcelain insulators for overhead Power lines with a nominal voltage greater than 1000 V	BS:137- (I&II) IEC:60383
4.	IS:2071 Part (I) – 1993 (Part(II)- 1991 Part(III)- 1991	Methods of High Voltage Testing	IEC:60060-1
5.	IS:2486	Specification for Insulator fittings for Overhead Power Lines with a nominal voltage greater than 1000V General Requirements and Tests	

Sl. No.	Indian Standard	Title	International Standard
	Part- I-1993 Part- II-1989 Part-III-1991	Dimensional Requirements Locking Devices	BS:3288 IEC:60120 IEC:60372
6.	IS:2629-1990	Recommended Practice for Hot, Dip Galvanisation for iron and steel	ISO-1461 (E)
7.	IS:2633-1992	Testing of Uniformity of Coating of zinc coated articles	
8.	IS:6745-1990	Determination of Weight of Zinc Coating on Zinc coated iron and steel articles	BS:433-1969 ISO:1460-1973
9.	IS:8263-1990	Methods of RI Test of HV insulators	IEC:60437 NEMAPubli- cation No.07/ 1964/ CISPR
10.	IS:8269-1990	Methods for Switching Impulse test on HV insulators	IEC:60506
11.		Thermal Mechanical Performance test and mechanical performance test on string insulator units	IEC: 60575
12.		Salt Fog Pollution Voltage Withstand Test	IEC:60507
13.		Composite insulators for A.C. Overhead lines with nominal voltage greater than 1000V – Definitions, test methods and acceptance criteria	IEC 61109
14.		Residual Strength of String Insulator units of Glass or ceramic material for Overhead Lines after mechanical damage of the Dielectric	IEC:60797
15.		Tests on insulators of Ceramic material or glass or glass for overhead lines with a nominal voltage greater than 1000V	IEC:60383
16.		Characteristics of string Insulators units of the long rod type	IEC: 60433
17.		Standard Test Method for Autoclave Expansion of Portland Cement	ASTM C151-93-a
18		Guide for the selection of Insulators in respect of polluted conditions	IEC 60815
19		American National Standard for Insulators wet process porcelain and toughened glass suspension type	ANSI C29-2-1992

The standards mentioned above are available from:

Reference Abbreviation	Name and Address
BS	British Standards, British Standards Institution 101, Pentonville Road, N - 19-ND, UK
IEC/CISPR	International Electro technical Commission, Bureau Central de la Commission, electro Technique international, 1 Rue de verembe, Geneva, SWITZERLAND
BIS/IS	Beureau Of Indian Standards.

	ManakBhavan, 9, Bahadur Shah ZafarMarg, New Delhi - 110001.INDIA
ISO	International Organisation for Standardization. Danish Board of Standardization Danish Standardizing Sraat, Aurehoegvej-12 DK-2900, Heeleprup, DENMARK
NEMA	National Electric Manufacture Association, 155, East 44th Street. New York, NY 10017U.S.A.
ASTM	American Society for Testing and Materials, 1916 Race St. Philadelphia, PA19103 USA

1.0 Tests on Complete Strings with Hardware Fittings**1.1 Voltage Distribution Test (For Disc Insulator Strings only)**

The voltage across each insulator unit shall be measured by spere gap method. The result obtained shall be converted into percentage. The voltage across any disc shall not exceed 13% for suspension insulator string and 14% for tension insulator strings for 220kV lines.

1.2 Corona Extinction Voltage Test (Dry)

The sample assembly when subjected to power frequency voltage shall have a corona extinction voltage of not less than 154kV (rms) line to ground under dry condition for 220kV line. There shall be no evidence of corona on any part of the sample. The atmospheric condition during testing shall be recorded and the test results shall be accordingly corrected with suitable correction factor as stipulated in IEC: 60383.

1.3 RIV Test (Dry)

Under the condition as specified under (1.2) above, the insulator string along with complete hardware fittings shall have a radio interference voltage level below 1000 micro volts at one MHz when subjected to 50 Hz AC voltage of 154 kV line to ground under dry condition for 220kV line. The test procedure shall be in accordance with IS: 8263 / IEC: 437

1.4 Mechanical Strength Test**1.4.1 Mechanical Strength Test for Insulator string**

The complete insulator string along with its hardware fitting excluding arcing horn, corona control ring, grading ring and suspension assembly/dead end assembly shall be subjected to a load equal to 50% of the specified minimum ultimate tensile strength (UTS) which shall be increased at a steady rate to 67% of the minimum UTS specified. The load shall be held for five minutes and then removed. After removal of the load, the string components shall not show any visual deformation and it shall be possible to disassemble them by hand. Hand tools may be used to, remove cotter pins and loosen the nuts initially. The string shall then be reassembled and loaded to 50% of UTS and the load shall be further increased at a steady rate till the specified minimum UTS and held for one minute. No fracture should occur during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

1.5 Vibration Test

The suspension string shall be tested in suspension mode, and tension string in tension mode itself in laboratory span of minimum 30 meters. In the case of suspension string, a load equal to 600 kg shall be applied along the axis of the suspension string by means of turn buckle. The insulator string along with hardware fittings and the sub-conductors (each tensioned at 25% of conductor UTS) shall be secured with clamps. The system shall be suitable to maintain constant tension on each sub-conductors throughout the duration of the test. Vibration dampers shall not be used on the test span. The sub-conductors shall be vertically vibrated simultaneously at one of the resonance frequencies of the insulators string (more than 10 Hz) by means of vibration inducing equipment. The peak to peak displacement in mm of vibration at the antinode point, nearest to the string, shall be measured and the same shall not be less than $1000/f^{1.8}$ where f is the frequency of vibration in cycles/sec. The insulator string shall be vibrated for not less than 10 million cycles without any failure. After the test, the insulators shall be examined for looseness of pins and cap or any crack in the cement. The hardware shall be

examined for looseness, fatigue failure and mechanical strength test. There shall be no deterioration of properties of hardware components and insulators after the vibration test. The insulators shall be subjected to the following tests as per relevant standards:

Tests	Percentage of units to be tested
a) Temperature cycle test followed by Mechanical performance test	60
b) Puncture test / Steep wave front test	40

2.0 On Disc Insulator Units

2.1 Steep Wave Front Test (For Disc Insulator only)

Following test shall be performed on 10 insulator units in case of disc insulators selected at random from the lot offered for selection of sample for type test.

- a) Each insulator unit shall be subjected to five successive positive and negative impulse flashovers with a wave having minimum effective rate of rise of 2500 kV per microseconds.
- b) Each unit shall then be subjected to three dry power frequency voltage flashovers.

Acceptance Criteria

An insulator shall be deemed to have met the requirement of this test if, having been successfully subjected to the ten impulse flashovers, the arithmetic mean of the three subsequent dry/power frequency voltage flashover values equals or exceeds 95% of the rated dry power frequency flashover voltage.

An insulator shall be deemed to have failed to meet the requirement of above testing if,

- (a) It has not flash over when the oscillogram or peak voltage indicator shows a marked reduction in voltage.
- or
- (b) Any one of the subsequent three dry power frequency voltage flashover values is less than 80% of the value specified.

Failure of any one unit either in the steep wave front or subsequent low frequency voltage test shall cause for testing on double number of units.

2.2 Hydraulic Internal Pressure Test on Shells (only for Disc Insulator)

The test shall be carried out on 100% shells before assembly. The details regarding test will be as discussed and mutually agreed to by the Supplier and Owner in Quality Assurance Programme.

2.3 Thermal Mechanical Performance Test

Thermal Mechanical Performance Test shall be performed in accordance with IEC-60383-1 Clause 20 with the following modifications:

- (1) The applied mechanical load during this test shall be 70% of the rated electromechanical or mechanical value.
- (2) The acceptance criteria shall be
 - (a) X greater than or equal to $R + 3S$.

Where

X = Mean value of the individual mechanical failing load.

R = Rated electro-mechanical / mechanical failing load.

S = Standard deviation.

- (b) The minimum sample size shall be taken as 20 for disc insulator units and 5 units for long rod units.
- (c) The individual electromechanical failing load shall be at least equal to the rated value. Also puncture shall not occur before the ultimate fracture.

2.4 **Electromechanical/Mechanical Failing Load Test**

This test shall be performed in accordance with clause 18 and 19 of IEC 383 with the following acceptance

- (i) X greater than or equal to $R + 3S$

Where

X = Mean value of the electro-mechanical/mechanical/ failing load.

R = Rated electro-mechanical / mechanical failing load.

S = Standard deviation.

- (ii) The minimum sample size shall be taken as 20 for disc insulators units and 5 for long rod units However, for larger lot size, IEC 591 shall be applicable.
- (iii) The individual electro-mechanical/mechanical failing load shall be at least equal to the rated value. Also electrical puncture shall not occur before the ultimate fracture.

2.5 **Residual Strength Test (For Disc Insulators only)**

The above test shall be performed as per clause 4.4 and 4.5 of IEC 797 preceded by the temperature cycle test, on both glass and porcelain disc insulators. The Sample size shall be 25 and the evaluation of the results and acceptance criteria shall be as per clause No. 4.6 of IEC: 797.

2.6 **Chemical Analysis of Zinc Sleeve**

The purity of the zinc used in zinc sleeve shall be tested as per IS: 209. The purity of zinc shall not be less than 99.8%.

2.7 **IR Measurements**

IR measurement shall be carried out by the instrument operating at 5/10 kV DC. IR value when measured under fair weather condition, shall not be less than 2000 M-ohm.

2.8 **Impact Test**

The Impact Test shall be carried out in accordance with ANSI-C-29.2 Clause 8.2.8 with the following modification.

The breaking point of the pendulum shall be so adjusted that, when released the copper nose will strike the outer rim of the shell or the most protruded rim of the shell squarely in a direction parallel to the axis of the unit and towards the cap.

The test specimen shall receive an impact of 7 N-m for 120 kN Disc and 10 N-m for 160 kN Disc by releasing the pendulum.

3. **Tests on All components (As applicable)**

3.1 **Chemical Analysis of Zinc used for Galvanizing**

Samples taken from the zinc ingot shall be chemically analysed as per IS: 209-1979. The purity of zinc shall not be less than 99.95%.

3.2 **Tests for Forgings**

The chemical analysis hardness tests and magnetic particle inspection for forgings, will be as per the internationally recognised procedures for these tests. The sampling will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the Supplier and Owner in Quality Assurance Programme.

3.3 Tests on Castings

The chemical analysis, mechanical and metallographic tests and magnetic, particle inspection for castings will be as per the internationally recognised procedures for these tests. The samplings will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the Supplier and Owner in Quality Assurance Programme.

3.4 Autoclave Test

For cement used in the assembly of the insulators six samples from different batches shall be tested in accordance with ASTM C-151. The cement shall have an expansion less than 0.12%.

6.0 Standard Technical Particulars

6.1 The guaranteed technical particulars to be adhered by the contractor / manufacturer are furnished below:

6.2 Standard Technical Particulars for insulator & insulator strings

6.2.1 Standard Technical Particulars of Disc Insulators

	Description	Unit	Standard Technical Particulars Value	
			120KN Disc Insulator	160KN Disc Insulator
1	General			
a)	Size and designation of pin ball shank	mm	20 as per IS 2468 / IEC 120	20 as per IS 2468 / IEC 120
2.0	Dimensions			
a)	Diameter of Disc	mm	255/280	280
b)	Tolerance on Diameter	±mm	11.0/13.0	13.0
c)	Ball to Ball spacing between disc	mm	145	170
d)	Tolerance on Spacing	±mm	4	5
e)	Minimum nominal creepage distance of single disc	mm	370	370
3.0	Materials			
	Colour of glaze of finished insulator		Brown	Brown
4.0	Electromechanical strength of disc	KN	120	160
5.0	Minimum Electrical values			
a)	Power frequency Flashover voltage DRY/WET	kV (rms)	75/45	78/48

b)	Power frequency Withstand voltage DRY/WET	kV (rms)	70/40	72/42
c)	Impulse Flashover test voltage 1.2 x50μs(Dry) POSITIVE/NEGATIVE	kV (peak)	115/120	120/125
d)	Impulse withstand test voltage 1.2 x50μs(Dry) POSITIVE/NEGATIVE	kV (peak)	110/110	115/115
e)	Steepness of impulse voltage (steep wave front test)	kV / μs	2500	2500
6.0	Power frequency puncture voltage	kV (rms)	120	125
7.0	Minimum Visible discharge voltage of single disc (dry)	kV (rms)	18	18
8.0	Max. RIV at 1MHz and 10kV AC (rms) voltage of single disc	Microvolts	50	50
9.0	Eccentricity of Disc			
a)	Max. radial run out	mm	7.65 / 8.84	8.4
b)	Max. axial run out		10.2/11.2	11.2
10.0	Galvanizing			
a)	Minimum mass of Zinc coating	gm/m ²	600	600
b)	Minimum No. of one minute dips in SPT	Nos.	6 dips	6 dips
c)	Minimum purity of Zinc used for galvanizing	%	99.95	99.95

6.2.2 Standard Technical Particulars of insulator strings with standard disc Insulators along with hardware fittings for 220kV lines

Sl.No.	Description	Unit	Standard Technical particular Value		
			SIS	DIS	DT
			1x25 (120KN)	2x25 (120KN)	2x22 (160KN)
1.0	Mechanical Strength of complete insulator string along with hardware fittings	KN	120	240	320
2.0	Power frequency withstand voltage of string with arcing horns, corona control rings/grading rings under wet conditions	KV (rms)	790		
3.0	Impulse withstand voltage (dry)				
a)	Positive (peak)	kV	1800		
b)	Negative (peak)	kV	1800		
4.0	Minimum corona extinction voltage	kV (rms)	154		
5.0	RIV at 1MHz when string is	Micro	1000 (max.)		

	energized at 154 kV (rms) under dry condition	Volts			
6.0	Maximum voltage distribution across any disc of line to earth voltage	%		13	14

6.2.3 Standard Technical Particulars of Long Rod Insulators

Sl. No.	Description	Unit	Standard Technical Particulars Value	
			120KN	160KN
1.0	General			
a)	Size and designation of ball & socket assembly	mm	20 as per IS 2468 / IEC 120	20 as per IS 2468 / IEC 120
2.0	Dimensions			
a)	Core diameter	mm	60 to 85	70 to 85
b)	Tolerance on core diameter	±mm	0.04d+1.5	0.04d+1.5
c)	Minimum nominal creepage distance of single unit	mm	3083	2713
3.0	Colour of glaze of finished porcelain unit		Brown	Brown
4.0	Mechanical strength of disc	kN	120	160
5.0	Minimum electrical values			
a)	Power frequency Flashover voltage DRY/WET	kV (rms)	310/280	320/290
b)	Power frequency Withstand voltage DRY/WET	kV (rms)	290/270	300/270
c)	Impulse Withstand test voltage 1.2 x50µs(Dry) POSITIVE/NEGATIVE	kV (peak)	600/610	600/610
6.0	Eccentricity of Insulator			
a)	Max. axial/radial run out		1.2% of insulator length	1.2% of insulator length
b)	Max. angular displacement	Deg.	15	15
7.0	Galvanizing			
a)	Minimum mass of Zinc coating	gm/m ²	600	600
b)	Minimum No. of one minute dips in SPT	Nos.	6 dips	6 dips
c)	Minimum purity of Zinc used for galvanizing	%	99.95	99.95

6.2.4 Standard Technical Particulars of insulator strings with Long rod Insulators along with hardware fittings for 220kV lines

Sl. No.	Description	Unit	Standard Technical Particulars		
			SIS Pilot	DIS	DTS
1.	Nominal length of Insulator string	mm	3625	3625	3740
2.0	Power frequency withstand voltage of string with arcing horns, corona control rings/grading rings under wet conditions	KV (rms)	790		

3.0	Impulse withstand voltage (dry)				
a)	Positive (peak)	kV	1800		
b)	Negative (peak)	kV	1800		
4.0	Minimum corona extinction voltage	kV (rms)	154		
5.0	RIV at 1MHz when string is energized at 154 kV (rms) under dry condition	Micro Volts	1000 (max.)		
6.0	Mechanical Strength of complete insulator string along with hardware fittings	KN	120	240	320

SECTION-VIII

CONTENTS

Clause	Description
1.0	Technical Description of Hardware Fittings
2.0	Technical Description of Accessories for Conductor
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	Annexure-B
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TECHNICAL SPECIFICATION

SECTION - VII

1.0 Technical Description of Hardware Fittings

1.1 Details of Hardware Fittings

1.1.1 The hardware fittings shall be suitable for use with Disc insulators and / or porcelain long rod insulators having ball and socket fittings. The hardware fittings shall be as per the specification drawings enclosed with the section of drawing of the specification. Each hardware fitting shall be supplied complete in all respects and shall include the following hardware parts:-

1.1.2 Suitable arcing horn as specified in clause 1.8 hereinafter.

1.1.3 Suitable yoke plates complying with the specifications given hereinafter.

1.1.4 Corona control rings/grading ring with fittings for attachment to line side yoke plate.

1.1.5 Sag adjustment plate for double tension hardware fittings.

1.1.6 Suspension and dead end assembly to suit conductor size as detailed in clause 1.13, 1.14 and 1.15 hereinafter.

1.1.7 Provisions for attaching balancing weights on the line side yoke plate of single suspension pilot hardware fittings.

1.1.8 Other necessary fittings viz. D-shackles, eye links, extension links, ball clevis, socket clevis, clevis eye, U clevis and chain link etc. to make the hardware fittings complete.

1.1.9 2.5% extra fasteners.

1.2 Dimensions of Insulator String Along with Hardware Fitting

The various limiting dimensions of the insulator strings along with hardware fittings shall be as per the specification drawings enclosed with section-VIII of the specification.

1.3 Interchangeability

1.3.1 The hardware for insulator strings with disc insulators / porcelain long rod insulators together with ball and socket fittings shall be of standard design, so that these hardware are inter-changeable with each other and suitable for use with insulators of any make conforming to relevant Indian/International Standard.

1.4 **Corona and RI Performance**

Sharp edges and scratches on all the hardware fittings shall be avoided. All surfaces must be clean, smooth, without cuts and abrasions or projections. The Contractor must give suitable assurance about the satisfactory corona and radio interference performance of the materials offered by them.

1.5 **Maintenance**

1.5.1 The hardware fittings offered shall be suitable for employment of hot line maintenance technique so that usual hot line operations can be carried out with ease, speed and safety. The technique adopted for hot line maintenance shall be generally bare hand method & hot stick method. The Bidder should clearly establish in the bid, the suitability of his fittings for hot line maintenance.

1.5.2 The line side yoke plate shall have a notch & a working hole of suitable size. The design of corona control rings/grading ring shall be such that it can be easily replaced by employing hot line maintenance technique.

1.6 **Designation**

1.6.1 **Ball and Socket Designation**

The dimensions of the ball and socket are furnished in section-I of this Specification. The designation should be in accordance with the standard dimensions stated in IS 2486(Part-II)/IEC 20. The dimensions shall be checked by the appropriate gauge after galvanising only.

1.7 **Security Clips and Split Pins**

1.7.1 Security clips for use with ball and socket coupling shall be R-shaped, hump type which provides positive locking of the coupling as per IS: 2486(Part-III)/ IEC : 372. The legs of the security clips shall be spread after assembly in the works to prevent complete withdrawal from the socket. The locking device should be resilient, corrosion resistant and of suitable mechanical strength. There shall be no risk of the locking device being displaced accidentally or being rotated when in position. Under no circumstances shall the locking devices allow, separation of fittings.

1.7.2 The hole for the security clip shall be countersunk and the clip should be of such design that the eye of clip may be engaged by a hot line clip puller to provide for disengagement under energised conditions. The force required to pull the security clip into its unlocked position shall not be less than 50 N (5 kg) or more than 500 N (50 kg).

1.7.3 Split pins shall be used with bolts & nuts.

1.8 Arcing Horn/Intermediate Arcing Horn

1.8.1 The arcing horn / Intermediate Arcing Horn shall be either ball ended rod type or tubular type.

1.8.2 The arcing horn shall be provided as shown on the drawing of the hardware fittings, in this specification.

1.8.3 The air gap shall be so adjusted to ensure effective operation under actual field conditions.

The arcing distance between arcing horn and corona control rings/grading shall be **3440 mm** for all strings for 220kV.

1.9 Yoke Plates

The strength of yoke plates shall be adequate to withstand the minimum ultimate tensile strength as specified in the bid drawings.

The plates shall be either triangular or rectangular in shape as may be necessary. The design of yoke plate shall take into account the most unfavorable loading conditions likely to be experienced as a result of dimensional tolerances for disc insulators as well as components of hardware fittings within the specified range. The plates shall have suitable holes for fixing corona control rings/grading ring/arcing horn. All the corners and edges should be rounded off with a radius of atleast 3 mm. Design calculations i.e. for bearing & tensile strength, for deciding the dimensions of yoke plate shall be furnished by the bidder. The holes provided for bolts in the yoke plate should satisfy shear edge condition as per 10.2.4 of IS:800-2007.

1.10 Corona Control Rings/Grading Ring

1.10.1 The Corona control rings/grading ring shall be provided with hardware fittings and shall be of such design that it should cover at least one disc insulator in disc insulator strings so that they will reduce the voltage across the insulator units. It shall also improve corona and radio interference performance of the complete insulator string along with hardware fittings.

1.10.2 The corona control rings/grading ring shall be made of high strength heat treated aluminium alloy tube of minimum 2.5 mm wall thickness. If mild steel brackets are used then the brackets shall not be welded to the pipe but shall be fixed by means of bolts and nuts on a small aluminium plate attachment welded to the pipe. The welded center of the corona control ring/grading ring shall be grinded before buffing. Alternately, Aluminium tube/flats of suitable dimensions welded to the corona control rings/grading rings may be used for connection to yoke plate.

- 1.10.3 The Corona control rings/grading ring should have a brushed satin finish and not a bright glossy surface. No blemish should be seen or felt when rubbing a hand over the metal.
- 1.10.4 The limiting dimensions of corona control ring shall be as per the specification drawings.
- 1.10.5 Bidder may quote for grading ring with armour grip suspension assembly. The grading ring shall be of open type design with a gap of 125 mm. The open ends shall be suitably terminated. The outside diameter of the tube shall be 60 mm. The ends of grading ring tube shall be sealed with welded aluminium cap duly buffed.
- 1.10.6 Racquet type arcing horn may also be used on the line side of hardware fittings as an alternative to corona / grading ring.
- 1.11 **Sag Adjustment Plate**
- 1.11.1 The sag-adjustment plate to be provided with the double tension hardware fitting shall be of three plate type. The sag adjustment plate shall be provided with a safety locking arrangement. The device shall be of such design that the adjustment is done with ease, speed and safety.
- 1.11.2 The maximum length of the sag adjustment plate from the connecting part of the rest of the hardware fittings shall be 520 mm. The details of the minimum and maximum adjustment possible and the steps of adjustment shall be clearly indicated in the drawing. An adjustment of 150 mm minimum at the interval of 6 mm shall be possible with the sag adjustment plate.
- 1.11.3 Design calculations for deciding the dimensions of sag adjustment plate shall be furnished by bidder. The hole provided for bolts should satisfy shear edge condition as per Clause No. 10.2.4 of IS: 800-2007.
- 1.12 **Turn Buckle**
- 1.12.1 The turn buckle is to be provided with single tension hardware fitting. The threads shall be of sufficient strength to remain unaffected under the specified tensile load.
- 1.12.2 The maximum length of the turn buckle from the connecting part of the rest of the hardware fittings shall be 520 mm. The details of the minimum and maximum adjustment possible shall be clearly indicated in the drawing. An adjustment of 150 mm minimum shall be possible with turn buckle.
- 1.13 **Suspension Assembly**
- 1.13.1 The suspension assembly shall be suitable for the specific conductor as given in Section-I of this Specification.
- 1.13.2 The suspension assembly shall include free center type suspension clamp along with standard preformed armour rods or armour grip suspension clamp; except for Pilot insulator string for which only suitable Envelope type suspension clamp shall be used.

- 1.13.3 The suspension clamp along with standard preformed armour rods set shall be designed to have maximum mobility in any direction and minimum moment of inertia so as to have minimum stress on the conductor in the case of oscillation of the same.
- 1.13.4 The suspension clamp along with standard preformed armour rods/ armour grip suspension clamp set shall have the slip strength not less than that 20 to 29 kN for ACSR DEER Conductor.
- 1.13.5 The suspension assembly shall be designed, manufactured and finished to give it a suitable shape, so as to avoid any possibility of hammering between suspension assembly and conductor due to vibration. The suspension assembly shall be smooth without any cuts, grooves, abrasions, projections, ridges or excrescence, which might damage the conductor.
- 1.13.6 The suspension assembly/clamp shall be designed so that it shall minimise the static & dynamic stress developed in the conductor under various loading conditions as well as during wind induced conductor vibrations. It shall also withstand power arcs & have required level of Corona/RIV performance.
- 1.13.7 The magnetic power loss shall not be more than 1 watts per suspension assembly at sub-conductor current of 500 amps for ACSR DEER conductor except for envelope type clamps for which magnetic power loss shall not be more than 2 watts per suspension assembly at sub- conductor current of 500 amps for ACSR DEER conductor.
- 1.13.8 **Free Center Type Suspension Clamp**
- For the Free Center Suspension Clamp seat shall be smoothly rounded and curved into a bell mouth at the ends. The lip edges shall have rounded bead. There shall be at least two U-bolts for tightening of clamp body and keeper pieces together.
- 1.13.10 **Standard Preformed Armour Rod Set**
- 1.13.10.1 The Preformed Armour Rods Set, suitable for specific Conductor, shall be used to minimise the stress developed in the sub-conductor due to different static and dynamic loads because of vibration due to wind, slipping of conductor from the suspension clamp as a result of unbalanced conductor tension in adjacent spans and broken wire condition. It shall also withstand power arcs. chafing and abrasion from suspension clamp and localised heating effect due to magnetic power losses from suspension clamps as well as resistance losses of the conductor.
- 1.13.10.2 The preformed armour rods set shall have right hand lay and the inside diameter of the helices shall be less than the outside diameter of the conductor to have gentle but permanent grip on the conductor. The surface of the armour rod when fitted on the conductor shall be smooth and free from projections, cuts and abrasions etc.

1.13.10.3 The pitch length of the rods shall be determined by the Bidder but shall be less than that of the outer layer of conductor and the same shall be accurately controlled to maintain uniformity and consistently reproducible characteristic wholly independent of the skill of linemen.

1.13.10.4 The length of each rod shall be as follows:

Length

ACSR 'DEER'	2540±25 mm

The end of armour rod shall be parrot billed.

1.13.10.5 The number of armour rods in each set shall as stipulated in the Standard Technical Particulars. Each rod shall be marked in the middle with paint for easy application on the line.

1.13.10.6 The armour rod shall not loose their resilience even after five applications.

1.13.10.7 The conductivity of each rod of the set shall not be less than 40% of the conductivity of the International Annealed Copper Standard (IACS).

1.13.11 Armour Grip Suspension Clamp

1.13.11.1 The armour grip suspension clamp shall comprise of retaining strap, support housing, elastomer inserts with aluminium reinforcements and AGS preformed rod set.

1.13.11.2 Elastomer insert shall be resistant to the effects of temperature up to 95⁰C, Ozone, ultraviolet radiations and other atmospheric contaminants likely to be encountered in service. The physical properties of the elastomer shall be of approved standard. It shall be electrically shielded by a cage of AGS performed rod set. The elastomer insert shall be so designed that the curvature of the AGS rod shall follow the contour of the neoprene insert.

1.13.11.3 The AGS preformed rod set shall be as detailed in clause 1.13.10.4 to 1.13.10.7 in general except for the following.

1.13.11.4 The length of the AGS preformed rods shall be such that it shall ensure sufficient slipping strength as detailed under clause 1.13.4 and shall not introduce unfavorable stress on the conductor under all operating conditions. However the length of AGS preformed rods shall not be less than 2080 ± 25 mm for ACSR 'DEER'.

1.14 Envelope Type Suspension Clamp

1.14.1 The seat of the envelope type suspension clamp shall be smoothly rounded & suitably curved at the ends. The lip edges shall have rounded bead. There shall be at least two U-bolts for tightening of clamp body and keeper pieces together. Hexagonal bolts and nuts with split-pins shall be used for attachment of the clamp.

1.15 Dead end Assembly

1.15.1 The dead end assembly shall be suitable for specific Conductor.

1.15.2 The dead end assembly shall be compression type with provision for comprising jumper terminal at one end. The angle of jumper terminal to be mounted should be 30° with respect to the vertical line. The area of bearing surface on all the connections shall be sufficient to ensure positive electrical and mechanical contact and avoid local heating due to I^2R losses. The resistance of the clamp when compressed on Conductor shall not be more than 75% of the resistance of equivalent length of Conductor.

1.15.3 Die compression areas shall be clearly marked on each dead-end assembly designed for continuous die compressions and shall bear the words 'COM PRESS FIRST' suitably inscribed near the point on each assembly where the compression begins. If the dead end assembly is designed for intermittent die compressions it shall bear identification marks 'COMPRESSION ZONE' AND 'NON-COMPRESSION ZONE' distinctly with arrow marks showing the direction of compressions and knurling marks showing the end of the zones. The letters, number and other markings on the finished clamp shall be distinct and legible. The dimensional tolerances of the cross section of Aluminium and steel dead end; for dead end assembly for the specific conductor shall be as stipulated in the Standard Technical Particulars.

1.15.4 The assembly shall not permit slipping of, damage to, or failure of the complete conductor or any part thereof at a load less than 95% of the ultimate tensile strength of the conductor.

1.16 Fasteners: Bolts, Nuts and Washers

1.16.1 All bolts and nuts shall conform to IS 6639. All bolts and nuts shall be galvanised as per IS 367 (Part 13)/ IS 2629. All bolts and nuts shall have hexagonal heads, the heads being forged out of solid truly concentric, and square with the shank, which must be perfectly straight.

1.16.2 Bolts up to M16 and having length up to 10 times the diameter of the bolt should be manufactured by cold forging and thread rolling process to obtain good and reliable mechanical properties and effective dimensional control. The shear strength of bolt for 5.6 grade should be 310 MPa minimum as per IS 12427. Bolts should be provided with washer face in accordance with IS 1363 (Part-1) to ensure proper bearing

1.16.3 Nuts should be double chamfered as per the requirement of IS: 1363 Part-III. It should be ensured by the manufacturer that nuts should not be over tapped beyond 0.4 mm oversize on effective diameter for size up to M16.

- 1.16.4 Fully threaded bolts shall not be used. The length of the bolt shall be such that the threaded portion shall not extend into the place of contact of the component parts.
- 1.16.5 All bolts shall be threaded to take the full depth of the nuts and threaded enough to permit the firm gripping of the component parts but no further. It shall be ensured that the threaded portion of the bolt protrudes not less than 3 mm and not more than 8 mm when fully tightened. All nuts shall fit and tight to the point where shank of the bolt connects to the head.
- 1.16.6 Flat washers and spring washers shall be provided wherever necessary and shall be of positive lock type. Spring washers shall be electro-galvanised. The thickness of washers shall conform to IS 2016:1967.
- 1.16.7 The Bidder shall furnish bolt schedules giving thickness of components connected. The nut and the washer and the length of shank and the threaded portion of bolts and size of holes and any other special details of this nature.
- 1.16.8 To obviate bending stress in bolt, it shall not connect aggregate thickness more than three time its diameter.
- 1.16.9 Bolts at the joints shall be so staggered that nuts may be tightened with spanners without fouling.
- 1.16.10 To ensure effective in-process Quality control it is essential that the manufacturer should have all the testing facilities for tests like weight of zinc coating, shear strength, other testing facilities etc, in-house. The manufacturer should also have proper Quality Assurance system, which should be in line with the requirement of this specification and IS-14000 services Quality System standard.
- 1.16.11 Fasteners of grade higher than 8.8 are not to be used.

1.17 **Materials**

The materials of the various components shall be as specified hereunder. The Bidder shall indicate the material proposed to be used for each and every component of hardware fittings stating clearly the class, grade or alloy designation of the material, manufacturing process & heat treatment details and the reference standards.

1.17.1 The details of materials for different component are listed as in Table-I

TABLE-1: (Details of Materials)

Sl. No.	Name of item	Material treatment	Process of Standard	Reference	Remarks
1.	Security Clips	Stainless Steel/ Phosphor Bronze	-	AISI 302 or 304-L/ IS-1385	
2.	Arcing Horn	Mild Steel Rod/ Tube Type	Hot dip galvanised	As per IS-226 or IS-2062	
3.	Ball Fittings, Socket, all shackles links cleves	Class-IV Steel	Drop forged & normalized Hot dip galvanised	As per IS: 2004	
4.	Yoke Plate	Mild Steel	Hot dip galvanized	As per IS-226 or IS-2062	
5.	Sag Adjustment plate	Mild Steel	Hot dip galvanized	As per IS-226 or IS-2062	
6(a).	Corona Control ring/ Grading ring	High Strength Al. Alloy tube (6061/ 6063/1100 type or 65032/ 63400 Type)	Heat treated Hot dip galvanised	ASTM-B429 or as per IS	Mechanical strength of welded joint shall not be less than 20 KN
6(b).	Supporting Brackets & Mounting Bolts	High Strenctgh Al Alloy 7061/ 6063/ 65032/ 63400 Type) or Mild Steel	Heat treated Hot dip galvanised	ASTM-B429 or as per IS:226 or IS:2062	
7.	Turn Buckle	Class-II Steel	Forged hot dip galvanized	IS:2004	
8(a).	Free centre type clamp/ Envelope type Clamp: Clamp Body, Keeper Piece	High Strength Al. Alloy 4600/ LM-6 or 6061/ 65032	Casted or forged & Heat treated	IS:617 or ASTM- B429	
8(b)	Envelope type Clamp: Cotter bolts/ Hangers, Shackles, Brackets	Mild Steel	Hot dip galvanised	As per IS-226 or IS-2062	
8(c)	Envelope type Clamp: U Bolts	Stainless Steel or High Strength Al alloy 6061/ 6063 or 65032/ 63400	Forged & Heat treated	AISI 302 or 304-L ASTM-B429	

TABLE-1 : (Details of Materials)

Sl. No.	Name of item	Material treatment	Process of Standard	Reference	Remarks
9.	P. A. rod	High strength Al Alloy type 6061 or equivalent	Heat treatment During manufacturing	ASTM:B429	Min. tensile strength of 35 kg/mm ²
10.	AGS clamp (a) Supporting house	High strength Corrosion resistant Al. alloy LM6, 4600 or equivalent 6061	Cast/forged heat treated.	IS:617 or equivalent	
	(b) Al insert and retaining strap	High strength Al Alloy type 6061 or equivalent	Forged and Heat treated	ASTM:B429	
	(c) Elastomer cushion	Moulded on Al reinforcement			
11(a).	Dead End Assembly: Outer Sleeve	grade Al of purity not less than 99.50%			
11(b).	Steel Sleeve	Mild Steel	Hot Dip Galvanised	IS:226/IS-2062	
12.	Balancing weights	Cast iron MCI/ machine Mild Steel	Hot dip galvanised	IS:226/2062 or equivalent	

Note : Alternate materials conforming to other national standards of other countries also may be offered provided the properties and compositions of these are close to the properties and compositions of material specified. Bidder should furnish the details of comparison of material offered viz. a viz. specified in the bid or else the bids are liable to be rejected.

1.18 Workmanship

- 1.18.1 All the equipment shall be of the latest design and conform to the best modern practices adopted in the Extra High Voltage field. The Bidder shall offer only such equipment as guaranteed by him to be satisfactory and suitable for the rated transmission lines and will give continued good performance.
- 1.18.2 The design, manufacturing process and quality control of all the materials shall be such as to give the specified mechanical rating, highest mobility, elimination of sharp edges and corners to limit corona and radio-interference, best resistance to corrosion and a good finish.

- 1.18.3 All ferrous parts including fasteners shall be hot dip galvanised, after all machining has been completed. Nuts may, however, be tapped (threaded) after galvanising and the threads oiled. Spring washers shall be electro galvanised. The bolt threads shall be undercut to take care of the increase in diameter due to galvanising. Galvanising shall be done in accordance with IS 2629:1985/ IS 1367 (Part 13) and shall satisfy the tests mentioned in IS 2633: 1986.
- 1.19.4 Before ball fittings are galvanised, all die flashing on the shank and on the bearing surface of the ball shall be carefully removed without reducing the dimensions below the design requirements.
- 1.19.5 The zinc coating shall be perfectly adherent, of uniform thickness, smooth, reasonably bright, continuous and free from imperfections such as flux, ash rust, stains, bulky white deposits and blisters. The zinc used for galvanising shall be Zinc of any grade in IS 209:1992 ingot (fourth revision) or IS 13229:1991.
- 1.19.6 Pin balls shall be checked with the applicable "GO" gauges in at least two directions, one of which shall be across the line of die flashing, and the other 90° to this line. "NO GO" gauges shall not pass in any direction.
- 1.19.7 Socket ends, before galvanising, shall be of uniform contour. The bearing surface of socket ends shall be uniform about the entire circumference without depressions or high spots. The internal contours of socket ends shall be concentric with the axis of the fittings as per IS: 2486/IEC: 120.
- The axis of the bearing surfaces of socket ends shall be coaxial with the axis of the fittings. There shall be no noticeable tilting of the bearing surfaces with the axis of the fittings.
- 1.19.8 In case of casting, the same shall be free from all internal defects like shrinkage, inclusion, blow holes, cracks etc. Pressure die casting shall not be used for casting of components with thickness more than 5 mm.
- 1.19.9 All current carrying parts shall be so designed and manufactured that contact resistance is reduced to minimum.
- 1.19.10 No equipment shall have sharp ends or edges, abrasions or projections and cause any damage to the conductor in any way during erection or during continuous operation which would produce high electrical and mechanical stresses in normal working. The design of adjacent metal parts and mating surfaces shall be such as to prevent corrosion of the contact surface and to maintain good electrical contact under service conditions.
- 1.19.11 All the holes shall be cylindrical, clean cut and perpendicular to the plane of the material. The periphery of the holes shall be free from burrs.
- 1.19.12 All fasteners shall have suitable corona free locking arrangement to guard against vibration loosening.
- 1.19.13 Welding of aluminium shall be by inert gas shielded tungsten arc or inert gas shielded metal arc process. Welds shall be clean, sound, smooth, uniform without overlaps, properly fused and completely sealed. There shall be no cracks, voids incomplete penetration, incomplete fusion, under-cutting or inclusions. Porosity shall be minimised so that mechanical properties of the aluminium alloys are not affected. All welds shall be properly finished as per good engineering practices.

1.20 Bid Drawings

1.20.1 The Bidder shall furnish full description and illustrations of materials offered.

1.20.2 Fully dimensioned drawings of the complete insulator string hardware and their component parts showing clearly the following arrangements shall be furnished along with the bid. Weight, material and fabrication details of all the components should be included in the drawings.

- (i) Attachment of the hanger or strain plate.
- (ii) Suspension or dead end assembly.
- (iii) Arcing horn attachment to the string as specified in clause 1.8 of this technical Specification.
- (iv) Yoke plates
- (v) Hardware fittings of ball and socket type for inter connecting units to the top and bottom Yoke plates.
- (vi) Corona control rings/grading ring attachment to conductor and other small accessories.
- (vii) Links with suitable fittings.
- (viii) Details of balancing weights and arrangements for their attachment in the single suspension pilot insulator string.

1.20.3 All drawings shall be identified by a drawing number and contract number. All drawings shall be neatly arranged. All drafting & lettering shall be legible. The minimum size of lettering shall be 3 mm. All dimensions & dimensional tolerances shall be mentioned in mm.

The drawings shall include:

- (i) Dimensions and dimensional tolerance.
- (ii) Material, fabrication details including any weld details & any specified finishes & coatings. Regarding material designation & reference of standards are to be indicated.
- (iii) Catalogue No.
- (iv) Marking
- (v) Weight of assembly
- (vi) Installation instructions
- (vii) Design installation torque for the bolt or cap screw.
- (viii) Withstand torque that may be applied to the bolt or cap screw without failure of component parts.
- (ix) The compression die number with recommended compression pressure.
- (x) All other relevant terminal details.

- 1.20.4 After placement of award, the Contractor shall submit fully dimensioned drawing including all the components in four (4) copies to the Employer for approval. After getting approval from the Employer and successful completion of all the type tests, the Contractor shall submit thirty (30) more copies of the same drawings to the Employer for further distribution and field use at Employer's end.

2.0 Accessories for Conductor

2.1 General

- 2.1.1 This portion (under clause 2.0) details the technical particulars of the accessories for Conductor.

- 2.1.2 2.5% extra fasteners and retaining rods shall be provided.

2.2 Mid Span Compression Joint

- 2.2.1 Mid Span Compression Joint shall be used for joining two lengths of conductor. The joint shall have a resistivity less than 75% of the resistivity of equivalent length of conductor. The joint shall not permit slipping off, damage to or failure of the complete conductor or any part thereof at a load less than 95% of the ultimate tensile strength of the conductor.

- 2.2.2 The joint shall be made of steel and aluminium sleeves for jointing the steel core and aluminium wires respectively. The steel sleeve should not crack or fail during compression. The steel sleeve shall be hot dip galvanised. The aluminium sleeve shall have aluminium of purity not less than 99.5%. The dimensions and dimensional tolerances of mid span compression joint shall be as per Standard Technical Particulars.

2.4 Repair Sleeve

Repair Sleeve of compression type shall be used to repair conductor with not more than two strands broken in the outer layer. The sleeve shall be manufactured from 99.5% pure aluminium and shall have a smooth surface. The repair sleeve shall comprise of two pieces with a provision of seat for sliding of the keeper piece. The edges of the seat as well as the keeper piece shall be so rounded that the conductor strands are not damaged during installation. The dimensions and dimensional tolerances of repair sleeve shall be as per Standard Technical Particulars.

2.5 Vibration Damper

- 2.5.1 Vibration dampers of 4R-stockbridge type with four (4) different resonances spread within the specified aeolian frequency band width corresponding to wind speed of 1 m/s to 7 m/s shall be used at suspension and tension points on each conductor in each span to damp out aeolian vibration as mentioned herein after.

- 2.5.2 Alternate damping systems or "Dogbone" dampers offering equivalent or better performance also shall be accepted provided the manufacturer meets the qualifying requirements stipulated in the Specifications. Relevant technical documents to establish the technical suitability of alternate systems shall be furnished by the Bidder along with the bid.

- 2.5.3 One damper minimum on each side per Conductor/Sub-conductor for suspension points and two dampers minimum on each side per conductor/sub-conductor for tension points shall be used for ruling design span as given in relevant clause of section-I.
- 2.5.4 The Bidder may offer damping system involving more number of dampers per ruling design span than the specified. However suitable price compensation shall be considered for evaluation. For the purpose of price compensation 80% of the towers as suspension locations and 20% of the towers as tension locations and all the spans shall be assumed to be ruling design spans.
- 2.5.5 The clamp of the vibration damper shall be made of high strength aluminium alloy of type LM-6. It shall be capable of supporting the damper and prevent damage or chaffing of the conductor during erection or continued operation. The clamp shall have smooth and permanent grip to keep the damper in position on the conductor without damaging the strands or causing premature fatigue failure of the conductor under the clamp. The clamp groove shall be in uniform contact with the conductor over the entire clamping surface except for the rounded edges. The groove of the clamp body and clamp cap shall be smooth, free from projections, grit or other materials which could cause damage to the conductor when the clamp is installed. Clamping bolts shall be provided with self locking nuts and designed to prevent corrosion of threads or loosening in service.
- 2.5.6 The messenger cable shall be made of high strength galvanised steel/stain less steel. It shall be of preformed and post formed quality in order to prevent subsequent droop of weight and to maintain consistent flexural stiffness of the cable in service. The messenger cable other than stainless steel shall be hot dip galvanised in accordance with the recommendations of IS: 4826 for heavily coated wires.
- 2.5.7 The damper mass shall be made of hot dip galvanised mild steel/cast iron or a permanent mould cast zinc alloy. All castings shall be free from defects such as cracks, shrinkage, inclusions and blow holes etc. The surface of the damper masses shall be smooth.
- 2.5.8 The damper clamp shall be casted over the messenger cable and offer sufficient and permanent grip on it. The messenger cable shall not slip out of the grip at a load less than the mass pull-off value of the damper. The damper masses made of material other-than zinc alloy shall be fixed to the messenger cable in a suitable manner in order to avoid excessive stress concentration on the messenger cables which shall cause premature fatigue failure of the same. The messenger cable ends shall be suitably and effectively sealed to prevent corrosion. The damper mass made of zinc alloy shall be casted over the messenger cable and have sufficient and permanent grip on the messenger cable under all service conditions.
- 2.5.9 The damper assembly shall be so designed that it shall not introduce radio interference beyond acceptable limits.
- 2.5.10 The vibration damper shall be capable of being installed and removed from energised line by means of hot line technique. In addition, the clamp shall be capable of being removed and reinstalled on the conductor at the designated torque without shearing or damaging of fasteners.

- 2.5.11 The contractor must indicate the clamp bolt tightening torque to ensure that the slip strength of the clamp is maintained between 2.5 kN and 5 kN. The clamp when installed on the conductor shall not cause excessive stress concentration on the conductor leading to permanent deformation of the conductor strands and premature fatigue failure in operation.
- 2.5.12 The magnetic power loss of vibration damper shall not exceed the limit as stipulated in the Standard Technical Particulars.
- 2.5.13 The vibration analysis of the system, with and without damper and dynamic characteristics of the damper as detailed under Annexure-A, shall have to be submitted. The technical particulars for vibration analysis and damping design of the system are as follows:

Sl. No.	Description	Technical particulars
1.	Span length in meters	
i)	Ruling design span	As given in section-I
ii)	Maximum span	1100 meters
iii)	Minimum span	100 meters
2.	Configuration	As per Section-I of this specification
3.	Tensile load in each sub-Conductor at temperature of 0 deg. C and still air	As per sag tension calculations.
4.	Armour rod used	Standard Preformed armour rods/ AGS
4.	Maximum permissible dynamic strain	+/- 150 micro strains

- 2.5.14 The damper placement chart for spans ranging from 100m to 1100m shall be submitted by the Bidder. Placement charts should be duly supported with relevant technical documents and sample calculations.

- 2.5.15 The damper placement charts shall include the following

- (1) Location of the dampers for various combinations of spans and line tensions clearly indicating the number of dampers to be installed per conductor per span.
- (2) Placement distances clearly identifying the extremities between which the distances are to be measured.
- (3) Placement recommendation depending upon type of suspension clamps (viz. Free center type/Armour grip type etc.)
- (4) The influence of mid span compression joints, repair sleeves and armour rods (standard and AGS) in the placement of dampers.

2.8 Material and Workmanship

- 2.8.1 All the equipment shall be of the latest proven design and conform to the best modern practice adopted in the extra high voltage field. The Bidder shall offer only such equipment as guaranteed by him to be satisfactory and suitable for transmission line application of the rated voltage with single conductor and will give continued good performance.
- 2.8.2 The design, manufacturing process and quality control of all the materials shall be such as to achieve requisite factor of safety for maximum working load, highest mobility, elimination of sharp edges and corners, best resistance to corrosion and a good finish.
- 2.8.3 All ferrous parts shall be hot dip galvanised, after all machining has been completed. Nuts may, however, be tapped (threaded) after galvanising and the threads oiled. Spring washers shall be electro galvanised as per grade 4 of IS- 1573-1970. The bolt threads shall be undercut to take care of increase in diameter due to galvanising. Galvanising shall be done in accordance with IS: 2629/IS-1367 (Part-13) and satisfy the tests mentioned in IS-2633. Fasteners shall withstand four dips while spring washers shall withstand three dips. Other galvanised materials shall have a minimum overall coating of Zinc equivalent to 600 gm/sq.m and shall be guaranteed to withstand at least six dips each lasting one minute under the standard Preece test for galvanising unless otherwise specified.
- 2.8.4 The zinc coating shall be perfectly adherent, of uniform thickness, smooth, reasonably bright, continuous and free from imperfections such as flux, ash, rust stains, bulky white deposits and blisters. The zinc used for galvanising shall be of grade Zn.99.95 as per IS: 209.
- 2.8.5 In case of castings, the same shall be free from all internal defects like shrinkage, inclusion, blow holes, cracks etc.
- 2.8.6 All current carrying parts shall be so designed and manufactured that contact resistance is reduced to minimum and localised heating phenomenon is averted.
- 2.8.7 No equipment shall have sharp ends or edges, abrasions or projections and shall not cause any damage to the conductor in any way during erection or during continuous operation which would produce high electrical and mechanical stresses in normal working. The design of adjacent metal parts and mating surfaces shall be such as to prevent corrosion of the contact surface and to maintain good electrical contact under all service conditions.
- 2.8.8 Particular care shall be taken during manufacture and subsequent handling to ensure smooth surface free from abrasion or cuts.
- 2.8.9 The fasteners shall conform to the requirements of IS: 6639. All fasteners and clamps shall have corona free locking arrangement to guard against vibration loosening.

2.9 Compression Markings

Die compression areas shall be clearly marked on each equipment designed for continuous die compressions and shall bear the words 'COMPRESS FIRST' 'suitably inscribed on each equipment where the compression begins. If the equipment is designed for intermittent die compressions, it shall bear the identification marks 'COMPRESSION ZONE' and 'NON-COMPRESSION ZONE' distinctly with arrow marks showing the direction of compression and knurling marks showing the end of the zones. The letters, number and other markings on finished equipment shall be distinct and legible.

2.10 Bid Drawings

2.10.1 The Bidder shall furnish detailed dimensioned drawings of the equipment's and all component parts. Each drawing shall be identified by a drawing number and Contract number. All drawings shall be neatly arranged. All drafting and lettering shall be legible. The minimum size of lettering shall be 3 mm. All dimensions and dimensional tolerances shall be mentioned in mm.

2.10.2 The drawings shall include

- (i) Dimensions and dimensional tolerances
- (ii) Material. fabrication details including any weld details and any specified finishes and coatings. Regarding material, designations and reference of standards are to be indicated.
- (iii) Catalogue No.
- (iv) Marking
- (v) Weight of assembly
- (vi) Installation instructions
- (vii) Design installation torque for the bolt or cap screw
- viii) Withstand torque that may be applied to the bolt or cap screw without failure of component parts
- (ix) The compression die number with recommended compression pressure.
- (x) All other relevant technical details

2.10.3 Placement charts for damper

2.10.4 The above drawings shall be submitted with all the details as stated above along with the bid document. After the placement of award. the Contractor shall again submit the drawings in four copies to the Purchaser for approval. After Purchaser's approval and successful completion of all type tests, 10 (ten) more sets of drawings shall be submitted to Purchaser for further distribution and field use at Purchaser's end.

3.0 G.S. Earth wire Accessories

3.1 General

3.1.1 This portion Specify the details of the technical particulars of the accessories for Galvanised Steel Earth wire.

3.1.2 2.5% extra fasteners shall be supplied.

3.2 Mid Span Compression Joint

Mid Span Compression Joint shall be used for joining two lengths of earth wire. The joint shall be made of mild steel with aluminium encasing. The steel sleeve should not crack or fail during compression. The Brinnel Hardness of steel should not exceed the value as stipulated in the Standard Technical Particulars. The steel sleeve shall be hot dip galvanised. The aluminium sleeve shall have aluminium of purity not less than that stipulated in the Standard Technical Particulars. Filler aluminium sleeve shall also be provided at the both ends. The joints shall not permit slipping off, damage to or failure of the complete earth wire or any part thereof at a load not less than 95% of the ultimate tensile strength of the earth wire. The joint shall have resistivity less than 75% of resistivity of equivalent length of earth wire. The dimensions and the dimensional tolerances of the joint shall be as stipulated in the Standard Technical Particulars.

3.3 Vibration Damper

3.3.1 Vibration dampers of 4R-Stockbridge type with four (4) different frequencies spread within the specified aeolian frequency band-width corresponding to wind speed of 5m/s to 7 m/s shall be used for suspension and tension points on each earth wire in each span to damp out aeolian vibrations as mentioned herein after.

3.3.2 Alternate damping systems or “Dogbone” dampers offering equivalent or better performance also shall be acceptable provided the manufacturer meets the qualifying requirements stipulated in the Specifications. Relevant technical documents to establish the technical suitability of alternate systems shall be furnished by the Bidder along with the bid.

3.3.3 One damper minimum on each side per earth wire at suspension points and two dampers on each side per earth wire at tension points shall be used for ruling design span as given is relevant clause of Section-I.

3.3.4 The Bidder may offer damping system involving more number of dampers per ruling design span than the specified. However suitable price compensation shall be considered for evaluation. For the purpose of price compensation 15% of towers as suspension locations and 85% of the towers as tension locations and all the spans assumed to be ruling design spans.

- 3.3.5 The clamp of the vibration damper shall be made of aluminium alloy. It shall be capable of supporting the damper during installation and prevent damage or chaffing of the earth wire during erection or continued operation. The clamp shall have smooth and permanent grip to keep the damper in position on the earth wire without damaging the strands or causing premature fatigue failure of the earth wire under the clamp. The clamp groove shall be in uniform contact with the earth wire over the entire clamping surface except for the rounded edges. The groove of the clamp body and clamp cap shall be smooth, free from projections, grit or materials which could cause damage to the earth wire when the clamp is installed. Clamping bolts shall be provided with self locking nuts designed to prevent corrosion of the threads or loosening during service.
- 3.3.6 The messenger cable shall be made of high strength galvanised steel/stainless steel with a minimum strength of 135 Kg/sq.mm. It shall be of preformed and post formed quality in order to prevent subsequent droop of weights and to maintain consistent flexural stiffness of the cable in service. The number of standards in the messenger cable shall be 19. The messenger cable ends shall be suitably and effectively sealed to prevent corrosion.
- 3.3.7 The damper mass shall be made of hot dip galvanised mild steel/cast iron or a permanent mould cast zinc alloy. All castings shall be free from defects such as cracks, shrinkages, inclusions and blow holes etc. The inside and outside surfaces of the damper masses shall be smooth.
- 3.3.8 The vibration analysis of the system, with and without damper, dynamic characteristic of the damper as detailed under Annexure-A, shall have to be submitted by the Bidder along with his bid. The technical particulars for vibration analysis and damping design of the system are as follows: -

Sl. o.	Description	Technical particulars
1.	Span length in meters	
i)	Ruling design span	As given in section-I
ii)	Maximum span	1100 meters
iii)	Minimum span	100 meters
2.	Tensile load in Conductor at temperature of 0 deg. C and still air	As per sag tension calculations.
3.	Maximum permissible dynamic strain	+/- 150 micro strains

- 3.3.9 The damper placement chart for spans ranging from 100 m to 1100 m shall be submitted by the Bidder. All the placement charts should be duly supported by relevant technical documents.
- 3.3.10 The damper placement charts shall include the following:

- (1) Location of the dampers for various combinations of spans and line tensions clearly indicating number of dampers to be installed per earth wire per span.
- (2) Placement distances clearly identifying the extremities between which the distances are to be measured.
- (3) Placement recommendation depending upon type of suspension clamps (viz. free center type/trunion type etc.)
- (4) The influence of mid span compression joints in the placement of dampers.

3.4 **Flexible Copper Bond**

The flexible copper bond shall be circular in cross-section of minimum 34 sq.mm equivalent copper area and not less than 500 mm in length. It shall consist of 259 wires of 0.417 mm dia. tinned copper conductor. It shall be laid up as 7 stranded ropes, each of 37 bunched wires. The tinning shall be as per relevant Indian Standard. Two tinned copper connecting lugs shall be press jointed to either ends of the flexible copper cable. One lug shall be suitable for 12 mm, dia. bolt and the other for 16 mm dia bolt. The complete assembly shall also include one 16 mm dia., 40 mm long HRH MS Bolt hot dip galvanised with nut and lock washer.

3.5 **Suspension Clamp**

- 3.5.1 Standard anchor shackle/twisted shackle for earth wire suspension clamp shall be supplied for attaching to the hanger plate of tower.
- 3.5.2 At all suspension towers, suitable suspension clamps shall be used to support the required earth wire. The clamps shall be of either free center type or trunion type and shall provide adequate area of support to the earth wire. The groove of the clamp shall be smooth, finished in an uniform circular or oval shape and shall slope downwards in a smooth curve to avoid edge support and hence to reduce the intensity of bending moment on earth wire.
- 3.5.3 There shall be no sharp point in the clamps coming in contact with earth wire. There shall not be any displacement in the configuration of the earth wire strands nor shall the strands be unduly stressed in final assembly during working conditions.
- 3.5.4 The clamping piece and the clamp body shall be clamped by at least two U-bolts of size not less than 10 mm diameter having one nut and one 3 mm thick lock nut with washer on each of its limbs. Suspension clamps shall be provided with inverted type U-bolts. One limb of the U-bolt shall be long enough to accommodate the lug of the flexible copper bond.
- 3.5.5 The Contractor shall supply all the components of the suspension assembly including shackles, bolts, nuts, washers, split pin etc. The total drop of the suspension assembly from the center point of the attachment to the center point of the earth wire shall not exceed 150 mm. The design of the assembly shall be such that the direction of run of the earth wire shall be same as that of the conductor.

- 3.5.6 The complete assembly shall be guaranteed for slip strength of not less than 12 KN and not more than 17 kN. The breaking strength of the assembly shall not be less than 30 kN.

3.6 Tension Clamp

- 3.6.1 At all tension towers suitable compression type tension clamps shall be used to hold the required galvanised steel earth wire. Anchor shackle shall be supplied which shall be suitable for attaching the tension clamp to strain plates.
- 3.6.2 The clamps shall have adequate area of bearing surface to ensure positive electrical and mechanical contact and shall not permit any slip to the earth wire under working tension and vibration conditions. The angle of jumper terminal to be mounted should be 30 deg. with respect to the vertical line.
- 3.6.3 The clamps shall be made of mild steel with aluminium encasing. The steel should not crack or fail during compression. The Brinnel hardness of steel sleeve shall not exceed 200. The steel sleeve shall be hot dip galvanised. The aluminium encasing shall have aluminium of purity not less than 99.5%. Filler aluminium sleeve shall also be provided at the end.
- 3.6.4 The complete assembly shall be so designed as to avoid undue bending in any part of the clamp and shall not produce any hindrance to the movements of the clamps in horizontal or vertical directions.
- 3.6.5 The slip strength of the assembly shall not be less than 95% of the ultimate strength of the earth wire.
- 3.6.6 The clamps shall be complete with all the components including anchor shackle, bolts, nuts, washers, split pin, jumper arrangement etc.

3.7 Material and Workmanship

Same as Clause 2.8 of this section

3.8 Compression Marking

Same as Clause 2.9 of this section

3.9 Bid Drawings

Same as Clause 2.10 of this section

4.0 Standard Technical Particulars

- 4.1 The Standard technical particulars to adhered by the contractor / manufacturer are furnished in annexure-C of this section.

5.0 Tests and Standards

5.1 Type Tests

5.1.1 On the complete Insulator String with Hardware Fittings

a)	Power frequency voltage withstand test with corona control rings/grading ring and arcing horns under wet condition Impulse voltage withstand test under dry	: As per IEC:383
b)	condition Impulse voltage flashover test under dry	: As per IEC:383
c)	condition	: As per IEC:383 : As per
d)	Voltage distribution test (for disc insulators only)	Annexure-A : As per
e)	Corona and RIV test under dry condition	Annexure-A : As per
f)	Mechanical Strength test	Annexure-A : As per
g)	Vibration test	Annexure-A

Note:

- 1) All the type test given in Clause No. 5.1.1 shall be conducted on following insulator string along with hardware fittings:-
 - A) On insulator strings along with hardware fittings for 220 kV line:-
 - ☐ Double 'I' suspension insulator string &
 - ☐ Double Tension insulator string.
- 2) All the type tests given under Clause No. 5.1.1 (a) to (f) shall also be conducted on following insulator string along with hardware fittings:-
 - A) On insulator strings along with hardware fittings for 220 kV line:- ☐ Single suspension Pilot insulator string,

5.1.2 On Suspension Hardware Fitting only

a)	Visual examination & Dimensional and material Verification	: IEC:61824, Clause 7 & 8
b)	Magnetic power loss test for suspension clamp	: As per Annexure-A

- c) Clamp slip test for suspension clamp : IEC:61824, Clause 11.4.2
- d) Vertical damage load & Failure load test for suspension clamp : IEC:61824, Clause 11.4.1
- e) Ozone resistance Test on elastomer : IEC:61824

5.1.3 On Tension Hardware Fitting only

- a) Visual examination & Dimensional and material Verification : IEC:61824, Clause 7 & 8
- b) Heating cycle test for dead end Assembly : IEC:61824, Clause 13
- c) Mechanical Damage & Failure load Test (excluding clamp) : IEC:61824, Clause 11.5.2
- d) Tensile test for dead-end clamp : IEC:61824, Clause 11.5.1

5.1.4 On Mid Span Compression Joint for Conductor and Earthwire

- a) Visual examination & Dimensional and material Verification : IEC:61824, Clause 7 & 8
- b) Heating cycle test : IEC:61824, Clause 13
- c) Tensile test IEC: 6128, clause 11.5.1
- d) Corona extinction voltage test (dry) (for 220 kV voltage level line only) : As per Annexure-A
- e) Radio interference voltage test (dry) (for 220 kV voltage level line only) : As per Annexure-A

Note: Tests mentioned at (b), (d) & (e) are not applicable for Mid Span Compression Joints for earthwire.

5.1.5 On Repair Sleeve for Conductor

- a) Visual examination & Dimensional and material Verification : IEC:61824, Clause 7 & 8
- b) Tensile test : IEC:61824, Clause 11.6.1
- c) Corona extinction voltage test (dry) (for 220 kV voltage level line only) : As per Annexure-A
- d) Radio interference voltage test (dry) (for 220 kV voltage level line only) : As per Annexure-A

5.1.6 On Flexible Copper Bond

a)	Visual examination & Dimensional and material Verification	: IEC:61824, Clause 7 & 8
a)	Slip strength test	: As per Annexure-A

5.1.7 On Vibration Damper for Conductor and Earthwire

a)	Visual examination & Dimensional and material Verification	: IEC:61897, Clause 7.1 & 7.2
b)	Dynamic characteristics test	: As per Annexure-A
c)	Vibration analysis	: As per Annexure-A
d)	Clamp slip test	: IEC:61897, Clause 7.5
e)	Clamp bolt tightening test	: IEC:61897, Clause 7.7
f)	Attachment of weights to messenger cable	: IEC:61897, Clause 7.8
g)	Attachment of clamp to Messenger cable	: IEC:61897, Clause 7.8
h)	Fatigue tests	: As per Annexure-A
i)	Magnetic power loss test	: As per Annexure-A
j)	Corona extinction voltage test (dry) (for 220 kV voltage level line only)	: As per Annexure-A
k)	Radio interference voltage test (dry) (for 220 kV voltage level line only)	: As per Annexure-A
l)	Damper effectiveness evaluation	: IEC:61897, Clause 7.11.3.2

Note: Tests mentioned at (i), (j) & (k) are not applicable for Vibration Damper for earthwire.

5.1.8 On Earthwire Suspension clamp Assembly

a)	Visual examination & Dimensional and material Verification	: IEC:61824, Clause 7 & 8
c)	Vertical damage load & Failure load test for suspension clamp	: IEC:61824, Clause 11.4.1
c)	Clamp slip test for suspension clamp	: IEC:61824, Clause 11.4.2

5.1.9 On Earthwire Tension clamp Assembly

a)	Visual examination & Dimensional and material Verification	: IEC:61824, Clause 7 & 8
b)	Mechanical Damage & Failure load Test (excluding clamp)	: IEC:61824, Clause 11.5.2
c)	Tensile test for dead-end clamp	: IEC:61824, Clause 11.5.1

5.1.10 Type tests specified under Clause 5.1.1 to 5.1.9 shall not be required to be carried out if a valid test certificate is available for a similar design, i.e., tests conducted earlier should have been conducted in accredited laboratory (accredited based on ISO/IEC guide 25/17025 or EN 45001 by the National Accreditation body of the country where laboratory is located) or witnessed by the representative (s) of RECTPCL/PDD, J&K or Utility.

In the event of any discrepancy in the test report (i.e., any test report not applicable due to any design / material/manufacturing process change including substitution of components or due to non-compliance with the requirement stipulated in the Technical Specification) the tests shall be conducted by the Contractor at no extra cost to the Employer.

5.2 Acceptance Tests

5.2.1 On Both Suspension and Tension Hardware Fittings

a)	Visual examination & Dimensional and material Verification	: IEC:61824, Clause 7 & 8
b)	Galvanising/Electroplating test	: As per Annexure-A
c)	Mechanical Damage & failure load of each component (excluding corona control rings grading ring and arcing horn)	: IEC:61824, Clause 11.3.1,
d)	Mechanical Strength test of welded joint	: As per Annexure-A
e)	Mechanical strength test for corona control ring/ grading ring and arcing horn	:BS:3288(Part-I) Clause 7.3.2
f)	Test on locking device for ball and socket coupling	: As per IEC:372 (2)
g)	Chemical analysis, hardness tests, grain size, inclusion rating & magnetic particle inspection for forgings/castings	: As per Annexure-A

5.2.2 On Suspension Hardware Fittings only

- a) Clamp Slip strength Vs Torque test for suspension clamp : As per Annexure-A
Shore hardness test of elastomer cushion
- b) for AG suspension clamp : As per Annexure-A
- c) Bend test for armour rod set : As per IS:2121(Part-I), Clause 7.5,7,10 & 7.11
- d) Resilience test for armour rod set : As per IS:2121(Part-I), Clause 7.5,7,10 & 7.11
- e) Conductivity test for armour rods set : As per IS:2121(Part-I), Clause 7.5,7,10 & 7.11

5.2.3 On Tension Hardware Fittings only

- a) Tensile test for dead end assembly : IEC:61824, Clause 1.5.1

5.2.4 On Mid Span Compression Joint for Conductor and Earthwire

- a) Visual examination & Dimensional and material Verification : IEC:61824, Clause 7 & 8
- b) Galvanising test : As per Annexure-B
- c) Hardness test : As per Annexure-B

5.2.5 Repair Sleeve for Conductor

- a) Visual examination & Dimensional and material Verification : IEC:61824, Clause 7 & 8
- b) Tensile test : IEC:61824, Clause 11.6.1

5.2.6 Flexible Copper Bond

- a) Visual examination & Dimensional and IEC:61824, Clause 7 & 8

material Verification

- b) Slip strength test : As per annexure-B

5.2.7 Vibration Damper for Conductor and Earthwire

- a) Visual examination & Dimensional and material Verification : IEC:61897, Clause 7.1 & 7.2
- b) Galvanising test : IEC:61897, Clause 7.3
- (i) On damper masses
- ii) On messenger cable
- c) Clamp slip test :IEC:61897, Clause 7.5
- d) Clamp bolt tightening test :IEC:61897, Clause 7.7
- e) Attachment of weights to messenger cable :IEC:61897, Clause 7.8
- f) Attachment of clamp to Messenger cabl :IEC :61897, clause 7.8
- g) Verification of resonance frequencies : As per Annexure-B
- h) Strength of the messenger cable : As per Annexure -B
- i) Dynamic characteristics test :As per Annexure –B

5.2.8 Earthwire Tension Clamp Assembly

- a) Visual examination & Dimensional and material Verification : IEC:61824, Clause 7 & 8
- b) Galvanising test : As per Annexure-A
- c) Slip strength test for tension clamp : As per Annexure-A
- d) Mechanical Damage & failure load of each component (excluding corona control rings grading ring and arcing horn) : IEC:61824, Clause 11.3.1

5.2.9 Earthwire Suspension Clamp Assembly

- a) Visual examination & Dimensional and material Verification : IEC:61824, Clause 7 & 8
- b) Galvanising test : As per Annexure-A
- c) Clamp slip strength test : As per Annexure-A
- d) Mechanical Damage & failure load of each component (excluding clamp) : IEC:61824, Clause 11.5.1

5.3 Routine Tests

5.3.1 For Hardware Fittings

- a) Visual examination : IEC:61824
- b) Proof Load Test : As per Annexure-A

5.3.2 For conductor and earthwire accessories

- a) Visual examination & Dimensional and material Verification : IEC:61824, Clause 7 & 8

5.4 Tests During Manufacture on all components as applicable

- a) Chemical analysis of Zinc used for galvanising IS:2486-(Part-I)
- b) Chemical analysis mechanical metallographic test and magnetic particle inspection for malleable castings : As per Annexure-A
- c) Chemical analysis, hardness tests and magnetic particle inspection for forging : As per Annexure-A

5.5 Testing Expenses

5.5.1 In case of failure in any type test, the Bidder is either required to modify the design of the material & successfully carryout all the type tests as has been detailed out in Clause 5.1 of this specification or to repeat that particular type test at least three times successfully at his own expenses.

5.5.2 In case of type test on the complete insulator string, the Contractor has to arrange similar insulators at his own cost

5.5.3 Bidder shall indicate the laboratories in which they propose to conduct the type tests. They shall ensure that adequate facilities for conducting the tests are available in the laboratory and the tests can be completed in these laboratories within the time schedule guaranteed by them in the appropriate schedule.

5.5.4 The entire cost of testing for acceptance and routine tests and tests during manufacture specified herein shall be treated as included in the quoted Ex-works/CIF Price.

5.5.5 In case of failure in any type test, repeat type tests are required to be conducted, then, all the expenses for deputation of Employer's representative/Inspector shall be deducted from the contract price. Also, if on receipt of the Contractor's notice of testing, the Employer's representative/Inspector does not find 'plant' to be ready for testing, the expenses incurred by the Employer for re-deputation shall be deducted from contract price.

5.5.6 The Contractor shall intimate the Employer about carrying out of the type tests along with detailed testing programme at least 3 weeks in advance (in case of Domestic Contractor and at least 6 weeks advance in case of Foreign Contractor) of the scheduled date of testing during which the Employer will arrange to depute his representative to be present at the time of carrying out the tests.

5.6 **Sample Batch For Type Testing**

5.6.1 The Contractor shall offer material for sample selection for type testing only after getting Quality Assurance Programme approved by the Employer. The Contractor shall offer at least three times the quantity of materials required for conducting all the type tests for sample selection. The sample for type testing will be manufactured strictly in accordance with the Quality Assurance Programme approved by the Employer.

5.6.2 Before sample selection for type testing the Contractor shall be required to conduct all the acceptance tests successfully in presence of Employer's representative.

5.7 **Schedule of Testing and Additional Tests**

5.7.1 The Bidder has to indicate the schedule of following activities in their bids

(a) Submission of drawing for approval.

(b) Submission of Quality Assurance programme for approval.

(c) Offering of material for sample selection for type tests.

(d) Type testing.

5.7.2 The Employer reserves the right of having at his own expense any other test(s) of reasonable nature carried out at Contractor's premises, at site, or in any other place in addition to the aforesaid type, acceptance and routine tests to satisfy himself that the material comply with the specifications.

5.7.3 The Employer also reserves the right to conduct all the tests mentioned in this specification at his own expense on the samples drawn from the site at Contractor's premises or at any other test center. In case of evidence of non compliance, it shall be binding on the part of Contractor to prove the compliance of the items to the technical specifications by repeat tests, or correction of deficiencies, or replacement

of defective items, all without any extra cost to the Employer.

5.8 Test Reports

- 5.8.1 Copies of type test reports shall be furnished in at least six copies along with one original. One copy shall be returned duly certified by the Employer, only after which the commercial production of the concerned material shall start.
- 5.8.2 Copies of acceptance test report shall be furnished in at least six copies. One copy shall be returned, duly certified by the Employer, only after which the materials will be dispatched.
- 5.8.3 Record of routine test report shall be maintained by the Contractor at his works for periodic inspection by the Employer's representative.
- 5.8.4 Test certificates of tests during manufacture shall be maintained by the Contractor. These shall be produced for verification as and when desired by the Employer.

5.9 Inspection

- 5.9.1 The Employer's representative shall at all times be entitled to have access to the works and all places of manufacture, where the material and/or its component parts shall be manufactured and the representatives shall have full facilities for unrestricted inspection of the Contractor's, sub-Contractor's works raw materials. Manufacturer's of all the material and for conducting necessary tests as detailed herein.
- 5.9.2 The material for final inspection shall be offered by the Contractor only under packed condition as detailed in clause 5.11 of this part of the Specification. The engineer shall select samples at random from the packed lot for carrying out acceptance tests.
- 5.9.3 The Contractor shall keep the Employer informed in advance of the time of starting and of the progress of manufacture of material in its various stages so that arrangements could be made for inspection.
- 5.9.4 Material shall not be dispatched from its point of manufacture before it has been satisfactorily inspected and tested unless the inspection is waived off by the Employer in writing. In the latter case also the material shall be dispatched only after all tests specified herein have been satisfactorily completed.
- 5.9.5 The acceptance of any quantity of material shall in no way relieve the Contractor of his responsibility for meeting all the requirements of the Specification, and shall not prevent subsequent rejection, if such material are later found to be defective.

5.10 Packing and Marking

- 5.10.1 All material shall be packed in strong and weather resistant wooden cases/crates. The gross weight of the packing shall not normally exceed 200 Kg to avoid handling problems.
- 5.10.2 The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field.

- 5.10.3 Suitable cushioning, protective padding, dunnage or spacers shall be provided to prevent damage or deformation during transit and handling.
- 5.10.4 Bolts, nuts, washers, cotter pins, security clips and split pins etc. shall be packed duly installed and assembled with the respective parts and suitable measures shall be used to prevent their loss.
- 5.10.5 Each component of Hardware fittings and accessories shall be legibly and indelibly marked with trade mark of the manufacturer. However, in such type of component/item, which consists of many parts and are being supplied in assembled condition(suspension clamp, vibration damper, spacer/rigid spacer, spacer damper etc.), the complete assembly shall be legibly and indelibly marked on main body/on one of the parts. The symbol  /  along with the word 'TOP' shall be marked on the main body of the spacer damper for installing spacer damper in correct position.
- 5.10.6 All the packing cases shall be marked legibly and correctly so as to ensure safe arrival at their destination and to avoid the possibility of goods being lost or wrongly dispatched on account of faulty packing and faulty or illegible markings. Each wooden case/crate shall have all the markings stenciled on it in indelible ink.
- 5.11 **Standards**
- 5.11.1 The Hardware fittings; conductor and earth wire accessories shall conform to the following Indian/International Standards which shall mean latest revisions, with amendments/ changes adopted and published, unless specifically stated otherwise in the Specification.
- 5.11.2 In the event of the supply of hardware fittings; conductor and earth wire accessories conforming to standards other than specified, the Bidder shall confirm in his bid that these standards are equivalent to those specified. In case of award, salient features of comparison between the Standards proposed by the Contractor and those specified in this document will be provided by the Contractor to establish their equivalence.

Sl.	Indian Standard	Title	International Standard
1.	IS: 209-1992	Specification for zinc	BS:3436-1986
2.	IS:398-1992 Part-V	Aluminum Conductor Galvanised Steel-Reinforced For Extra High Voltage (400 KV) and above	IEC:1089-1991 BS:215-1970
3.	IS 1573	Electroplated Coating of Zinc on iron and Steel	
4.	IS : 2121 (Part-II)	Specification for Conductor and Earthwire Accessories for	

		Overhead Power lines:	
		Mid-span Joints and Repair Sleeves for Conductors	
5.	IS:2486 (Part-I)	Specification for Insulator Fittings for Overhead power Lines with Nominal Voltage greater than 1000 V: General Requirements and Tests	
6.	IS:2629	Recommended Practice for Hot Dip Galvanising of Iron and Steel	
7.	IS:2633	Method of Testing Uniformity of Coating on Zinc Coated Articles	
8.		Ozone test on Elastomer	ASTM- D1 171
9.		Tests on insulators of Ceramic material or glass for overhead lines with a nominal voltage greater than 1000V	IEC:383-1993
10.	IS:4826	Galvanised Coating on Round Steel Wires	ASTM A472-729 BS:443-1969
11.	IS:6745	Methods of Determination of Weight of Zinc Coating of Zinc Coated Iron and Steel Articles	BS:433 ISO : 1460 (E)
12.	IS:8263	Method of Radio Interference Tests on High Voltage Insulators	IEC:437 NEMA:107 CISPR
13.	IS:6639	Hexagonal Bolts for Steel Structures	ISO/R-272
14.	IS:9708	Specification for Stock Bridge Vibration Dampers for Overhead Power Lines	
15.	IS:10162	Specification for Spacers Dampers for Twin Horizontal Bundle Conductors	

The standards mentioned above are available from:

Reference Abbreviation	Name and Address
BS	British Standards, British Standards Institution 101, Pentonville Road, N – 19-ND UK
IEC/CISPR	International Electro technical Commission, Bureau Central de la Commission, electro Technique international, 1 Rue de verembe,

	Geneva SWITZERLAND
BIS/IS	Beureau Of Indian Standards. Manak Bhavan, 9, Bahadur Shah Zafar Marg, New Delhi – 110001. INDIA
ISO	International Organisation for Standardization. Danish Board of Standardization Danish Standardizing Sraat, Aurehoegvej-12 DK-2900, Heeleprup, DENMARK.
NEMA	National Electric Manufacture Association, 155, East 44 th Street. New York, NY 10017 U.S.A.

1.0 Tests on Complete Strings with Hardware Fittings

1.1 Voltage Distribution Test (For Insulator String with Disc Insulators)

The voltage across each insulator unit shall be measured by sphere gap method.

The result obtained shall be converted into percentage. The voltage across any disc shall not exceed following percentage value for different voltage level lines:-

SL. NO.	VOLTAGE LEVEL OF LINE	SUSPENSION STRING	TENSION STRING
1.	220 kV	13.0 %	14.0 %

1.2 Corona Extinction Voltage Test (Dry)

The sample assembly when subjected to power frequency voltage shall have a corona extinction voltage of not less than stipulated in the Standard Technical Particulars. There shall be no evidence of corona on any part of the sample. The test shall be carried out as per IEC:61284 The atmospheric condition during testing shall be recorded and the test results; shall be accordingly corrected with suitable correction factor as stipulated in IEC:60060-1.

1.3 RIV Test (Dry)

Under the conditions as specified under (1.2) above, the insulator string along with complete hardware fittings shall have a radio interference voltage level below that stipulated in the Standard Technical Particulars. The test procedure shall be in accordance with IEC:61284.

1.4 Mechanical Strength Test

1.4.1 Mechanical Strength Test

The complete insulator string along with its hardware fitting excluding arcing horn, corona control ring, grading ring and suspension assembly/dead end assembly shall be subjected to a load equal to 50% of the specified minimum ultimate tensile strength (UTS) which shall be increased at a steady rate to 67% of the minimum UTS specified. The load shall be held for five minutes and then removed. After removal of the load, the string components shall not show any visual deformation and it shall be possible to disassemble them by hand. Hand tools may be used to remove cotter pins and loosen the

nuts initially. The string shall then be reassembled and loaded to 50% of UTS and the load shall be further increased at a steady rate till the specified minimum UTS and held for one minute. No fracture should occur during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

1.5 **Vibration Test**

The suspension string shall be tested in suspension mode, and tension string in tension mode itself in laboratory span of minimum 30 meters. In the case of suspension string a load equal to 600 kg shall be applied along the axis of the suspension string by means of turn buckle. The insulator string along with hardware fittings, with each sub conductor tensioned at 25 % of RTS of the conductor, shall be secured them with clamps. The system shall be suitable to maintain constant tension on each sub-conductors throughout the duration of the test. Vibration dampers shall not be used on the test span. Both the sub- conductors shall be vertically vibrated simultaneously at one of the resonance frequencies of the insulators string (more than 10 Hz) by means of vibration inducing equipment. The peak to peak displacement in mm of vibration at the antinode point nearest to the string shall be measured and the same shall not be

less than $1000/f^{1.8}$ where f is the frequency of vibration in cycles/sec. The insulator string shall be vibrated for not less than 10 million cycles without any failure. After the test the disc insulators shall be examined for looseness of pins and cap or any crack in the cement. The hardware shall be examined for looseness, fatigue failure and mechanical strength test. There shall be no deterioration of properties of hardware components and disc insulators after the vibration test. The disc insulators shall be subjected to the following, tests as per relevant standards:-

Sl. No.	Test	Percentage of insulator units to be tested	
		Disc Insulators	Long Rod Insulators
a)	Temperature cycle test followed by mechanical performance test	60	100
b)	Puncture test/steep wave front test (Only for glass insulators)	40	-

1.7 **Assembly Test**

This test shall be carried out to ensure that the cotter pins, bolts, clamps etc., fit freely and properly.

2.0 **Tests on Hardware Fittings**

2.1 **Magnetic Power Loss Test for Suspension Assembly**

2.1.1 The sample shall be tested in a manner to simulate service conditions for 50Hz Hz pure sine-wave. This test shall be carried out as per Clause 12.0 of IEC: 61284. An alternating current over the range of 400 to 800 Amps, shall be passed through a suitable length of conductor and the power losses shall be measured both with and without the fittings assembled on the conductor. Armour rods shall be applied to the conductor if they are used in service. The reading of the wattmeter with and without five suspension clamps shall be recorded. The test is passed if the average power loss for suspension clamp at given ampere is less than or equal to the value indicated in the Standard Technical Particulars.

2.2 **Galvanising/Electroplating Test**

The test shall be carried out as per Clause no. 5.9 of IS:2486-(Part-1) - 1972 except that both uniformity of zinc coating and standard preece test shall be carried out and the results obtained shall satisfy the requirements of this specification.

2.3 **Mechanical Strength Test of Welded Joint**

The welded portion of the component shall be subjected to a Load of 2000 kgs for one minute. Thereafter, it shall be subjected to die-penetration/ultrasonic test. There shall not be any crack at the welded portion.

2.4 **Shore Hardness Test for Elastomer Cushion for AG Suspension Assembly**

The shore hardness at various points on the surface of the elastomer cushion shall be measured by a shore hardness meter and the shore hardness number shall be between the values indicated in the Standard Technical Particulars.

2.5 **Proof Load Test**

Each component shall be subjected to a load equal to 50% of the specified minimum ultimate tensile strength which shall be increased at a steady rate to 67% of the UTS specified. The load shall be held for one minute and then removed. After removal of the load the component shall not show any visual deformation.

2.6 **Tests for Forging Casting and Fabricated Hardware**

The chemical analysis, hardness test, grain size, inclusion rating and magnetic particle inspection for forging, castings and chemical analysis and proof load test for fabricated hardware shall be as per the internationally recognised procedures for these tests. The sampling will be based on heat number and heat treatment batch. The details regarding test will be as in the

Quality Assurance programme.

3.0 Tests on Conductor and Earth wire Accessories

3.1 Flexible Copper Bond for earthwire

Slip Strength Test

On applying a load of 3 kN between the two ends, stranded flexible copper cable shall not come out of the connecting lugs and none of its strands shall be damaged. After the test, the lugs shall be cut open to ascertain that the gripping of cable has not been affected.

3.3 Vibration Damper for conductor and earth wire

(a) Dynamic Characteristics, Test

The damper shall be mounted with its clamp tightened with torque recommended by the manufacturer on shaker table capable of simulating sinusoidal vibrations for aeolian vibration frequency band range as per table 3.3 for vibration damper for different type of conductor/earthwire. The damper assembly shall be vibrated vertically with a ± 1 mm amplitude from 5 to 15 Hz frequency and beyond 15 Hz at ± 0.5 mm to determine following characteristics with the help of suitable recording instruments:

- (i) Force Vs frequency
- (ii) Phase angle Vs frequency
- (iii) Power dissipation Vs frequency

The Force Vs frequency curve shall not show steep peaks at resonance frequencies and deep troughs between the resonance frequencies. The resonance frequencies shall be suitably spread within the aeolian vibration frequency-band between the lower and upper dangerous frequency, limits determined by the vibration analysis of conductor/earth wire without dampers.

Acceptance criteria for vibration damper.

- (i) The above dynamic characteristics test on five damper shall be conducted.
- (ii) The mean reactance and phase angle Vs frequency curves shall be drawn with the criteria of best fit method.
- (iii) The above mean reactance response curve should lie within limits as per table 3.3.
- (iv) The above mean phase angle response curve shall be between 25° to 130° within the frequency range of interest.
- (v) If the above curve lies within the envelope, the damper design shall be considered to have successfully met the requirement.

- (vi) Visual resonance frequencies of each mass of damper are to be recorded and to be compared with the guaranteed values.

Table 3.3

Conductor name	Range of vibration frequency for dynamic characteristic test	Range of mean reactance
ACSR BERSIMIS	5 Hz to 40 Hz	
ACSR MOOSE	5 Hz to 40 Hz	0.191 f to 0.762 f
ACSR ZEBRA	5 Hz to 40 Hz	0.135 f to 0.540 f
ACSR PANTHER	5 Hz to 40 Hz	0.0991 f to 0.495 f
ACSR DEER	5 Hz to 40 Hz	0.095 f to 0.475 f kgf/mm
7/3.66 mm GS EARTHWIRE	5 Hz to 40 Hz	0.060 f to 0.357 f
7/3.15 mm GS EARTHWIRE	5 Hz to 40 Hz	0.050 f to 0.300 f
7/4.27 mm GS EARTHWIRE	5 Hz to 40 Hz	0.060 f to 0.357f

(b) Vibration Analysis

The vibration analysis of the conductor/earthwire shall be done with and without damper installed on the span. The vibration analysis shall be done on a digital computer using energy balance approach. The following parameters shall be taken into account for the purpose of analysis :

- (i) The analysis shall be borne for single conductor/earthwire without armour rods as per the parameters given under clause 2.5.13 and 3.3.8 of this part of the Specification. The tension shall be taken as 25 % of RBS of the conductor/earthwire for a span ranging from 100 m to 1100 m.
- (ii) The self-damping factor and flexural stiffness (EI) for conductor/earthwire shall be calculated on the basis of experimental results. The details of experimental analysis with these data should be furnished.
- (iii) The power dissipation curve obtained from Dynamic Characteristics Test shall be used for analysis with damper.
- (iv) Examine the aeolian vibration level of the conductor/earthwire with and without vibration damper installed at the recommended location or wind velocity ranging from 0 to 30 Km per hour, predicting amplitude, frequency and vibration energy input.

- (v) From vibration analysis of conductor/earthwire without damper, antinode vibration amplitude and dynamic strain levels at clamped span extremities as well as antinodes shall be examined and thus lower and upper dangerous frequency limits between which the aeolian vibration levels exceed the specified limits shall be determined.
- (vi) From vibration analysis of conductor/earthwire with damper/dampers installed at the recommended location, the dynamic strain level, at the clamped span extremities, damper attachment point and the antinodes on the conductor/earthwire shall be determined. In addition to above damper clamp vibration amplitude and antinode vibration amplitudes shall also be examined.

The dynamic strain levels at damper attachment points, clamped span extremities and antinodes shall not exceed the specified limits. The damper vibration amplitude shall not be more than that of the specified fatigue limits.

c) Fatigue Tests

(i) Test Set Up

The fatigue tests shall be conducted on a laboratory set up with a minimum effective span length of 30 m. The conductor/earthwire shall be tensioned at 25 % of RBS of the conductor/earthwire and shall not be equipped with protective armour rods at any point. Constant tension shall be maintained within the span by means of lever arm arrangement. After the conductor/earthwire has been tensioned, clamps shall be installed to support the conductor/earthwire at both ends and thus influence of connecting hardware fittings are eliminated from the free span. The clamps shall not be used for holding the tension on the conductor/ earthwire. There shall be no loose parts, such as suspension clamps, U bolts on the test span supported between clamps mentioned above. The span shall be equipped with vibration inducing equipment suitable for producing steady standing vibration. The inducing equipment shall have facilities for stepless speed control as well as stepless amplitude arrangement. Equipment shall be available for measuring the frequency, cumulative number of cycles and amplitude of vibration at any point along the span.

(ii) Fatigue Test

The vibration damper shall be installed on the test span with the manufacturer's specified tightening torque. It shall be ensured that the damper shall be kept minimum three loops away from the shaker to eliminate stray signals influencing damper movement.

The damper shall then be vibrated at the highest resonant frequency of each damper mass. For dampers involving torsional resonant frequencies, tests shall be done at torsional modes also in addition to the highest resonant frequencies at vertical modes. The resonance frequency shall be identified as the frequency at which each damper mass vibrates with the maximum amplitude on itself. The amplitude of vibration of the damper clamp shall be maintained not less than $\pm 25/f$ mm, where f is the frequency in Hz.

The test shall be conducted for minimum ten million cycles at each resonant frequency mentioned above. During the, test if resonance shift is observed the test frequency shall be tuned to the new resonant frequency.

The clamp slip test as mentioned hereinabove shall be repeated after fatigue test without retorquing or adjusting the damper clamp, and the clamp shall withstand a minimum load equal to 80% of the slip strength for a minimum duration of one minute.

After the above tests, the damper shall be removed from conductor/earthwire and subjected to dynamic characteristics test. There shall not be any major deterioration in the characteristic of the damper. The damper then shall be cut open and inspected. There shall not be any broken, loose, or damaged part. There shall not be significant deterioration or wear of the damper. The conductor/earthwire under clamp shall also be free from any damage.

For the purpose of acceptance, the following criteria shall be applied.

- (1) There shall not be any frequency shift by more than ± 2 Hz for frequencies lower than 15 Hz and ± 3 Hz for frequencies higher than 15 Hz.
- (2) The force response curve shall generally lie within guaranteed % variation in reactance after fatigue test in comparison with that before fatigue test by the Contractor.
- (3) The power dissipation of the damper shall not be less than guaranteed % variation in power dissipation before fatigue test by the Contractor. However, it shall not be less than minimum power dissipation which shall be governed by lower limits of reactance and phase angle indicated in the envelope.

3.7 Corona Extinction Voltage Test (Dry)

The sample when subjected to power frequency voltage shall have a corona extinction voltage of not less than 154 kV (rms) line to ground for 220 kV line under dry condition. There shall be no evidence of corona on any part of the sample. The atmospheric condition during testing shall be recorded and the test results shall be accordingly corrected with suitable correction factor as stipulated in IS: 731.

3.8 Radio Interference Voltage Test (Dry)

Under the conditions as specified under (3.7) above, the sample shall have a radio interference voltage level below 1000 micro volts at one MHz when subjected to 50 Hz AC voltage of 154 kV rms line to ground under dry condition for 220 kV line. The test procedure shall be in accordance with IS 8263.

3.9 Chemical Analysis Test

Chemical analysis of the material used for manufacture of items shall be conducted to check the conformity of the same with Technical Specification and approved drawing.

4.0 Tests on All components (As applicable)

4.1 Chemical Analysis of Zinc used for Galvanizing

Samples taken from the zinc ingot shall be chemically analysed as per IS-209-1979. The purity of zinc shall not be less than 99.95%.

4.2 Tests for Forgings

The chemical analysis hardness tests and magnetic particle inspection for forgings, will be as per the internationally recognised procedures for these tests. The, sampling will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the Contractor and Purchaser in Quality Assurance Programme.

4.3 Tests on Castings

The chemical analysis, mechanical and metallographic tests and magnetic particle inspection for castings will be as per the internationally recognised procedures for these tests. The samplings will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the Contractor and Purchaser in Quality Assurance Programme.

Acceptance Tests

1 Mid Span Compression Joint for Conductor and Earthwire

(a) Hardness Test

The Brinell hardness at various points on the steel sleeve of conductor core and of the earthwire compression joint and tension clamp shall be measured.

3. Flexible Copper Bond

(a) Slip Strength Test

Same as clause 3.2 of Annexure - A.

4. Vibration Damper for Conductor/ Earthwire

(a) Verification of Resonance Frequencies

The damper shall be mounted on a shaker table and vibrate at damper clamp displacement of ± 0.5 mm to determine the resonance frequencies. The resonance shall be visually identified as the frequency at which damper mass vibrates with maximum displacement on itself. The resonance frequency thus identified shall be compared with the guaranteed value. A tolerance of ± 1 Hz at a frequency lower than 15 Hz and ± 2 Hz at a frequency higher than 15 Hz only shall be allowed.

(d) Strength of the Messenger Cable

The messenger cable shall be fixed in a suitable tensile testing machine and the tensile load shall be gradually applied until yield point is reached. Alternatively, each strand of message caste may be fixed in a suitable tensile testing machine and the tensile load shall be gradually applied until yield point is reached. In such a case, the 95% of yield strength of each wire shall be added to get the total strength of the caste. The load shall be not less than the value guaranteed by the Contractor

(f) Dynamic Characteristics Test

The test will be performed as acceptance test with the procedure mentioned for type test with sampling mentioned below:-

Vibration Damper:

- 1 Sample for 1000 Nos. & below Conductor
- 3 Samples for lot above 1 000 & up to 5000 nos.
- Additional 1 sample for every additional 1500 pieces above 5000. The acceptance criteria will be as follows

- (i) The above dynamic characteristics curve for reactance & phase angle will be done for frequency range for vibration damper as per Table 3.4 of Annexure- A for different type of conductor/earthwire.
- (ii) If all the individual curve for dampers are within the envelope as already mentioned for type test for reactance & phase angle, the lot passes the test.
- (iii) If individual results do not fall within the envelope, averaging of characteristics shall be done.
 - (a) Force of each damper corresponding to particular frequency shall be taken & average force of three dampers at the frequency calculated.
 - (b) Similar averaging shall be done for phase angle.
 - (c) Average force Vs frequency and average phase Vs frequency curves shall be plotted on graph paper. Curves of best fit shall be drawn for the entire frequency range.
 - (d) The above curves shall be within the envelope specified.

ANNEXURE – C**Standardized Technical Particulars of Hardware Fittings for 220 kV Transmission Line with ACSR DEER Conductor**

1.	Suspension hardware fittings for ACSR DEER conductor				
Sl.	Description	Unit	Particulars / Value		
			Double 'T'		Single 'T' Pilot
			AGS clamp	Free centre clamp	Envelope clamp
1.	Maximum magnetic power loss of suspension assembly at sub conductor current of 500 amperes, 50Hz AC	Watt	1		2
2.	Slipping strength of suspension assembly(clamp torque Vs slip curve shall be enclosed)	kN	20-29		
3.	Particulars of standard/AGS Standard / AGS preformed armour rod set for suspension assembly				
	a) No. of rods per set	No.	12		NA
	b) Direction of lay		Right Hand		NA
	c) Overall length after fitting on conductor	mm	2080	2540	NA
	d) Diameter of each rod	mm	7.87		NA
	e) Tolerance in				NA
	i) Diameter of each rod	±mm	0.10		NA
	ii) Length of each rod	±mm	25		NA
	iii) Difference of length between the longest and shortest rod in a set	±mm	13		NA
	g) Type of Aluminium alloy used for manufacture of PA rod set		6061/ 65032		NA
	h) UTS of each rod	Kg/mm 2 (Min)	35		NA
4.	Particulars of Elastomer (For AGS Clamp only)				
	a) Type of elastomer		Chloroprene / Neoprene	NA	NA
	b) Shore hardness of elastomer		65 - 80	NA	NA
	c) Temperature range for which elastomer is designed	°C	Upto 95°C	NA	NA
	d) Moulded on insert		Yes	NA	NA
5.	Mechanical Strength of Suspension fitting (excluding suspension clamp)	KN	240		120
6.	Mechanical Strength of suspension clamp.		70	70	70
7.	Purity of Zinc used for galvanising	%	As per IS:209 / IS 13229		

8.	Min. No. of dips in standard preece test the ferrous parts can withstand	No	a) Fasteners : 4 dips of 1 min b) Spring washers: 3 dips of 1 min c) All others : 6 dips of 1 min

2. Tension hardware fittings for ACSR DEER Conductor

Sl.	Description	Unit	Particulars/ Value	
				Double Tension
1.	Mechanical strength of Tension fitting(excluding dead end clamp)	KN		2 X 160
2.	Type of dead end assembly		Compression	
3.	Compression pressure	MT	100	
4.	Maximum electrical resistance of dead end assembly as a percentage of equivalent length of Conductor	%	75	
5.	Slip strength of dead end assembly	KN	169.5	
6.	Galvanising			
a)	Minimum weight of Zinc coating for steel parts	gm/m ²	600	
b)	Purity of Zinc used for galvanising	%	99.95 (IS 209) or 98.5 (IS 13229)	
c)	Min. No. of dips in standard preece test the ferrous parts can withstand (wherever applicable)	No.	a) Fasteners: 4 dips of 1 minute b) Spring washers: 3 dips of 1 minute & c) all others: 6 dips of 1 minute	

I) Accessories for ACSR DEER conductor for 220 kV transmission line

1. Mid span compression Joint for ACSR DEER Conductor

Sl.	Description	Unit	Particulars/ Value	
			<u>Aluminium Sleeve</u>	<u>Steel Sleeve</u>
1.	Material of Joint		Aluminium of minimum purity 99.5%	Mild Steel(Fe-410, IS:2062)
2.	Range of Hardness of the steel sleeve (Brinell hardness)	BHN	From 100 to 200	
3.	Dimension of sleeve Before compression		<u>Aluminum sleeve</u>	<u>Steel sleeve</u>
i)	Inside diameter	mm	33.00 ± 0.5	9.50 ± 0.2
ii)	Outside diameter	mm	54.00 ± 1.0	24 ± 0.5
iii)	Length	mm	610 ± 5	203 ± 5
4.	Dimensions of Sleeve after compression		<u>Aluminum sleeve</u>	<u>Steel sleeve</u>

i)	Outside dimension(Corner to corner)	mm	53.00 ± 0.5	23.40 ± 0.5
ii)	Outside dimension (face to face)	mm	46.00 ± 0.5	20.20 ± 0.5
5.	Slip strength	KN	169.5	
6.	Maximum resistance of the compressed unit expressed, as percentage of the resistance of equivalent length of bare conductor.	%	75	
7.	Galvanising			
a)	Minimum weight of Zinc coating for steel parts	gm/m ²	600	
b)	Purity of Zinc used for galvanising	%	99.95 (IS 209) or 98.5 (IS 13229)	
c)	Min. No. of dips in standard preece test the ferrous parts can withstand(whenever applicable)	No.	a) Fasteners: 4 dips of 1 minute b) Spring washers: 3 dips of 1 minute & c) all others: 6 dips of 1 minute	

2. Repair sleeve for ACSR DEER Conductor

Sl.	Description	Unit	Particulars/ Value
1.	Material		Aluminium of minimum purity 99.5%
2.	Dimension of Aluminum sleeve Before compression		
i)	Inside diameter	mm	33.0 0 ± 0.5
ii)	Outside diameter	mm	54.0 0 ± 1.0
iii)	Length	mm	610 ± 5
3.	Dimensions of Aluminum Sleeve after compression		
i)	Outside dimension(Corner to corner)	mm	53.00 ± 0.5
ii)	Outside dimension (face to face)	mm	46.00 ± 0.5

3. Vibration Damper for ACSR DEER Conductor

Sl.	Description	Unit	Particulars/ Value
1.	Type of Damper		4R-Stockbridge type
2.	Materials of components		
	a) Damper masses		Cast iron/ mild steel hot dip galvanised / Zinc alloy
	b) Clamp		Aluminum alloy 4600
	c) Messenger cable		High tensile strength galvanized steel
3.	Number of strands in stranded messenger cable	Nos.	19
4.	Minimum ultimate tensile strength of stranded messenger cable	Kg/mm ²	135
5.	Slip strength of stranded messenger cable (mass pull off)	KN	5
6.	Slipping strength of damper clamp		

	(a) Before fatigue test	KN	2.5
	(b) After fatigue test	KN	2
7.	Resonance frequencies range	Hz	5 to 45
8.	Maximum magnetic power loss per vibration damper watts for 350 amps, 50 Hz Alternating Current	Watts	1
9.	Percentage variation in reactance after fatigue test in comparison with that . before fatigue test	%	+/-40 (Maximum)
10.	Percentage variation in power dissipation after fatigue test in comparison with that before fatigue test	%	+/-40 (Maximum)
11.	Galvanising		
a)	Minimum weight of Zinc coating for steel parts	gm/m ²	600
b)	Purity of Zinc used for galvanising	%	99.95 (IS 209) or 98.5 (IS 13229)
c)	Min. No. of dips in standard preece test the ferrous parts can withstand (wherever applicable)	No.	a) Fasteners: 4 dips of 1 minute b) Spring washers: 3 dips of 1 minute & c) all others: 6 dips of 1 minute

Accessories for 7/4.27 mm GS Earthwire for 220 kV and 66 kV transmission line

1. Mid span compression Joint for 7/4.27 mm GS Earthwire

Sl.	Description	Unit	Particulars/ Value		
			<u>Aluminium / Filler Sleeve</u>	<u>Steel Sleeve</u>	
1.	Material of Joint		Aluminium of minimum purity 99.5 %	Mild Steel(Fe-410, IS:2062)	
2.	Range of Hardness of the steel sleeve (Brinnel hardness)	BHN	From 120 to 200		
3.	Dimension of sleeve Before compression				
			<u>Aluminium Sleeve</u>	<u>Steel Sleeve</u>	<u>Alu filler sleeve</u>
i)	Inside diameter	mm	As per manufacturer’s design to suit the earthwire & technical specification requirements.		
ii)	Outside diameter	mm			
iii)	Length	mm			
4.	Dimensions of Sleeve after compression				
			Aluminium Sleeve	Steel Sleeve	

i)	Outside dimension(Corner to Corner)	mm	29.40 ± 0.5	20.20 ± 0.5
ii)	Outside dimension (face to face)	mm	25.00 ± 0.5	17.50 ± 0.5
5.	Slip strength	KN	88.5	
6.	Maximum resistance of the compressed unit expressed, as percentage of the resistance of equivalent length of bare Earthwire	%	75	
7.	Galvanising			
a)	Minimum weight of Zinc coating for steel parts	gm/m ²	600	
b)	Purity of Zinc used for galvanising	%	99.95 (IS 209) or 98.5 (IS 13229)	
c)	Min. No. of dips in standard preece test the ferrous parts can withstand (wherever applicable)	No.	a) Fasteners: 4 dips of 1 minute b) Spring washers: 3 dips of 1 minute & c) all others: 6 dips of 1 minute	

2. Flexible Copper Bond for 7/4.27 mm GS Earthwire

Sl.	Description	Unit	Particulars/ Value
1.	Stranding		37/7/0.417
2.	Cross sectional area	Sq.mm	35.4
3.	Minimum copper equivalent area	Sq.mm	34
4.	Length of copper cable	mm	500 + 5
5.	Material of lugs		Tinned copper as IS:9567
6.	Bolt Size		
	i) Diameter	mm	16
	ii) Length	mm	40

3. Vibration Damper for 7/4.27 mm GS Earthwire

Sl.	Description	Unit	Particulars/ Value
1.	Type of Damper		4R-Stockbridge type
2.	Materials of components		
	a) Damper masses		Cast iron/ mild steel hot dip galvanised / Zinc alloy
	b) Clamp		Aluminum alloy 4600
	c) Messenger cable		High tensile strength galvanized steel
3.	Number of strands in stranded messenger cable	Nos.	19
4.	Minimum ultimate tensile strength of stranded messenger cable	Kg/mm ²	135

5.	Slip strength of stranded messenger cable (mass pull off)	kN	2.5
6.	Slipping strength of damper clamp		
	(a) Before fatigue test	kN	2.5
	(b) After fatigue test	kN	2
7.	Resonance frequencies range	Hz	10 to 60
8.	Percentage variation in reactance after fatigue test in comparison with that . before fatigue test	%	+/-40 (Maximum)
9.	Percentage variation in power dissipation after fatigue test in comparison with that before fatigue test	%	+/-40 (Maximum)
10.	Galvanising		
a)	Minimum weight of Zinc coating for steel parts	gm/m ²	600
b)	Purity of Zinc used for galvanising	%	99.95 (IS 209) or 98.5 (IS 13229)
c)	Min. No. of dips in standard preece test the ferrous parts can withstand (wherever applicable)	No.	a) Fasteners: 4 dips of 1 minute b) Spring washers: 3 dips of 1 minute & c) all others: 6 dips of 1 minute

4. Suspension Clamp for 7/4.27 mm GS Earthwire

Sl.	Description	Unit	Particulars/ Value
1.	Material of components		
	(a) Shackle		Forged Steel
	(b) Clamp Body & Keeper		Malleable cast iron / SGI
	(c) U- Bolt		Mild Steel (Fe 410, IS 2062)
2.	Total Drop (Maximum)	mm	150
3.	Breaking Strength (Minimum)	kN	42
4.	Slipping Strength	kN	17 to 24
5.	Galvanising		
a)	Minimum weight of Zinc coating for steel parts	gm/m ²	600
b)	Purity of Zinc used for galvanising	%	99.95 (IS 209) or 98.5 (IS 13229)
c)	Min. No. of dips in standard preece test the ferrous parts can withstand (wherever applicable)	No.	a) Fasteners: 4 dips of 1 minute b) Spring washers: 3 dips of 1 minute & c) all others: 6 dips of 1 minute

5. Tension Clamp for 7/4.27 mm GS Earthwire

Sl.	Description	Unit	Particulars/ Value
1.	Material of components		
	(i) Anchor Shackle		Forged Steel

	(ii) Compression Clamp				
	a) Steel Sleeve		Mild Steel (Fe 410, IS 2062)		
	b) Aluminium sleeve		Aluminium of purity 99.5%		
	c) Aluminium Filler sleeve		Aluminium of purity 99.5%		
2.	Range of Hardness of the steel sleeve (Brinell hardness)	BHN	120-200		
3.	Dimension of sleeve Before compression				
			<u>Aluminium Sleeve</u>	<u>Steel Sleeve</u>	<u>Alu filler sleeve</u>
i)	Inside diameter	mm	As per manufacturer's design to suit the earthwire & technical specification requirements.		
ii)	Outside diameter	mm			
iii)	Length	mm			
4.	Dimensions of Sleeve after compression				
			<u>Aluminium Sleeve</u>	<u>Steel Sleeve</u>	
i)	Outside dimension(Corner to Corner)	mm	To suit the earthwire & technical specification requirements.		
ii)	Outside dimension (face to face)	mm			
5.	Slip strength	KN	88.5		
6.	Minimum Breaking strength of assembly (excluding clamp)	KN	98		
7.	Compression Pressure	Ton	100		
8.	Galvanising				
a)	Minimum weight of Zinc coating for steel parts	gm/m ²	600		
b)	Purity of Zinc used for galvanising	%	99.95 (IS 209) or 98.5 (IS 13229)		
c)	Min. No. of dips in standard preece test the ferrous parts can withstand (wherever applicable)	No.	a) Fasteners: 4 dips of 1 minute b) Spring washers: 3 dips of 1 minute & c) all others: 6 dips of 1 minute		



Technical Specifications for Optical Ground Wire (OPGW) Cable

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**Technical Specifications for
Optical Ground Wire (OPGW) Cable**

**Section-IX A
Specification for OPGW cabling & associated hardware & fittings**

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**Technical Specifications for
Optical Ground Wire (OPGW) Cable**

**Section-IX A
Specification for OPGW cabling and associated hardware & fittings**

The broad scope of this specification include the survey, planning, design, engineering, manufacturing, supply, transportation, insurance, delivery at site, unloading, handling, storage, , installation, splicing, termination, testing, demonstration for acceptance and commissioning and documentation for:

- a) OPGW fibre optic cable including all associated hardware, accessories & fittings
- b) Fibre Optic approach cable including installation material
- c) Fibre Optic Distribution Panels (FODP) & Joint Box
- d) Supply of spares
- e) Supply of test equipments
- f) All other associated work/items described in the technical specifications.

This section of the technical specification describes the functional and technical specifications of OPGW cabling and associated hardware and fittings.

1.0 Fibre Optic Cabling

In this section of the technical specification, the functional & technical specifications of OPGW cable, associated hardware & fittings for the requirements for G.652D Dual-window Single mode (DWSM) telecommunications grade fibre optic cable is mentioned. Bidders shall furnish with their bids, detailed descriptions of the fibres & cable(s) proposed.

All optical fibre cabling including fibre itself and all associated installation hardware shall have a minimum guaranteed design life span of 25 years. Documentary evidence in support of guaranteed life span of cable & fibre shall be submitted by the Contractor during detailed engineering.

1.1 Required Optical Fibre Characteristics

The optical fibre to be provided should have following characteristics:

1.1.1 Physical Characteristic

Dual-Window Single mode (DWSM), G.652D optical fibres shall be provided in the fibre optic cables.

DWSM optical fibres shall meet the requirements defined in Table 1-1(a).

1.1.2 Attenuation

The attenuation coefficient for wavelengths between 1525 nm and 1575 nm shall not exceed the attenuation coefficient at 1550 nm by more than 0.05 dB/km. The attenuation coefficient between 1285 nm and 1330 nm shall not exceed the attenuation coefficient at 1310 nm by more than 0.05 dB/km. The attenuation of the fibre shall be distributed uniformly throughout its length such that there are no point discontinuities in excess of 0.10 dB. The fibre attenuation characteristics specified in table 1-1(a) shall be “guaranteed” fibre attenuation of any & every fibre reel.

The overall optical fibre path attenuation shall not be more than calculated below :

Maximum attenuation @ 1550 nm : 0.21 dB/km x total km + 0.05 dB/splice x no. of splices + 0.5 dB/connector x no. of connectors.

Maximum attenuation @ 1310 nm : 0.35 dB/km x total km + 0.05 dB/splice x no. of splices + 0.5 dB/connector x no. of connectors.

Table 2-1(a)
DWSM Optical Fibre Characteristics

Fibre Description:	Dual-Window Single-Mode
Mode Field Diameter:	8.6 to 9.5 μm ($\pm 0.6\mu\text{m}$)
Cladding Diameter:	125.0 $\mu\text{m} \pm 1 \mu\text{m}$
Mode field concentricity error	$\leq 0.6\mu\text{m}$
Cladding non-circularity	$\leq 1\%$
Cable Cut-off Wavelength λ_{cc}	$\leq 1260 \text{ nm}$
1550 nm loss performance	As per G.652 D
Proof Test Level	$\geq 0.69 \text{ Gpa}$
Attenuation Coefficient:	@ 1310 nm $\leq 0.35 \text{ dB/km}$ @ 1550 nm $\leq 0.21 \text{ dB/km}$
Chromatic Dispersion; Maximum:	18 ps/(nm x km) @ 1550 nm 3.5 ps/(nm x km) 1288-1339nm 5.3 ps/(nm x km) 1271-1360nm
Zero Dispersion Wavelength : Zero Dispersion Slope :	1300 to 1324 nm 0.092 ps/(nm ² x km) maximum
Polarization mode dispersion coefficient	$\leq 0.2 \text{ ps/km}^{1/2}$
Temperature Dependence :	Induced attenuation $\leq 0.05 \text{ dB}$ (-60 °C - +85°C)
Bend Performance :	@ 1310 nm (75 $\pm$ 2 mm dia Mandrel), 100 turns; Attenuation Rise $\leq 0.05 \text{ dB/km}$ @ 1550 nm (75 $\pm$ 2 mm dia Mandrel), 100 turns; Attenuation Rise $\leq 0.10 \text{ dB/km}$ @ 1550 nm (32 $\pm$ 0.5 mm dia Mandrel, 1 turn; Attenuation Rise $\leq 0.50 \text{ dB/km}$

1.2 Fibre Optic Cable Construction

The OPGW (Optical Ground Wire) cable is proposed to be installed on the transmission lines in heavy snow hilly terrain areas. The design of cable shall account for the varying operating and environmental conditions that the cable shall experience while in service. The OPGW cable to be supplied shall be designed to meet the overall requirements of all

the transmission lines. The Tower span details shall be collected by the Contractor during survey. To meet the overall requirement of the transmission line(s), the contractor may offer more than one design without any additional cost to Employer, in case single design is not meeting the requirement. Transmission line details are enclosed along with the specification. The typical detail of transmission line technical parameters is indicated in the **Appendix A**. Any other details, as required for cable design etc. shall be collected by the Contractor during survey.

1.2.1 Optical Fibre Cable Link Lengths

The estimated optical fibre link lengths are provided in Appendices as transmission line route length. However, the Contractor shall supply the OPGW cable as required based on the tower schedule. The Contractor shall verify the transmission line route length during the survey and the Contract price shall be adjusted accordingly.

For the purpose of payment, the optical fibre link lengths are defined as transmission line route lengths from Gantry at one terminating station to the Gantry in the other terminating station. The actual cable lengths to be delivered shall take into account various factors such as sag, service loops, splicing, working lengths & wastage etc. and no additional payment shall be payable in this regard. The unit rate for FO cable quoted in the Bid price Schedules shall take into account all such factors.

1.2.2 Optical Fibre Identification

All optical fibres shall be individually coated. Individual optical fibres within a fibre unit and fibre units shall be identifiable in accordance with EIA/TIA 598 or IEC 60304 or Bellcore GR-20 colour-coding scheme.

Colouring utilized for colour coding optical fibres shall be integrated into the fibre coating and shall be homogenous. The colour shall not bleed from one fibre to another and shall not fade during fibre preparation for termination or splicing.

Each cable shall have traceability of each fibre back to the original fibre manufacturer's fibre number and parameters of the fibre. If more than the specified number of fibres is included in any cable, the spare fibres shall be tested by the cable manufacturer and any defective fibres shall be suitably bundled, tagged and identified at the factory by the vendor.

1.2.3 Buffer Tube

Loose tube construction shall be implemented. The individually coated optical fibre(s) shall be surrounded by a single / multiple buffer tube(s) in case of central fibre optic unit is of Aluminium tube for protection from physical damage during fabrication, installation and operation of the cable. However, the individually coated optical fibre(s) may be provided directly in the central fibre optic unit in case of stainless steel tube with aluminium protective coating. The fibre coating and buffer shall be strippable for splicing and termination. Each fibre unit shall be individually identifiable utilizing colour coding. Buffer tubes shall be filled with a water-blocking gel. In case of central stainless steel tube, the tube housing the optical fibre(s) completely filled with a water-blocking gel shall be provided.

1.2.4 Optical Fibre Strain & Sag-Tension chart

The OPGW cable shall be designed and installed such that the optical fibres experience no strain under all loading conditions defined in IS 802. Zero fibre strain condition shall apply even after a 25 year cable creep.

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

- ❑ Maximum Working Tension (MWT) is defined as the maximum cable tension at which there is *no fibre strain*.
- ❑ The *no fibre strain* condition is defined as fibre strain of less than or equal to 0.05%, as determined by direct measurements through IEC/ ETSI (FOTP) specified optical reflectometry
- ❑ The Cable strain margin is defined as the maximum cable strain at which there is no fibre strain.
- ❑ The cable Maximum Allowable Tension (MAT) is defined as the maximum tension experienced by the Cable under the worst case loading condition.
- ❑ The cable max strain is defined as the maximum strain experienced by the Cable under the worst case loading condition.
- ❑ The cable Every Day Tension (EDT) is defined as the maximum cable tension on any span under normal conditions.
- ❑ The Ultimate /Rated Tensile Strength (UTS/ RTS/ breaking strength) is defined as the maximum tensile load applied and held constant for one minute at which the specimen shall not break.

While preparing the Sag-tension charts for the OPGW cable the following conditions shall be met:

- ❑ The Max Allowable Tension (MAT) / max strain shall be less than or equal to the MWT/ Strain margin of the cable.
- ❑ The sag shall not exceed the earth wire sag in all conditions.
- ❑ The Max Allowable Tension shall also be less than or equal to 0.4 times the UTS.
- ❑ The 25 year creep at 25% of UTS (creep test as per IEEE 1138) shall be such that the 25 year creep plus the cable strain at Max Allowable Tension (MAT) is less than or equal to the cable strain margin.
- ❑ The everyday tension (EDT) shall not exceed 20% of the UTS for the OPGW cable.

The Sag-tension chart of OPGW cable indicating the maximum tension, cable strain and sag shall be calculated and submitted along with the bid under various conditions as per tower design of the transmission line.

The size of OPGW shall be selected such that maximum tension and sag at specified temperature and wind condition remains within the limits of transmission line tower design.

1.2.5 Cable Materials

The materials used for optical fibre cable construction, shall meet the following requirements:

1.2.5.1 Filling Materials

The interstices of the fibre optic unit and cable shall be filled with a suitable compound to prohibit any moisture ingress or any water longitudinal migration within the fibre optic unit or along the fibre optic cable. The water tightness of the cable shall meet or exceed the test performance criteria as per IEC 60794-1-F-5.

The filling compound used shall be a non-toxic homogenous waterproofing compound that is free of dirt and foreign matter, non-hygroscopic, electrically nonconductive and non-nutritive to fungus. The compound shall also be fully compatible with all cable components it may come in contact with and shall inhibit the generation of hydrogen within the cable.

The waterproofing filling materials shall not affect fibre coating, colour coding, or encapsulant commonly used in splice enclosures, shall be dermatologically safe, non-staining and easily removable with a non-toxic cleaning solvent.

1.2.5.2 Metallic Members

When the fibre optic cable design incorporates metallic elements in its construction, all metallic elements shall be electrically continuous.

1.2.6 Marking, Packaging and Shipping

This section describes the requirements for marking, packaging and shipping the overhead fibre optic cable.

- (a) Drum Markings: Each side of every reel of cable shall be permanently marked in white lettering with the vendors' address, the Purchaser's destination address, cable part number and specification as to the type of cable, length, number of fibres, a unique drum number including the name of the transmission line & segment no., factory inspection stamp and date.
- (b) Cable Drums: All optical fibre cabling shall be supplied on strong drums provided with lagging of adequate strength, constructed to protect the cabling against all damage and displacement during transit, storage and subsequent handling during installation. Both ends of the cable shall be sealed as to prevent the escape of filling compounds and dust & moisture ingress during shipment and handling. Spare cable caps shall be provided with each drum as required.

The spare cable shall be supplied on sturdy, corrosion resistant, steel drums suitable for long periods of storage and re-transport & handling.

There shall be no factory splices allowed within a continuous length of cable. Only one continuous cable length shall be provided on each drum. The lengths of cable to be supplied on each drum shall be determined by a "schedule" prepared by the Contractor and approved by the owner.

1.3. Optical Ground Wire (OPGW)

OPGW cable construction shall comply with IEEE-1138, 2009. The cable provided shall meet both the construction and performance requirements such that the ground wire function, the optical fibre integrity and optical transmission characteristics are suitable for the intended purpose. The cable shall consist of optical fibre units as defined in this specification. There shall be no factory splices within the cable structure of a continuous cable length.

The composite fibre optic overhead ground wire shall consist of a central fibre optic unit made up of aluminium / aluminium alloy/stainless steel with aluminium coating surrounded by concentric-lay stranded metallic wires in single or multiple layers. The dual purpose of the composite cable is to provide the electrical and physical characteristics of conventional overhead ground wire while providing the optical transmission properties of optical fibre.

1.3.1 Central Fibre Optic Unit

The central fibre optic unit shall be designed to house and protect single/multiple buffered optical fibre unit(s) from damage due to forces such as crushing, bending, twisting, tensile stress and moisture. The central fibre optic unit and the outer stranded metallic conductors shall serve together as an integral unit to protect the optical fibres from degradation due to vibration and galloping, wind and ice loadings, wide temperature variations, lightning and fault current, as well as environmental effects which may produce hydrogen.

The OPGW design of dissimilar materials for stranded wires and tubes are not allowed. Central fibre optic unit may be of aluminium or stainless steel tube with aluminium protective coating. In case of aluminium protective coating, the coating must completely cover the tubes leaving no exposed areas of tubing that can make electrical contact either directly or indirectly through moisture, contamination, protrusions, etc. with the surrounding stranded wires. The tube may be fabricated as a seamless tube, seam welded, or a tube without a welded seam.

1.3.2 Basic Construction

The OPGW cable construction shall conform to the applicable requirements of this specification, applicable clauses of IEC 61089 related to stranded conductors and **Table 1.2(a)** OPGW Mechanical and Electrical Characteristics. In addition, the basic construction shall include bare concentric-lay-stranded metallic wires with the outer layer having left hand lay. The wires may be of multiple layers with a combination of various metallic wires within each layer. The direction of lay for each successive layer shall be reversed. The finished wires shall contain no joints or splices unless otherwise agreed to by the Employer and shall conform to all applicable clauses of IEC 61089 as they pertain to stranded conductors.

The wires shall be so stranded that when the complete OPGW is cut, the individual wires can be readily regrouped and then held in place by one hand.

1.3.3 Breaking Strength

The rated breaking strength of the completed OPGW shall be taken as no more than 90 percent of the sum of the rated breaking strengths of the individual wires, calculated from their nominal diameter and the specified minimum tensile strength.

The rated breaking strength shall not include the strength of the optical unit. The fibre optic unit shall not be considered a load bearing tension member when determining the total rated breaking strength of the composite conductor.

1.3.4 Electrical and Mechanical Requirements

Table 1-2(a) provides OPGW Electrical and Mechanical Requirements for the minimum performance characteristics. Additionally, the OPGW mechanical & electrical characteristics shall be similar to that of the earthwire being replaced such that there is no or minimal consequential increase in stresses on towers. For the purposes of determining the appropriate Max Working Tension limit for the OPGW cable IS 802:1995 and IS 875: 1987 shall be applied. However the OPGW installation sag & tension charts shall be based on IS 802 version to which the line is originally designed. For the OPGW cable design selection and preparation of sag tension charts, the limits

specified in this section shall also be satisfied. The Bidder shall submit sag-tension charts for the above cases with their bids.

Table 1.2(a)
OPGW Electrical and Mechanical Requirements

(1)	Everyday Tension	$\leq 20\%$ of UTS of OPGW
(2)	D.C. Resistance at 20°C:	< 1.0 ohm/Km
(3)	Short Circuit Current	≥ 6.32 kA for 1.0 second (for 220 kV & above lines) ≥ 5.6 kA for 1.0 second (for 132 kV & below lines)

Bidder may offer separate design for each short circuit rating however OPGW design with higher short circuit level shall be acceptable.

1.3.5 Operating conditions

Since OPGW shall be located at the top of the transmission line support structure, it will be subjected to Aeolian vibration, Galloping and Lightning strikes. It will also carry ground fault currents. Therefore, its electrical and mechanical properties shall be same or similar as those required of conventional ground conductors.

1.4 Installation Hardware

The scope of supply includes all required fittings and hardware such as Tension assembly, Suspension assembly, Vibration dampers, Reinforcing rods, Earthing clamps, Downlead clamps, splice enclosure etc. The Bidder shall provide documentation justifying the adequacy and suitability of the hardware supplied. The quantity of hardware & fittings to meet any eventuality during site installation minimum@ 1% shall also be provided as part of set/km for each transmission line without any additional cost to Employer.

The OPGW hardware fittings and accessories shall follow the general requirements regarding design, materials, dimensions & tolerances, protection against corrosion and markings as specified in clause 4.0 of EN 61284: 1997 (IEC 61284). The shear strength of all bolts shall be at least 1.5 times the maximum installation torque. The OPGW hardware & accessories drawing & Data Requirement Sheets (DRS) document shall consist of three parts: (1) A technical particulars sheet (2) An assembly drawing i.e. level 1 drawing and (3) Component level drawings i.e. level 2 & lower drawings. All component reference numbers, dimensions and tolerances, bolt tightening torques & shear strength and ratings such as UTS, slip strength etc. shall be marked on the drawings.

The fittings and accessories described herein are indicative of installation hardware typically used for

OPGW installations and shall not necessarily be limited to the following:

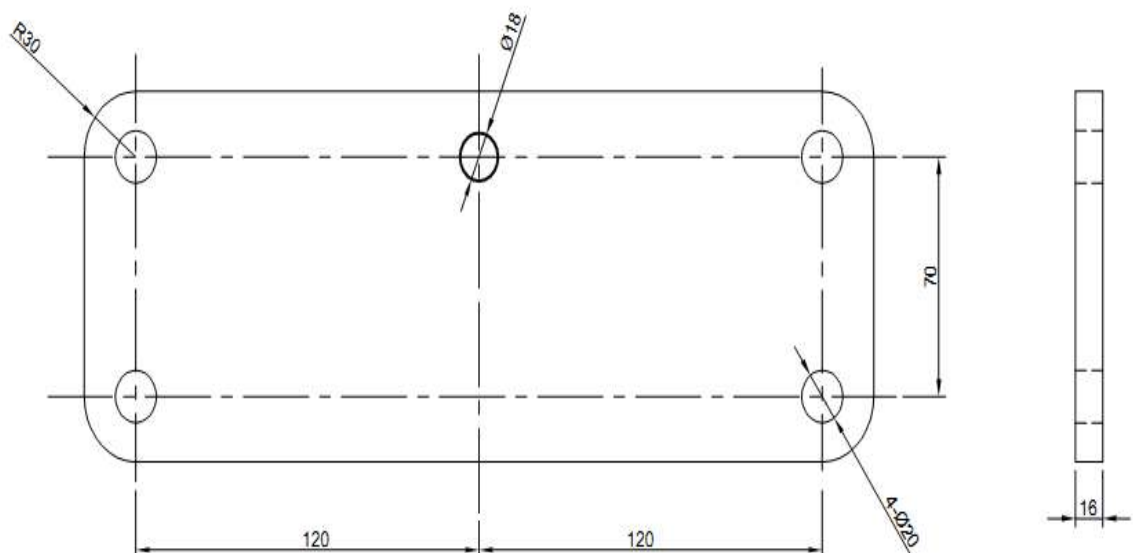
- (a) Suspension Assemblies: Preformed armour grip suspension clamps and aluminium alloy armour rods/ reinforcing rods shall be used. The suspension clamps shall be designed to carry a vertical load of not less than 25 kN. The suspension clamps slippage shall occur between 12kN and 17 kN as measured.

The Contractor shall supply all the components of the suspension assembly including shackles, bolts, nuts, washers, split pins, etc. The total drop of the

suspension assembly shall not exceed 150 mm (measured from the centre point of attachment to the centre point of the OPGW). The design of the assembly shall be such that the direction of run of the OPGW shall be the same as that of the conductor.

- (b) Dead End Clamp Assemblies: All dead end clamp assemblies shall preferably be of performed armoured grip type and shall include all necessary hardware for attaching the assembly to the tower strain plates. Dead end clamps shall allow the OPGW to pass through continuously without cable cutting. The slip strength shall be rated not less than 95% of the rated tensile strength of the OPGW.
- (c) Clamp Assembly Earthing Wire: Earthing wire consisting of a 1500 mm length of aluminium or aluminium alloy conductor equivalent in size to the OPGW shall be used to earth suspension and dead end clamp assemblies to the tower structure. The earthing wire shall be permanently fitted with lugs at each end. The lugs shall be attached to the clamp assembly at one end and the tower structure at the other.
- (d) Structure Attachment Clamp Assemblies: Clamp assemblies used to attach the OPGW to the structures, shall have two parallel grooves for the OPGW, one on either connecting bolt. The clamps shall be such that clamping characteristics do not alter adversely when only one OPGW is installed. The tower attachment plates shall locate the OPGW on the inside of the tower and shall be attached directly to the tower legs/cross-members without drilling or any other structural modifications.
- (e) Tension Fitting for Suspension Tower
The OPGW cable parts shall also be terminated & spliced on suspension towers as per requirement. For this, a special fitting namely Yoke plate along with tension fittings shall be provided for termination/jointing of OPGW on Suspension tower. Typical drawing of suspension fitting where cable may be terminated on suspension tower is given below:

Yoke Plate design for OPGW jointing on Suspension Tower (Typical)



- (f) Vibration Dampers: Vibration dampers type 4R Stockbridge or equivalent, having four (4) different frequencies spread within the Aeolian frequency bandwidth corresponding to wind speed of 1m/s to 7 m/s, shall be used for suspension and tension points in each span. The Contractor shall determine the exact numbers and placement(s) of vibration dampers through a detailed vibration analysis as specified in technical specifications.

One damper minimum on each side per OPGW cable for suspension points and two dampers minimum on each side per OPGW cable for tension points shall be used for nominal design span of 400 meters. For all other ruling spans, the number of vibration damper shall be based on vibration analysis.

The clamp of the vibration damper shall be made of high strength aluminum alloy of type LM-6. It shall be capable of supporting the damper and prevent damage or chaffing of the conductor during erection or continued operation. The clamp shall have smooth and permanent grip to keep the damper in position on the OPGW cable without damaging the strands or causing premature fatigue failure of the OPGW cable under the clamp. The clamp groove shall be in uniform contact with the OPGW cable over the entire clamping surface except for the rounded edges. The groove of the clamp body and clamp cap shall be smooth, free from projections, grit or other materials which could cause damage to the OPGW cable when the clamp is installed. Clamping bolts shall be provided with self-locking nuts and designed to prevent corrosion of threads or loosening in service.

The messenger cable shall be made of high strength galvanised steel/stain less steel. It shall be of preformed and post formed quality in order to prevent subsequent droop of weight and to maintain consistent flexural stiffness of the cable in service. The messenger cable other than stainless steel shall be hot dip galvanised in accordance with the recommendations of IS: 4826 for heavily coated wires.

The damper mass shall be made of hot dip galvanised mild steel/cast iron or a permanent mould cast zinc alloy. All castings shall be free from defects such as cracks, shrinkage, inclusions and blow holes etc. The surface of the damper masses shall be smooth.

The damper clamp shall be casted over the messenger cable and offer sufficient and permanent grip on it. The messenger cable shall not slip out of the grip at a load less than the mass pull-off value of the damper. The damper masses made of material other-than zinc alloy shall be fixed to the messenger cable in a suitable manner in order to avoid excessive stress concentration on the messenger cables which shall cause premature fatigue failure of the same. The messenger cable ends shall be suitably and effectively sealed to prevent corrosion. The damper mass made of zinc alloy shall be casted over the messenger cable and have sufficient and permanent grip on the messenger cable under all service conditions.

The contractor must indicate the clamp bolt tightening torque to ensure that the slip strength of the clamp is maintained between 2.5 kN and 5 kN. The clamp when installed on the OPGW cable shall not cause excessive stress concentration on the OPGW cable leading to permanent deformation of the OPGW strands and premature fatigue failure in operation.

The vibration analysis of the system, with and without damper and dynamic characteristics of the damper as detailed in Technical Specification, shall have to be

submitted. The technical particulars for vibration analysis and damping design of the system are as follows:

Sl. No.	Description	Technical Particulars
1	Span Length in meters (i) Ruling design span: (ii) Maximum span: (iii) Minimum Span:	400 meters 1100 meters 100 meters
2	Configuration:	As per Specifications
3	Tensile load in each:	As per sag tension calculations
4	Armour rods used:	Standard preformed armour rods/AGS
5	Maximum permissible dynamic strain:	+/- 150 micro strains

The damper placement chart for spans ranging from 100m to 1100m shall be submitted by the Contractor. Placement charts should be duly supported with relevant technical documents and sample calculations.

The damper placement charts shall include the following

- (1) Location of the dampers for various combinations of spans and line tensions clearly indicating the number of dampers to be installed per OPGW cable per span.
- (2) Placement distances clearly identifying the extremities between which the distances are to be measured.
- (3) Placement recommendation depending upon type of suspension clamps (viz. Free center type/Armour grip type etc.)
- (4) The influence of mid span compression joints, repair sleeves and armour rods (standard and AGS) in the placement of dampers

1.5 Fibre Optic Splice Enclosures (Joint Box)

All splices shall be encased in Fibre Optic Splice Enclosures. Suitable splice enclosures shall be provided to encase the optical cable splices in protective, moisture and dust free environment. Splice enclosures shall comply with ingress protection class IP 66 or better. The splice enclosures shall be designed for the storage and protection of required number of optical fibre splices and equipped with sufficient number of splice trays for splicing all fibres in the cable. No more than 12 fibres shall be terminated in a single splice tray. They shall be filled with suitable encapsulate that is easily removable should re-entry be required into the enclosures.

Splice enclosures shall be suitable for outdoor use with each of the cable types provided under this contract. Splice enclosures shall be appropriate for mounting on transmission line towers above anti-climb guard levels at about 10 metres from top of the tower and shall accommodate pass-through splicing. The actual mounting height and location shall be finalised after Survey. Contractor shall be responsible for splicing of fibres and installation of splice enclosures.

1.5.1 Optical Fibre Splices

Splicing of the optical fibre cabling shall be minimized through careful Contractor planning. There shall be no mid-span splices allowed. All required splices shall be planned to occur on tower structures. All optical fibre splicing shall comply with the following:

- (a) All fibre splices shall be accomplished through fusion splicing.
- (b) Each fibre splice shall be fitted with a splice protection sheath fitted over the final splice.
- (c) All splices and bare fibre shall be neatly installed in covered splice trays.
- (d) For each link, bi-directional attenuation of single mode fusion splices, shall not average more than 0.05 dB and no single splice loss shall exceed 0.1 dB when measured at 1550 nm.
- (e) For splicing, fibre optic cable service loops of adequate length shall be provided so that all splices occurring at tower structures can be performed at ground level.

1.6 Fibre Optic Approach Cables

For purposes of this specification, a fibre optic approach cable is defined as the Armoured underground fibre optic cable required to connect Overhead Fibre Optic Cable (OPGW) between the final in line splice enclosure on the gantry / tower forming the termination of the fibre cable on the power line and the Fibre Optic Distribution Panel (FODP) installed within the building. The estimated fibre optic approach cabling length requirements are indicated in the appendices. However, the Contractor shall supply & install the optical fibre approach cable as required based on detailed site survey to be carried out by the Contractor during the project execution and the Contract price shall be adjusted accordingly.

1.6.1 Basic Construction

The cable shall be suitable for direct burial, laying in trenches & PVC/Hume ducts, laying under false flooring and on indoor or outdoor cable raceways.

1.6.2 Jacket Construction & Material

The Approach Cable shall be a UV resistant, rodent proof, armoured cable with metallic type of armouring. The outer cable jacket for approach cable shall consist of carbon black polyethylene resin to prevent damage from exposure to ultra-violet light, weathering and high levels of pollution. The jacket shall conform to ASTM D1248 for density.

1.6.3 Optical, Electrical and Mechanical Requirements

Approach cable shall contain fibres with identical optical/ physical characteristics as those in the OPGW cables. The cable core shall comprise of tensile strength member(s), fibre support/bedding structure, core wrap/bedding, and an overall impervious jacket.

1.7 Fibre Optic Distribution Panel

Fibre Optic Distribution Panels is required for each location for termination of fibres in a manner consistent with the following:

- (a) FODPs shall be suitable for use with each of the cable types provided as part of this contract. FODPs shall accommodate pass-through splicing and fibre terminations.
- (b) FODPs for indoor use shall be supplied in suitable cabinets/racks with locking arrangement
- (c) All FODPs shall be of corrosion resistant, robust construction and shall allow both top or bottom entry for access to the splice trays. Ground lugs shall be provided on all FODPs and the Contractor shall ensure that all FODPs are properly grounded. The FODP shall meet or exceed ingress protection class IP55 specifications.

1.7.1 Optical Fibre Connectors

Optical fibres shall be connectorised with FC-PC type connectors preferably. Alternatively connector with matching patch cord shall also be acceptable. Fibre optic couplings supplied with FODPs shall be appropriate for the fibre connectors to be supported. There shall be no adapters.

1.8 Service Loops

For purposes of this specification, cable and fibre service loops are defined as slack (extra) cable and fibre provided for facilitating the installation, maintenance and repair of the optical fibre cable plant.

- (a) Outdoor Cable Service Loops: In-line splice enclosures installed outdoors and mounted on the utility towers shall be installed with sufficient fibre optic cable service loops such that the recommended minimum bend radius is maintained while allowing for installation or maintenance of the cable to be performed in a controlled environment at ground level.
- (b) Indoor Cable Service Loops: FODPs shall provide at least three (3) metres of cable service loop. Service loops shall be neatly secured and stored, coiled such that the minimum recommended bend radius' are maintained.
- (c) Fibre Units Service Loops: For all fibre optic cable splicing, the cable shall be stripped back a sufficient length such that the fan-out of fibre units shall provide for at least one (1) metre of fibre unit service loop between the stripped cable and the bare fibre fan-out.
- (d) Pigtail Service Loops: Connectorised pigtails spliced to bare fibres shall provide at least 1 metre of service loop installed in the FODP fibre organizer and at least one (1) metre of service loop to the couplings neatly stored behind the FODP coupling panels.
- (e) Fibre Service Loops : At least 0.5 metre of bare fibre service loop shall be provided on each side of all fibre splices. The bare fibre service loops shall be neatly and safely installed inside covered splice trays.

1.9 Test Equipment

The table 1.3 below provides mandatory test equipment requirements, to be provided as applicable as per BOQ. The parameters / features of the mandatory equipment's are enumerated as follows:

Table 1.3		
S. No.	Test equipment	Parameter
A.	Test Equipment's for OPGW cable	
1	OTDR (Optical Time Domain Reflectometer) for 1310/1550 nm with laser source.	Equivalent to Anritsu MW9076B1 or better.
2	Optical Attenuators (variable 1310/1550nm).	Equivalent to JDSU OLA55 or better.
3	Optical Power meter (1310/1550nm)	Equivalent to JDSU OLP55 or better
4	Laser Light Source (1310/1550nm)	Equivalent to EXFO FLS300-23BL or better
5	Optical Fibre Fusion Splicer incl. Fibre cleaver	Equivalent to Sumitomo T-39-SE or better.
6	Splice kit	FIS – FI-0053-FF or equivalent
7	Optical test accessory kit including all necessary connectors, adaptors, cables, terminations and other items required for testing	FIS – FI-0053-TS-ST or equivalent

In case the offered make/model of test equipment has multiple options for the parameters, the option of higher range shall be acceptable. The supplied test equipment shall be suitable for use in the high EMI/EMC environment. The Contractor shall submit performance certificate for offered test equipment from at least one customer. The Contractor shall offer only reputed make test equipment such as Acterna (JDSU)/Anritsu/Sumitomo/Agilent/EXFO etc.

-----END-----

**Technical Specifications for
Optical Ground Wire (OPGW) Cable**

**Section – IX B
Inspection & Testing Requirement**

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Technical Specifications for Optical Ground Wire (OPGW) Cable

Section – IX B Inspection & Testing Requirement

All materials furnished and all work performed under this Contract shall be inspected and tested. Deliverables shall not be shipped until all required inspections and tests have been completed, and all deficiencies have been corrected to comply with this Specification and approved for shipment by the Employer.

Except where otherwise specified, the Contractor shall provide all manpower and materials for tests, including testing facilities, logistics, power and instrumentation, and replacement of damaged parts. The costs shall be borne by the Contractor and shall be deemed to be included in the contract price.

The entire cost of testing for factory, production tests and other test during manufacture specified herein shall be treated as included in the quoted unit price of materials, except for the expenses of Inspector/Employer's representative.

Acceptance or waiver of tests shall not relieve the Contractor from the responsibility to furnish material in accordance with the specifications.

All tests shall be witnessed by the Employer and/or its authorized representative (hereinafter referred to as the Employer) unless the Employer authorizes testing to proceed without witness. The Employer representative shall sign the test form indicating approval of successful tests.

Should any inspections or tests indicate that specific item does not meet Specification requirements; the appropriate items shall be replaced, upgraded, or added by the Contractor as necessary to correct the noted deficiencies at no cost to the Employer. After correction of a deficiency, all necessary retests shall be performed to verify the effectiveness of the corrective action.

The Employer reserves the right to require the Contractor to perform, at the Employer's expense, any other reasonable test(s) at the Contractor's premises, on site, or elsewhere in addition to the specified Type, Acceptance, Routine, or Manufacturing tests to assure the Employer of specification compliance.

2.1 Testing Requirements

Following are the requirements of testing:

1. Type Testing
2. Factory Acceptance Testing
3. Site Acceptance Testing

2.3.1 Type Testing

"Type Tests" shall be defined as those tests which are to be carried out to prove the design, process of manufacture and general conformity of the materials to this Specification. Type Testing shall comply with the following:

- (a) All cable & equipment being supplied shall conform to type tests as per technical specification.
- (b) The test reports submitted shall be of the tests conducted within last seven (7) years for OPGW cable prior to the date of proposal/offer submitted. In case the test reports are older than seven (7) years for OPGW cable on the date of proposal/offer, the Contractor shall repeat these tests at no extra cost to the Employer.
- (c) The Contractor shall submit, within 30 days of Contract Award, copies of test reports for all of the Type Tests that are specified in the specifications and that have previously (before Contract award) been performed. These reports may be accepted by the Employer only if they apply to materials and equipment that are essentially identical to those due to be delivered under the Contract and only if test procedures and parameter values are identical to those specified in this specifications carried out at accredited labs and witnessed by third party / customer's representatives.

In the event of any discrepancy in the test reports or any type tests not carried out, same shall be carried out by Contractor without any additional cost implication to the Employer.

In case the Type Test is required to be carried out, then following shall be applicable:-

- (d) Type Tests shall be certified or performed by reputed laboratories using material and equipment data sheets and test procedures that have been approved by the Employer. The test procedures shall be formatted as defined in the technical specifications and shall include a complete list of the applicable reference standards and submitted for Employer approval at least four (4) weeks before commencement of test(s). The Contractor shall provide the Employer at least 30 days written notice of the planned commencement of each type test.
- (e) The Contractor shall provide a detailed schedule for performing all specified type tests. These tests shall be performed in the presence of a representative of the Employer.
- (f) The Contractor shall ensure that all type tests can be completed within the time schedule offered in his Technical Proposal.

- (g) In case of failure during any type test, the Supplier is either required to manufacture a fresh sample lot and repeat all type tests successfully or repeat that particular type test(s) at least three times successfully on the samples selected from the already manufactured lot at his own expenses. In case a fresh lot is manufactured for testing then the lot already manufactured shall be rejected.

2.1.1 Type Test Samples

The Contractor shall supply equipment/material for sample selection only after the Quality Assurance Plan has been approved by the Employer. The sample material shall be manufactured strictly in accordance with the approved Quality Assurance Plan. The Contractor shall submit for Employer approval, the type test sample selection procedure. The selection process for conducting the type tests shall ensure that samples are selected at random. For optical fibres/ Fibre Optic cables, at least three reels/ drums of each type of fibre/cable proposed shall be offered for selection. For FO cable installation hardware & fittings at least ten (10) samples shall be offered for selection. For Splice enclosures at least three samples shall be offered for selection.

2.1.2 List of Type Tests

The type testing shall be conducted on the following items

- (a) Optical fibres
- (b) OPGW Cable
- (c) OPGW Cable fittings
- (d) Vibration Damper
- (e) Splice Enclosure (Joint Box)
- (f) Approach Cable

2.1.2.1 Type Tests for Optical Fibres

The type tests listed below in table 2-1 shall be conducted on DWSM fibres to be supplied as part of overhead cables. The tests specific to the cable type are listed in subsequent sections.

Table 2-1
Type Tests for Optical Fibres

S. No.	Test Name	Acceptance Criteria	Test procedure
1	Attenuation	As per Section-IXA of TS	IEC 60793-1-40 Or EIA/TIA 455-78A
2	Attenuation Variation with Wavelength		IEC 60793-1-40 Or EIA/TIA 455-78A
3	Attenuation at Water Peak		IEC 60793-1-40 Or EIA/TIA 455-78A
4	Temp. Cycling(Temp dependence of Attenuation)		IEC 60793-1-52 Or EIA/TIA 455-3A, 2 cycles

5	Attenuation With Bending (Bend Performance)		IEC 60793-1-47 Or EIA/TIA 455-62A
6	Mode Field dia.		IEC 60793-1-45 Or EIA/TIA 455- 164A/167A/174
7	Chromatic Dispersion		IEC 60793-1-42 Or EIA/TIA 455- 168A/169A/175A
8	Cladding Diameter		IEC 60793-1-20 Or EIA/TIA 455-176
9	Point Discontinuities of attenuation		IEC 60793-1 40 Or EIA/TIA 455-59
10	Core -Clad concentricity error		IEC 60793-1-20 Or EIA/TIA 455-176
11	Fibre Tensile Proof Testing		IEC 60793-1-30 Or EIA/TIA 455-31B

2.1.2.2 Type Tests for OPGW Cables

The type tests to be conducted on the OPGW cable are listed in Table 2-2 Type Tests for OPGW Cables. Unless specified otherwise in the technical specifications or the referenced standards, the optical attenuation of the specimen, measured during or after the test as applicable, shall not increase by more than 0.05 dB/Km.

Table 2-2
Type tests for OPGW Cable

S. No.	Test Name	Test Description	Test Procedure	
1	Water Ingress Test	IEEE 1138-2009	IEEE 1138-2009 (IEC 60794-1-2 Method F5 or EIA/TIA 455-82B) Test duration : 24 hours	
2	Seepage of Filling compound	IEEE 1138-2009	IEEE 1138-2009 (EIA/TIA 455-81B)	Preconditioning period: 72 hours. Test duration: 24 hours.
3	Short Circuit Test	IEEE 1138-2009	IEEE 1138-2009	Fibre attenuation shall be continuously monitored and recorded through a digital data logging system or equivalent means. A suitable temperature sensor such as thermocouple shall be used to monitor and record the temperature inside the OPGW tube in addition to monitoring & recording the temperatures between the strands and between optical tube and the strand as required by IEEE 1138. Test shall be conducted with the tension clamps proposed to be supplied.

				The cable and the clamps shall be visually inspected for mechanical damage and photographed after the test.
				Initial temperature during the test shall be greater than or equal to ambient field temperature.
	4	Aeolian Vibration Test	Or IEC60794-4-10 / IEC 60794-1-2 (2003) Method H1 IEEE 1138-2009 Or IEC60794-4-10 / IEC 60794-1-2, Method E19	IEEE 1138-2009 Fibre attenuation shall be continuously monitored and recorded through a digital data logging system or equivalent means. The vibration frequency and amplitude shall be monitored and recorded continuously. All fibres of the test cable sample shall be spliced together in serial for attenuation monitoring. Test shall be conducted with the tension/suspension clamps proposed to be supplied. The cable and the clamps shall be visually inspected for mechanical damage and photographed after the test
5	Galloping test	IEEE 1138-2009	IEEE 1138-2009	Test shall be conducted with the tension/suspension clamps Proposed to be supplied. The cable and clamps shall be visually inspected for mechanical damage and photographed after the test. All fibres of the test cable sample shall be spliced together in serial for attenuation monitoring.
6	Cable Bend Test	Procedure 2 in IEC 60794-1-2 Method E11		The short-term and long-term bend tests shall be conducted in accordance with Procedure 2 in IEC 60794-1-2 E11 to determine the Minimum acceptable radius of bending without any increase in attenuation or any other damage to the fibre optic

				cable core such as bird caging, deformation, kinking and crimping.
7	Sheave Test	IEEE 1138-2009 OR IEC 60794-1-2 (2003) Method E1B	IEEE 1138-2009	Fibre attenuation shall be continuously monitored and recorded through a digital data Logging system or equivalent means. The Sheave dia. shall be based on the pulling angle and the minimum pulley dia employed during installation. All fibres of the test cable sample shall be spliced together in serial for attenuation monitoring.
8	Crush Test	IEEE 1138-2009	IEEE 1138-2009 (IEC 60794-1-2, Method E3/ EIA/TIA 455-41B)	The crush test shall be carried out on a sample of approximately one (1) metre long in accordance with IEC 60794-1-2 E3. A load equal to 1.3 times the weight of a 400-metre length of fibre optic cable shall be applied for a period of 10 minutes. A permanent or temporarily increase in optical attenuation Value greater than 0.1 dB change in sample shall constitute failure. The load shall be further increased in Small increments until the measured attenuation of the optical waveguide fibres increases and the failure load recorded along with results.
9	Impact Test	IEEE 1138-2009	IEEE 1138-2009, (IEC 60794-1-2 E4/ EIA/TIA 455-25B)	The impact test shall be carried Out in accordance with IEC 60794-1-2 E4. Five separate Impacts of 0.1-0.3kgm shall be applied. The radius of the intermediate piece shall be the reel drum radius $\pm$ 10%. A permanent or temporary Increase in optical attenuation Value greater than 0.1 dB/km Change in sample shall constitute failure.
10	Creep Test	IEEE 1138-2009	IEEE 1138-2009	As per Aluminium Association

				Method, the best-fit straight line shall be fitted to the recorded creep data and shall Be extrapolated to 25 years. The strain margin of the cable at the end of 25 years shall be calculated. The time when the creep shall achieve the strain margin limits shall also be calculated.
11	Fibre Strain Test	IEEE 1138-1994	IEEE 1138-1994	
12	Strain Margin Test	IEEE 1138-2009	IEEE 1138-2009	
13	Stress strain Test	IEEE 1138-2009	IEEE 1138-2009	
14	Cable Cut-off wavelength Test	IEEE 1138-1994	IEEE 1138-1994	
15	Temperature Cycling Test	IEEE 1138-2009	IEEE 1138-2009 Or IEC 60794-1-2, Method F1	
16	Corrosion (Salt Spray) Test	EIA/TIA 455-16A		
17	Tensile Performance Test	IEC 60794-1-2 E1 / EIA/TIA 455-33B		The test shall be conducted on a sample of sufficient length In accordance with IEC 60794-1-2 E1. The attenuation variation shall not exceed 0.05 dB/Km up to 90% of RTS of fibre optic cable. The load shall Be increased at a steady rate up to rated tensile strength and held for one (1) minute. The fibre optic cable sample shall not fail during the period. The applied load shall then be increased until the failing load is reached and the value recorded
18	Lightning Test	IEC 60794-4-10 / IEC 60794-1-2 (2003)		The OPGW cable construction shall be tested in accordance with IEC 60794-1-2, Method H2 for Class 1.
19	DC Resistance Test (IEC 60228)	On a fibre optic cable sample of minimum 1 metre length, two contact clamps shall be fixed with a predetermined bolt torque. The resistance shall be measured by a Kelvin double bridge by placing the clamps initially zero metre and subsequently one metre apart. The tests shall be repeated at least five times and the average value recorded after correcting at 20°C		

2.1.2.3 Type Test on OPGW Cable Fittings

The type tests to be conducted on the OPGW Cable fittings and accessories are listed below:

(i) Mechanical Strength Test for Suspension/Tension

Assembly Applicable Standards: IEC 61284, 1997.

Suspension Assembly

The armour rods /reinforcement rods are assembled on to the approved OPGW using the Installation Instructions to check that the assembly is correctly fitted and is the same that will be carried out during installations.

Part 1:

The suspension assembly shall be increased at a constant rate up to a load equal to 50% of the specified minimum Failure Load increased and held for one minute for the test rig to stabilise. The load shall then be increased at a steady rate to 67% of the minimum Failure Load and held for five minutes. The angle between the cable, the Suspension Assembly and the horizontal shall not exceed 16°. This load shall then be removed in a controlled manner and the Protection Splice disassembled. Examination of all the components shall be made and any evidence of visual deformation shall be documented.

Part 2:

The Suspension clamp shall then be placed in the testing machine. The tensile load shall gradually be increased up to 50% of the specified Minimum Failure Load of the Suspension Assembly and held for one minute for the Test Rig to stabilise and the load shall be further increased at a steady rate until the specified minimum Failure Load is reached and held for one minute. No fracture should occur during this period. The applied load shall then be increased until the failing load is reached and the value shall be documented.

Tension Assembly

The Tension Assembly is correctly fitted and is the same that will be carried out during installations.

Part 1:

The tension assembly (excluding tension clamp) shall be increased at a constant rate up to a load equal to 50% of the specified minimum Failure Load increased at a constant rate and held for one minute for the test rig to stabilise. The load shall then be increased at a steady rate to 67% of the minimum Failure Load and held for five minutes. This load shall then remove in a controlled manner and the Tension Assembly disassembled. Examination of the Tension Dead-End and associated components shall be made and any evidence of visual deformation shall be documented.

Part 2:

The Tension Dead-End and associated components shall then be reassembled and bolts tightened as before. The tensile load shall gradually be increased up shall gradually be increased up to 50% of the specified Minimum Failure Load of the Tension Assembly and held for one minute for the Test Rig to stabilise and the load shall be further increased at a steady rate until the specified minimum Failure Load is reached and held for one minute. No fracture should occur during this period. The applied load shall then be increased until the failing load is reached and the value shall be documented.

Acceptance Criteria for Tension/Suspension Assembly:

- No evidence of binding of the Nuts or Deformation of components at end of Part 1 of Test.
- No evidence of Fracture at the end of one minute at the minimum failure load during Part 2 of the Test.

Any result outside these parameters shall constitute a failure.

(ii) Clamp Slip Strength Test for Suspension Assembly

The suspension assembly shall be vertically suspended by means of a flexible attachment. A suitable length fibre optical cable shall be fixed in the clamps. Once the Suspension Clamp has been assembled, the test rig is tensioned to 1 kN and the position scale on the recorder 'zeroed'. The test rig is then tensioned to 2.5 kN and the relative positions of the Reinforcing Rods, Armour Rods and Suspension Clamp shall be marked by a suitable means to confirm any slippage after the test has been completed. The relative positions of the helical Armour Rods and associated Reinforcing Rods at each end shall be marked and also 2 mm relative position between clamp body and Armour Rods shall be marked on one side. The load shall be increased to 12 kN at a loading rate of 3 kN/min and held for one minute. At the end of this one minute period, the relative displacement between clamp body and the armour rods shall be observed. If the slippage is 2 mm or above, the test shall be terminated. Otherwise, at the end of one minute the position of the clamp body and 2 mm. relative positions between clamp body and armour rods shall be marked on the other side. After the one minute pause, the load shall be further increased at a loading rate of 3 kN/min, and recording of load and displacement shall continue until either the relative Position displacement between clamp body and armour rods reaches more than 2 mm or the load reaches the maximum slip load of 17 kN. On reaching either of the above values the test is terminated. Visual examination of all paint marks shall be recorded, and a measurement of any displacement recorded in the Table of Results.

Acceptance Criteria:

The Suspension Clamp has passed the Slip Test if the following conditions are met:

- ☐ No slippage* shall occur at or below the specified minimum slip load.

* Definition of no slippage in accordance with IEC 61284, 1997:- Any relative movement less than 2 mm is accepted. The possible couplings or elongations produced by the cable as a result of the test itself are not regarded as slippage.

- ☐ Slippage shall occur between the specified maximum and minimum slip load of 12 - 17 kN.

- ☐ There shall be no slippage of the Reinforcing Rods over the cable, and no slippage of the Armour Rods over the Reinforcing Rods.

- ☐ The relative movement (i.e. more than 2 mm between Armour Rods & Clamp body) between minimum 12 kN and maximum slip 17 kN, shall be considered as slip.

- ☐ The Armour Rods shall not be displaced from their original lay or damaged**.

** Definition of no damage in accordance with convention expressed in IEC 61284: 1997 no damage, other than surface flattening of the strands shall occur.

Any result outside these parameters is a failure.

(iii) Slip Strength Test of Tension Clamp

Tension clamps shall be fitted on an 8 m length of fibre optic cable on both ends. The assembly shall be mounted on a tensile testing machine and anchored in a manner similar to the arrangement to be used in service. A tensile load shall gradually be applied up to 20 % of the RTS of OPGW. Displacement transducers shall be installed to measure the relative movement between the OPGW relative to the Reinforcing Rods and Tension Dead -End relative to Reinforcing Rods. In addition, suitable marking shall be made on the OPGW and Dead-End to confirm grip. The load shall be gradually increased at a constant rate up to 50 % of the UTS and the position scale of the recorder is zeroed. The load shall then gradually increased up to 95 % of the UTS and maintained for one minute. After one minute pause, the

load shall be slowly released to zero and the marking examined and measured for any relative movement.

Acceptance Criteria:

- No movement* shall occur between the OPGW and the Reinforcing Rods, or between the Reinforcing Rods and the Dead-End assembly.
- No failure or damage or disturbance to the lay of the Tension Dead-End, Reinforcing Rods or OPGW.

* Definition of no movement as defined in IEC 61284: Any relative movement less than 2 mm is accepted. The possible couplings or elongations produced by the conductor as a result of the test itself are not regarded as slippage.

Any result outside these parameters shall constitute a failure.

(iv) Grounding Clamp and Structure Mounting Clamp Fit Test

For structure mounting clamp, one series of tests shall be conducted with two fibre optic cables installed, one series of tests with one fibre optic cable installed in one groove, and one series of tests with one fibre optic cable in the other groove. Each clamp shall be installed including clamping compound as required on the fibre optic cable. The nut shall be tightened on to the bolt by using torque wrench with a torque of 5.5 kgm or supplier's recommended torque and the tightened clamp shall be held for 10 minutes. After the test remove the fibre optic cable and examine all its components for distortion, crushing or breaking. Also the fibre optic cable shall be checked to ensure free movement within the core using dial callipers to measure the diameter of the core tube. The material shall be defined as failed if any visible distortion, crushing, cracking or breaking of the core tube is observed or the fibre optic cable within the core tube is not free to move, or when the diameter of the core tube as measured at any location in the clamped area is more than 0.5 mm larger or smaller of the core diameter as measured outside the clamped area.

(v) Structure Mounting Clamp Strength Test

The clamp and mounting assembly shall be assembled on a vertical 200 mm x 200 mm angle and a short length of fibre optic cable installed. A vertical load of 200 kg shall be applied at the end of the mounting clamp and held for 5 minutes. Subsequently, the load shall be increased to 400 kg and held for 30 seconds. Any visible distortion, slipping or breaking of any component of the mounting clamp or assembly shall constitute failure.

2.1.2.4 Type Test on Vibration Damper

The testing standard of vibration damper for OPGW shall be as per applicable international standard i.e. IEC 61897.

(a) Dynamic Characteristic Test

The damper shall be mounted with its clamp tightened with torque recommended by the manufacturer on shaker table capable of simulating sinusoidal vibrations for Critical Aeolian Vibration frequency band ranging from $0.18/d$ to $1.4/d$ – where d is the OPGW cable diameter in meters. The damper assembly shall be vibrated vertically with a ± 1 mm amplitude from 5 to 15 Hz frequency and beyond 15 Hz at 0.5 mm to determine following characteristics with the help of suitable recording instruments.

- (i) Force Vs frequency
- (ii) Phase angle Vs frequency

(iii) Power dissipation Vs frequency

The Force Vs frequency curve shall not show steep peaks at resonance frequencies and deep troughs between the resonance frequencies. The resonance frequencies shall be suitably spread within the Aeolian vibration frequency-band between the lower and upper dangerous frequency limits determined by the vibration analysis of fibre optic cable without dampers.

Acceptance criteria for vibration damper:

- (i) The above dynamic characteristics test on five damper shall be conducted.
- (ii) The mean reactance and phase angle Vs frequency curves shall be drawn with the criteria of best fit method.
- (iii) The above mean reactance response curve should lie within following limits:
V.D. for OPGW - $0.060 f$ to $0.357 f \text{ kgf / mm}^*$
Where f is frequency in Hz.
- (iv) The above mean phase angle response curve shall be between 25° to 130° within the frequency range of interest.
- (v) If the above curve lies within the envelope, the damper design shall be considered to have successfully met the requirement.
- (vi) Visual resonance frequencies of each mass of damper are to be recorded and to be compared with the guaranteed values.

(b) Vibration Analysis

The vibration analysis of the fibre optic cable shall be done with and without damper installed on the span. The vibration analysis shall be done on a digital computer using energy balance approach. The following parameters shall be taken into account for the purpose of analysis.

- (i) The analysis shall be done for single fibre optic cable without armour rods. The tension shall be taken as 25% of RTS of fibre optic cable for a span ranging from 100 m to 1100 m.
- (ii) The self-damping factor and flexural stiffness (EI) for fibre optic cable shall be calculated on the basis of experimental results. The details to experimental analysis with these data shall be furnished.
- (iii) The power dissipation curve obtained from Damper Characteristics Test shall be used for analysis with damper.
- (iv) Examine the Aeolian Vibration level of the fibre optic cable with and without vibration damper installed at the recommended location or wind velocity ranging from 0 to 30 Km per hour, predicting amplitude, frequency and vibration energy input.
- (v) From vibration analysis of fibre optic cable without damper, antinode vibration amplitude and dynamic strain levels at clamped span extremities as well as antinodes shall be examined and thus lower and upper dangerous frequency limits between which the Aeolian vibration levels exceed the specified limits shall be determined.
- (vi) From vibration analysis of fibre optic cable with damper(s) installed at the recommended location, the dynamic strain level at the clamped span extremities, damper attachment point and the antinodes on the fibre optic

cable shall be determined. In addition to above damper clamp vibration amplitude and antinodes vibration amplitudes shall also be examined.

The dynamic strain levels at damper attachment point, clamped span extremities and antinodes shall not exceed the specified limits. The damper clamp vibration amplitude shall not be more than that of the specified fatigue limits.

(c) Fatigue Tests

(i) Test Set Up

The fatigue tests shall be conducted on a laboratory set up with a minimum effective span length of 30m. The fibre optic cable shall be tensioned at 25% of RTS of fibre optic cable and shall not be equipped with protective armour rods at any point.

Constant tension shall be maintained within the span by means of lever arm arrangement. After the fibre optic cable has been tensioned, clamps shall be installed to support the fibre optic cable at both ends and thus influence of connecting hardware fittings are eliminated from the free span. The clamps shall not be used for holding the tension on the fibre optic cable. There shall be no loose parts, such as suspension clamps, U bolts, on the test span supported between clamps mentioned above. The span shall be equipped with vibration inducing equipment suitable for producing steady standing vibration. The inducing equipment shall have facilities for step less speed control as well as step less amplitude arrangement. Equipment shall be available for measuring the frequency, cumulative number of cycles and amplitude of vibration at any point along the span.

(ii) Fatigue Test

The vibration damper shall be installed on the test span with the manufacturer's specified tightening torque. It shall be ensured that the damper shall be kept minimum three loops away from the shaker to eliminate stray signals influencing damper movement.

The damper shall then be vibrated at the highest resonant frequency of each damper mass. For dampers involving torsional resonant frequencies, tests shall be done at torsional modes also in addition to the highest resonant frequencies at vertical modes. The resonance frequency shall be identified as the frequency at which each damper mass vibrates with the maximum amplitude on itself. The amplitude of vibration of the damper clamp shall be maintained not less than $\pm 25/f$ mm where f is the frequency in Hz.

The test shall be conducted for minimum ten million cycles at each resonant frequency mentioned above. During the test, if resonance shift is observed, the test frequency shall be tuned to the new resonant frequency.

The clamp slip test as mentioned herein shall be repeated after fatigue tests without retorquing or adjusting the damper clamp and the clamp shall withstand a minimum load equal to 80% of the slip strength for a minimum duration of one minute.

After the above tests, the damper shall be removed from fibre optic cable and subjected to dynamic characteristics test. There shall not be any major deterioration in the characteristics of the damper. The damper then shall be cut open and inspected. There shall not be any broken, loose, or damaged part. There shall not be significant deterioration or wear of the damper. The fibre optic cable under clamp shall also be free from any damage.

For purposes of acceptance, the following criteria shall be applied:

- (1) There shall not be any resonant frequency shift before and after the test by more than $\pm 20\%$
- (2) The power dissipation of the damper before and after test at the individual resonant frequencies do not differ by more than $\pm 20\%$

Beside above tests, the type tests listed below in the table shall also be conducted on Vibration Damper

Sl. No.	Test Name	Test Procedure
1	Visual examination & Dimensional and material verification	IEC 61897 Clause 7.1 & 7.2
2	Clamp Slip test	IEC 61897 Clause 7.5
3	Clamp bolt tightening test	IEC 61897 Clause 7.7
4	Attachments of weights to messenger cable	IEC 61897 Clause 7.8
5	Attachment of clamps to messenger cable	IEC 61897 Clause 7.8
6	Damper effectiveness evaluation	IEC 61897 Clause 7.11.3.2

2.1.2.5 Type Tests for Splice Enclosures (Joint Box)

Following Type tests shall be demonstrated on the Splice Enclosure(s) (Splice Enclosure/Box). For certain tests, lengths of the fibre optic cable shall be installed in the splice box, and the fibres must be spliced and looped in order to simulate conditions of use. The attenuation of the fibres shall be measured, during certain tests, by relevant Fibre Optic Test Procedures (EIA/TIA 455 or IEC 60794-1 procedures).

(i) Temperature Cycling Test

FO cable is installed in the splice enclosure and optical fibres spliced and looped. The box must be subjected to 5 cycles of temperature variations of -40°C to $+65^{\circ}\text{C}$ with a dwell time of at least 2 hours on each extreme.

Fibre loop attenuation shall be measured in accordance with EIA 455-20 / IEC 60794-1-C10. The variation in attenuation shall be less than $\pm 0.05\text{dB}$. The final humidity level, inside the box, shall not exceed the initial level, at the closing of the box.

(ii) Humid Heat test

The sealed splice enclosure, with fibres spliced and looped inside, must be subjected to a temperature of $+55^{\circ}\text{C} \pm 2^{\circ}\text{C}$ with a relative humidity rate of between 90% and 95% for 5 days. The attenuation variation of the fibres during the duration of the test shall be less than $\pm 0.05\text{dB}$, and the internal humidity rate measured, less than 2%.

(iii) Rain Withstand Test / Water Immersion test

The splice enclosure with optical fibres cable installed and fibres spliced fixed, shall be subjected to 24 hours of simulated rain in accordance with IEC 60060 testing requirements. No water seepage or moisture shall be detected in the splice enclosure. The attenuation variation of the fibres after the test shall be less than $\pm 0.05\text{dB}$.

(iv) Vibration Test

The splice enclosure, with fibres united inside, shall be subjected to vibrations on two axes with a frequency scanning of 5 to 50 Hz. The amplitude of the vibrations shall be constant at 0.450mm, peak to peak, for 2 hours, for each of the vibrations' axes. The variation in attenuation, of the fibres, shall be less than $\pm 0.05\text{dB}$. The splice enclosure shall be examined for any defects or deformation. There shall be no loosening or visible damage of the FO cable at the entry point.

(v) Bending and Torsion test

The splice enclosure, with fibres spliced inside, shall be firmly held in place and be subjected to the following sequence of mechanical stresses on the cable:

- a) 3 torsion cycles of $\pm 180^\circ$ shall be exercised on the cable. Each cycle shall be less than one minute.
- b) 3 flexure cycles of the cable, of $\pm 180^\circ$ with one cycle less than one minute.

The variation in the attenuation, of the fibres, shall be less than $\pm 0.05\text{dB}$. The cables connection ring shall remain securely fixed to the box with the connection maintained firmly. No defects/fissures shall be noted on the joint ring or on the splice enclosure

(vi) Tensile test

The splice enclosure with cable fixed to the boxes shall be subjected to a minimum tension of 448 N for a period of two minutes. No fissure shall be noted in the connections or on the box.

(vii) Drop Test

With 2 lengths of 11 metres of cable fixed to the box, it shall be dropped five times from a height of 10 metres. There shall be no fissure, at all, of the box, and the connections shall remain tight. The test surface shall be carried out in accordance with IEC 60068-2-32.

2.1.2.6 Type Tests for Fibre Optic Approach Cable

The type tests to be conducted on the Fibre Optic Approach cable are listed in Table 2-3: Type Tests for Fibre Optic Approach Cable. Unless specified otherwise in the technical specifications or the referenced standards, the optical attenuation of the specimen, measured during or after the test as applicable, shall not increase by more than 0.05 dB/Km.

S.NO.	Test Name	Test Procedure
1	Water Ingress Test	(IEC 60794-1-F5 / EIA 455-82B) Test duration : 24 hours
2	Seepage of filling compound	(EIA 455-81A) Preconditioning : 72 hours, Test duration: 24 hours.
3	Crush Test	(IEC 60794-1-E3/ EIA 455-41)
4	Impact Test	(IEC-60794-1-E4/ EIA 455-25A)
5	Stress strain Test	(EIA 455-33A)
6	Cable Cut-off wavelength Test	(EIA 455-170)
7	Temperature Cycling Test	(IEC60794-1-F1/EIA-455-3A) - 2 cycles

2.1.2.6.1 Impact Test

The Impact test shall be carried out in accordance with IEC: 60794-1-E4. Five separate impacts of 2.0 kg shall be applied at different locations. The radius of the intermediate piece shall be the reel drum radius $\pm 10\%$. A permanent or temporary increase in optical attenuation value greater than 0.05 dB/km shall constitute failure.

2.2 Factory Acceptance Tests

Factory acceptance tests shall be conducted on randomly selected final assemblies of all equipment to be supplied. Factory acceptance testing shall be carried out on OPGW Cable and associated hardware & fittings, Approach Cable, Joint Box, FODP etc. and all other items for which price has been identified separately in the Bid Price Schedules.

Material shall not be shipped to the Employer until required factory tests are completed satisfactorily, all variances are resolved, full test documentation has been delivered to the Employer, and the Employer has issued Material Inspection & Clearance Certificate (MICC). Successful completion of the factory tests and the Employer approval to ship, shall in no way constitute final acceptance of the system or any portion thereof. These tests shall be carried out in the presence of the Employer's authorised representatives unless waiver for witnessing by Employer's representatives is intimated to the contractor.

Factory acceptance tests shall not proceed without the prior delivery to and approval of all test documentation by the Employer.

The factory acceptance tests for the supplied items shall be proposed by the Contractor in accordance with technical specifications and Contractor's (including Sub-Contractor's / supplier's) standard FAT testing program. In general the FAT for other items shall include at least: Physical verification, demonstration of technical characteristics, various operational modes, functional interfaces etc.

For Test equipment FAT shall include supply of proper calibration certificates, demonstration of satisfactory performance, evidence of correct equipment configuration and manufacturer's final inspection certificate/ report.

2.2.1 Sampling for FAT

From each batch of equipment presented by the Contractor for Factory acceptance testing, the Employer shall select random sample(s) to be tested for acceptance. Unless otherwise agreed, all required FAT tests in the approved FAT procedures, shall be performed on all samples. The Sampling rate for the Factory acceptance tests shall be minimum 10% of the batch size (minimum 1) for all items. The physical verification shall be carried out on 100% of the offered quantities as per the approved FAT procedure. In case any of the selected samples fail, the failed sample is rejected and additional 20% samples shall be selected randomly and tested. In case any sample from the additional 20% also fails the entire batch may be rejected.

For the OPGW cable hardware fittings & accessories, the minimum sampling rate, and batch acceptance criteria shall be as defined in IS 2486.

The Sampling rate for the Factory acceptance tests shall be 10% of the batch size (minimum 2) for FO cable drums, FODPs, Joint box and other similar items.

Since FAT testing provides a measure of assurance that the Quality Control objectives are being met during all phases of production, the Employer reserves the right to require the

Contractor to investigate and report on the cause of FAT failures and to suspend further testing/ approvals until such a report is made and remedial actions taken, as applicable.

2.2.2 Production Testing

Production testing shall mean those tests which are to be carried out during the process of production by the Contractor to ensure the desired quality of end product to be supplied by him. The production tests to be carried out at each stage of production shall be based on the Contractor's standard quality assurance procedures. The production tests to be carried out shall be listed in the Manufacturing Quality Plan (MQP), along with information such as sampling frequency, applicable standards, acceptance criteria etc.

The production tests would normally not be witnessed by the Employer. However, the Employer reserves the right to do so or inspect the production testing records in accordance with Inspection rights specified for this contract.

2.2.3 Factory Acceptance Tests on Optical Fibre to be supplied with OPGW

The factory acceptance tests listed in table below are applicable for the Optical fibres to be supplied. The listed tests follow testing requirements set forth in IEEE standard 1138/IEC 60794. The referenced sections specify the detailed test description. The acceptance norm shall be as specified in the above mentioned IEEE standards unless specified otherwise in the technical specifications.

Table 2-4
Factory Acceptance Tests for Optical Fibres: Optical Tests

Factory Acceptance Tests for Optical Fibres: Optical Tests			
S. No.	Test Name	Acceptance Criteria	Test procedure
1	Attenuation Coefficient	T S, Table 1-1(a)	EIA/TIA 455- 78A
2	Point Discontinuities of attenuation	TS, Section 1.1.2	EIA/TIA 455-59
3	Attenuation at Water Peak	TS ,Table 2-1(a)	EIA/TIA 455- 78A
4	Chromatic Dispersion		EIA/TIA 455-168A/169A/175A
5	Core – Clad Concentricity Error		EIA/TIA 455-/176
6	Cladding diameter		EIA/TIA 455-176
7	Fibre Tensile Proof Testing		EIA/TIA 455-31B
-End of table-			

The test report for the above tests for the fibers carried out by the Fiber Manufacturer and used in the OPGW cables shall be shown to the inspector during OPGW cable FAT and shall be submitted along with the OPGW cable FAT report.

The factory acceptance tests for OPGW cable specified below in Table follow the requirements set forth in IEEE standard 1138 / IEC 60794. The FAT shall be carried out on 10% of offered drums in each lot as specified in technical specifications and the optical tests shall be carried out in all fibres of the selected sample drums. The Rated Tensile Strength test shall be carried out on one sample in each lot.

Table 2-5
Factory Acceptance Tests on OPGW
Applicable standard: IEEE 1138 / IEC 60794

S. No.	Factory Acceptance Test on Manufactured OPGW
1	Attenuation Co-efficient at 1310 nm and 1550 nm
2	Point discontinuities of attenuation
3	Visual Material verification and dimensional checks as per approved DRS/Drawings
4	Rated Tensile Strength
5	Lay Length Measurements

2.2.5 Factory Acceptance Test on OPGW Fittings

The factory acceptance tests for OPGW Fittings as specified below in Table 2-6. The sampling plan shall be as per relevant standard:

Table 2-6
Factory Acceptance Tests On OPGW Fittings

S. No.	Factory Acceptance Test
Suspension Assembly	
1.	UTS/Mechanical Strength of the assembly
2.	Clamp Slip Test
3.	Visual Material verification and dimensional checks as per approved DRS/Drawings
4.	Mechanical strength of each component
5.	Galvanising test
Tension Assembly	
6.	Clamp Slip Strength test
7.	Visual Material verification and dimensional checks as per approved DRS/Drawings
8.	Mechanical strength of each component
9.	Galvanising Test
Vibration Damper	
10.	Galvanising test on damper, masses and messenger wires
11.	Damper response (resonant frequencies)
12.	Clamp Slip test
13.	Strength of messenger wires
14.	Attachments of weights to messenger cable
15.	Clamp bolt tightening test
16.	Clamp bolt torque test
17.	Dynamic characteristic test.
18.	Visual Material verification and dimensional checks as per approved DRS/Drawings
Structure Mounting Clamp	
19.	Clamp fit test
20.	Clamp Strength test
21.	Visual Material verification and dimensional checks as per approved DRS/Drawings
End of the Table	

2.2.6 Factory Acceptance Test on Approach Cable

The factory acceptance tests for Approach Cable specified below in Table 2-7:

Table 2-7
Factory Acceptance Tests On Approach Cable

S. No	Factory Acceptance Test
1	Attenuation Co-efficient at 1310 nm and 1550 nm
2	Point discontinuities of attenuation
3	Visual Material verification and dimensional checks as per approved DRS/Drawings

2.2.7 Factory Acceptance Test on Splice Enclosure (Joint Box) /FODP

The factory acceptance tests for Splice Enclosures/FODP as specified below in Table: 2-8

Table 2-8
Factory Acceptance Tests on Splice Enclosures (Joint Box)/FODP

S. No.	Factory Acceptance Test
1	Visual check of Quantities and Specific Component Number for each compon of Splice Enclosure/FODP and dimensional checks against the approved drawings

2.2.8 Factory Acceptance Test on Test Equipment & other items

As per technical specification and approved DRS/Documents.

2.3 Site Acceptance Tests

The Contractor shall be responsible for the submission of all material & test equipment supplied in this contract for site tests and inspection as required by the Employer. All equipment shall be tested on site under the conditions in which it will normally operate.

The tests shall be exhaustive and shall demonstrate that the overall performance of the contract works satisfies every requirement specified. At a minimum Site Acceptance Testing requirement for FO cable etc. is outlined in following section. This testing shall be supplemented by the Contractor's standard installation testing program, which shall be in accordance with his quality plan(s) for FO installation.

During the course of installation, the Employer shall have full access for inspection and verification of the progress of the work and for checking workmanship and accuracy, as may be required. On completion of the work prior to commissioning, all equipment shall be tested to the satisfaction of the Employer to demonstrate that it is entirely suitable for commercial operation.

2.3.1 Minimum Site Acceptance Testing Requirement for FO Cabling

Prior to installation, every spooled fibre optic cable segment shall be tested for compliance with the Pre-shipment data previously received from the manufacturer. This requirement will preclude the installation of out of specification cable segments that may have been damaged during shipment.

2.3.1.1 Phases of Site Acceptance Testing

SAT shall be carried out link by link from FODP to FODP. SAT may be performed in parts in case of long links.

The tests, checks, adjustments etc. conducted by the Contractor prior to offering the equipment for SAT shall be called Pre-SAT activities. The Pre-SAT activities shall be described in the installation manuals and Field Quality Plan documents.

Sag and tension of OPGW shall generally be as per approved sag-tension chart and during installation, sag and tension of OPGW shall be documented. Upon completion of a continuous cable path, all fibres within the cable path shall be demonstrated for acceptance of the cable path. Fibre Optic cable site testing minimum requirements are provided in Table 2-9(a) through 2-9(c) below:

Table 2-9(a)
Fibre Optic Cable Pre-Installation Testing

Item:	Description:
1.	Physical Inspection of the cable assembly for damage
2.	Optical fibre continuity and fibre attenuation with OTDR at 1550 nm
3.	Fibre Optic Cable length measurement using OTDR

Table 2-9(b)
Fibre Optic Cable Splicing Testing

Item:	Description:
1.	Per splice bi-directional average attenuation with OTDR
2.	Physical inspection of splice box/enclosure for proper fibre / cable routing techniques
3.	Physical inspection of sealing techniques, weatherproofing, etc.

Table 2-9(c)
Fibre Optic Cable Commissioning Testing

Item:	Description:
1.	End to End (FODP to FODP) bi-directional average attenuation of each fibre at 1310 nm and 1550 nm by OTDR.
2.	End to End (FODP to FODP) bi-directional average attenuation of each fibre at 1310 nm and 1550 nm by Power meter.
3.	Bi-directional average splice loss by OTDR of each splice as well as for all splices in the link (including at FODP also).
4.	Proper termination and labelling of fibres & fibre optic cables at FODP as per approved labelling plan.
-End of Table-	

-----End of this Section-----

Section-IX C

Installation for OPGW Cabling

**Technical Specifications for
Optical Ground Wire (OPGW) Cable**

Section-IX C

Installation for OPGW Cabling

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Technical Specifications for Optical Ground Wire (OPGW) Cable

Section- IX C Installation of OPGW Cabling

3.1 Installation requirements

The OPGW cable shall be installed at the top of the tower in place of earthwire (only one of the earthwire peaks in case of 400kV & above lines, if applicable) for under construction transmission lines as envisaged.

The OPGW cable sections shall normally be terminated & spliced only on tension towers. In exceptional circumstances, and on Employer specific approval, cable may be terminated on suspension towers, but in this case tower strength shall be examined to ensure that tower loads are within safe limits and if required, necessary tower strengthening shall be carried out by the Contractor.

For OPGW Cable to be installed on new line transmission line, the stringing shall be carried by the Transmission Line Contractor as per the stringing chart/procedure submitted by them and approved by Employer. The Contractor shall install OPGW as per approved stringing procedure.

The Contractor shall follow precautions including proper location of drum site, installation of stringing blocks/pulleys, proper sagging, proper installation of hardware, proper tension as per Sag-Tension chart, provision of service loops of OPGW in jointing locations etc.

3.1.1 Installation of OPGW cable

The OPGW cable sections shall normally be terminated & spliced only on tension towers. In exceptional circumstances and on Employer specific approval, cable may be terminated on Suspension towers, but in this case tower strength shall be examined to ensure that tower loads are within safe limits and if required, necessary tower strengthening shall be carried out by the Contractor. In such a case, the jointing of OPGW on suspension tower if required, shall be acceptable subject to its suitability.

3.1.2 Installation Hardware Fittings

All required hardware fittings shall be installed along with OPGW Cable.

3.2 Installation of Approach Cable

The existing cable trenches/ cable raceways proposed to be used shall be identified in the survey report. The Contractor shall make its best effort to route the cable through the existing available cable trenches. Where suitable existing cable trenches are not available, suitable alternatives shall be provided after Employer approval. However, the approach cable shall be laid in the HDPE pipe in all condition.

Suitable provisions shall be made by the Contractor to ensure adequate safety earthing and insulated protection for the approach cable.

All required fittings, supports, accessories, ducts, inner ducts, conduits, risers and any item not specially mentioned but required for laying and installation of approach cables shall be supplied and installed by the Contractor.

3.3 Optical Fibre Termination and Splicing

Optical fibre terminations shall be installed in Fibre Optic Distribution Panels (FODP) designed to provide protection for fibre splicing of preconnectorized pigtails and to accommodate connectorized termination and coupling of the fibre cables. The Contractor shall provide rack /wall mounted Fibre Optic Distribution Panels (FODPs) sized as indicated in the appendices and shall terminate the fibre optic cabling up to the FODPs. The location of FODP rack shall be fixed by the Contractor, with the Employer's approval.

3.4 Fibre Optic Distribution Panel

At each location requiring the termination of at least one fibre within a cable, all fibres within that cable shall be connectorized and terminated in Fibre Optic Distribution Panels in a manner consistent with the following:

- (a) All fibre optic terminations shall be housed using FODPs provisioned with splice organizers and splice trays. All fibres within a cable shall be fusion spliced to pre-connectorized pigtails and fitted to the "Back-side" of the provided fibre optic couplings.
- (b) Flexible protection shall be provided to the patch cord bunches going out from FODP to other equipment.

3.5 Methodology for Installation and Termination

All optical fibre cable termination, installation, stringing and handling plans, guides and procedures, and engineering analysis (e.g. tension, sag, vibration etc.) shall be submitted to the Employer for review and approval in the engineering/design phase of the project, prior to establishing the final cable lengths for manufacture. Installation procedures including details of personnel and time required shall be documented in detail and submitted to Employer for approval. All installation practices shall be field proven and ISO accredited.

All cable segments shall include service loops as specified in this specification. The maximum allowable stringing tension, maximum allowable torsional shear stress, crush strength and other physical parameters of the cable shall not be exceeded. The preventative measures to be taken shall be documented in detail and submitted to Employer in advance of installation.

Optical fibre attenuation shall be measured after installation and before splicing. Any increase in attenuation or step discontinuity in attenuation shall not be acceptable and shall constitute a cable segment failure. In the event of cable damage or any fibre damage, the complete section (tension location to tension location) shall be replaced as mid-span joints are not acceptable.

Any or all additional steel work or modifications required to attach the fibre cabling to the overhead transmission/ distribution line towers shall also be carried out by the Contractor. It shall be the Contractor's responsibility to provide adequate communications among all crew members and support staff to ensure safe and successful installations.

3.6 Cable Raceways

To the extent possible, existing cable raceways shall be utilised. The Contractor is required to provide and install any additional indoor cable raceways which may be required for proper implementation

of the fibre optic cabling system. This requirement shall be finalised during survey. The cable raceways shall conform to the following:

- (a) All cable raceways shall be sized to support full loading requirements plus at least a 200% safety loading factor.
- (b) Indoor cable raceways shall be fabricated from construction grade aluminium, galvanized iron or anodized sheet metal or any other suitable material approved by the Employer. Suitable anti-corrosion measures shall be provided. Steel fabricated raceways shall be finished inside and out, treated to resist rust and to form a metal-to- paint bond.
- (c) Mechanical construction drawings of the cable raceways shall be submitted for Employer's information & review.

.....**End of this Section**.....

SECTION-X

SECTION: X
TECHNICAL SPECIFICATION
(220kV Cable)

1.0 SUPPLY PORTION:

TECHNICAL REQUIREMENTS

The XLPE insulated, EHV cable shall conform to the requirements of IEC 60502-2 (applicable clauses only) for construction and IEC 60840/IEC 62067(as applicable) for testing. The terminating accessories shall conform to IEC 60840/IEC 62067(as applicable). The offered cables and its terminating accessories shall be compatible with each other.

- 1.0.1 The cable shall be 220 kV EHV grade, single core, unarmoured, stranded compacted Copper conductor, core screening by a layer of semiconducting tape followed by a layer of semiconducting compound, cross linked polyethylene (XLPE) dry cured insulation, insulation screening with semiconducting compound extruded directly over the insulation, longitudinal sealing by a layer of non-woven tape with water swellable absorbent over insulation screen, followed by radial sealing (Metal sheath of Lead alloy 'E'), metallic screening by concentric layer of plain copper wire followed by an open helix of copper & overall HDPE sheathed & graphite coated and conforming to the technical particulars of specification.
- 1.0.2 The construction of cable shall generally conform to the description mentioned at sl no.1.0.1 of the specification. Bidder may offer necessary layers such as separation tape, binder tapes etc additionally as per their manufacturing practices for meeting required performance of the offered cable. The bidder shall enclose with the bid, drawing showing cross section of the cable.
- 1.0.3 The cable shall be suitable for laying under extremely low temperature conditions and underground buried installation with uncontrolled back fill and chances of flooding by water and suitably designed by the addition of chemicals in the outer sheath to be protected against rodent and termite attack.
- 1.0.4 The conductors screen (non-metallic semi-conductive) shall be extruded in a single one-time process to ensure homogeneity and absence of voids.
- 1.0.5 They shall be designed to withstand all mechanical, electrical and thermal stresses under steady state and transient operating conditions.
- 1.0.6 Progressive sequential marking of the length of cable in metres at every one metre shall be provided on the outer sheath of the cable.
- 1.0.7 Repaired cables shall not be accepted.
- 1.0.8 Allowable tolerance on the overall diameter of the cables shall be plus or minus 2mm.

1.0.9 CONDUCTOR

The conductor shall be of plain copper wires. The shape of conductor shall be compacted circular having high compactness and smooth surface finish.

1.0.10 CONDUCTOR SCREEN

The conductor screen shall consist of extruded semi-conducting XLPE. Semi-conducting separator tapes may be applied between conductor and the extruded semi-conductor XLPE.

1.0.11 INSULATION

The extruded XLPE insulation shall be applied over the conductor screen to the desired thickness in a void free manner.

1.0.12 INSULATION SCREEN

The insulation screen shall consist of extruded semi-conducting XLPE. Suitable bedding tapes shall be applied over the extruded semi-conducting XLPE.

1.0.13 MOISTURE BARRIER

Longitudinal water barrier:

The longitudinal water barrier shall be applied over insulation screen by a layer of non-woven synthetic tape with suitable water swellable absorbent.

Radial Moisture Barrier:

This shall be of extruded lead alloy "E" sheath.

1.0.14 METALLIC SCREEN:

The metallic screen shall be of plain copper wires, helically applied over the radial moisture barrier. A binder tape of annealed plain copper shall be applied in the form of an open helix over the copper wire screen.

The combination of the metallic sheath (lead sheath) in combination with wire screen shall be designed to meet the requirement of the system short circuit rating of **40 kA for 1 sec.**

1.0.15 OUTER SHEATH

The outer sheath shall consist of extruded black coloured HDPE with graphite coating.

1.0.16 RATING

The bidder shall declare current rating of cable for maximum conductor temperature of 90 degree C under continuous operation and 250 degree C during short-circuit condition. A complete set of calculation made in arriving at the current rating shall be furnished for laying condition under present scope of work during detailed engineering for Employer/Owner's reference.

1.1.1 CABLE JOINTING ACCESSORIES

- 1.1.2 The cable jointing accessories shall include the end terminating kits, straight through joints and also any special tools and tackles required for making these joints.
- 1.1.3 The straight through joint shall preferably be built up from the same material as the main cable and shall have electrical and mechanical withstand capabilities same as or better than the main cable. The joints shall be suitable for tropical and high altitude climatic conditions specified under Section-Project.
- 1.1.4 The cable end terminations shall be of synthetic/composite type suitable for withstanding the extreme climatic conditions (up to -45 degree C) with required Creepage distance. The cable end terminals for terminating the cables shall be fully compatible with the cables to be supplied. The termination shall also be capable to withstand mechanical forces during normal and short circuit operations.
- 1.1.5 The detailed description on jointing procedure shall be furnished during detailed engineering.
- 1.1.6 The straight through joints and cable end terminations shall be of proven design and should have been type tested as per relevant IEC. A complete list of supply of cable jointing accessories which are in successful operation in projects having low temperature conditions shall be furnished along with bid.

1.2 CABLE DRUMS

- 1.2.1 Cables shall be supplied in returnable steel drums of heavy construction of suitable size and packed conforming to applicable internationally accepted standards.
- 1.2.2 Standard drum lengths for manufacturing shall be finalised during detailed engineering. Each drum shall carry the manufacturer's name, the purchaser's name, address and contract number and type, size and length of the cable, net and gross weight stencilled on both sides of drum. A tag containing the same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.
- 1.2.3 Packing shall be sturdy and adequate to protect the cables, from any injury due to mishandling or other conditions encountered during transportation, handling and storage. Both cable ends shall be sealed with PE/Rubber caps so as to eliminate ingress of water during transportation and erection.

1.3 TESTS ON CABLES

- 1.3.1 All cables shall conform to all type, routine and acceptance tests listed in the relevant IEC.
- 1.3.2 All type and acceptance tests shall be carried out as per IEC on the XLPE insulated EHV cable.

1.4 TESTS ON ACCESSORIES

- 1.4.1 The bidder shall submit type test reports for all type tests as per IEC 60840:1999/ IEC

62067 for owner's acceptance.

- 1.4.2 Contractor shall submit type test reports as per clause no. 9.2 of Technical Specification, Section: GTR for owner's acceptance.

1.4 TESTS AFTER INSTALLATION

All tests on cable system as prescribed in IEC 62067 shall be performed after installation.

2.0 LAYING AND INSTALLATION PORTION

- 2.1 Four (4) single core, 220 kV, cable to form 220 kV, single circuit [(3-1C) in one circuit + (1-1C) as spare] as per scope indicated under Section-project shall be laid throughout the route. However, as per requirement of the field, in exceptional cases ,the cables shall also have to be laid (with prior approval of owner):

1. In ducts.
2. In HDPE pipes (pipes to be filled with sand/suitable material after cabling)
3. In air at terminations.
4. At varying depths due to obstructions.
5. As per approved drawings.

- 2.2 The bidder is advised to visit the site and acquaint themselves with the topography, infrastructure etc. The contractor shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the erection and successful commissioning, of 220 kV cable in all respects.

- 2.3 The arrangement of laying the cable en-route shall be submitted by contractor during detailed engineering for Employer/JKPDD acceptance.

2.4 TRENCHING

The cable trench work involves earth excavation for cable trench, back filling and removal of excess earth from site. The work site shall be left as clean as possible.

The trench shall be excavated using manual /mechanical modes as per field conditions. Most main roads are of asphalt surface and some of the roads with cement concrete surface.

Where paved footpaths are encountered, the pavement slabs shall be properly stored and reinstated. Identification markers of other services shall be properly stored and restored.

The sides of the excavated trenches shall wherever required, be well shored up.

Suitable barriers should be erected between the cable trench and pedestrian/ motorway to prevent accidents. The barriers shall be painted with yellow and black or red and white coloured cross stripes. Warning and caution boards should be consciously displayed. Red lights as warning signal should be placed along the trench during the nights.

The excavated material shall be properly stored to avoid obstruction to public and traffic movement.

The bottom of the excavated trench should be levelled flat and free from any object which would damage the cables. Any gradient encountered shall be gradual.

2.5 TREFOIL FORMATION

Cables shall be laid in trefoil formation for entire route. The contractor shall submit drawings and arrangements for Employer approval.

2.6 CABLE HANDLING

The inspection of cable on receipt, handling of cables, paying out, flaking, cushioning with sand or sieved compacted soil, back-filling, reinstatement of road surfaces, providing and fixing joint markers, route indicators, precautions of joint holes, sump holes and all necessary precautions that are required shall be carefully planned and in accordance with acceptable standard practices/statutory requirements.

2.7 DAMAGE TO PROPERTY

The contractor shall take all precautions while excavation of trench, trial pits etc., to protect the public and private properties and to avoid accidental damage. Any damage so caused shall be immediately repaired and brought to the notice of the concerned and to the Employer/JKPDD.

- The contractor shall bear all responsibilities and liabilities and shall bear all costs of the damages so caused by him or by his workman or agents.
- At places where the cables cross private roads, gates of residential houses or buildings, the cables shall be laid in **HDPE** pipes of adequate strength.

2.8 CABLE ROUTE MARKERS/CABLE JOINT MARKERS

Permanent means of indicating the position of joints and cable route shall be fabricated supplied and erected as per drawings supplied by Employer/JKPDD.

Markers provided shall be as per the field requirement, If the route passes through open fields, markers should be conspicuously visible and above ground surface.

The marker should incorporate the relevant information. The name of the JKPDD, voltage, circuit and distance of cable from the marker

2.9 DEPTH OF LAYING OF CABLES:

Depth of laying shall be as per drawing annexed with specifications. Laying at varying depths due to obstructions/site conditions may be accepted in extreme cases with prior approval of Employer/JKPDD during detailed engineering.

2.10 PAYING OUT THE CABLE

The excavated cable trench shall be drained of all water and the bed surface shall be smooth, uniform and fairly hard before paying out the cable. The cable shall be rolled in the trench on cable rollers, spaced out at uniform intervals. The paying out process must be smooth and steady without subjecting the cable to abnormal tension. The cable on being paid out shall be smoothly and evenly transferred to the ground after providing the cushion. The cables shall never be dropped. All snake bends shall be straightened. Suitable size cable stocking pulling eye shall be used for pulling the cable. While pulling the cable by winches or machines, the tension loading shall be by tension indicator and shall not exceed the permissible value for the cable. The cable laying shall be performed continuously at a speed not exceeding 600 to 1000 meters per hour.

The cable end seals shall be checked after laying and if found damaged shall immediately be resealed. Sufficient number of heat shrinkable cable end sealing caps shall be stocked at site stores for testing and jointing work. The integrity of the outer sheath shall be checked after the cable is laid in position.

2.11 SAND BEDDING:

The cable shall be completely surrounded by well-compacted cable sand to such a thickness and of such size that the cable is protected against damage(applicable where cables are not to be laid in pipes). The thickness of the cable sand should normally be a minimum of 10 cm in all directions from the cable surface.

2.12 SNAKING

Snaking shall be done at necessary places recommended by manufacturer with prior approval of Employer/JKPDD.

2.13 THERMAL BACKFILL

Based on the evaluation of soil thermal resistivity along the cable route and after approval from the Employer/JKPDD the contractor shall design, specify, supply, lay and monitor the installation of thermal backfill surrounding the cables.

2.14 IMMEDIATE ENVELOPE TO CABLE

The option on the use of the material that immediately envelopes the cable viz., thermal backfill or sand or sieved native soil rests with the Employer/JKPDD. The contractor shall seek prior approval on the use of the envelop material from the Employer/JKPDD before execution of the works.

2.15 BACK FILLING:

Normally back filling shall consist of the material earlier excavated. However, bigger stones or pieces of rock should be removed.

2.16 WARNING TAPE:

A pre-warning, Red colour plastic/ PVC tape, 250 mm wide 100 microns thick, shall be laid

at approx. 0.4 m above the cable specified depth, throughout the cable route. The tape shall carry the legend printed in black continuously as under CAUTION; JKPDD, 220000 V CABLES.

2.17 PREVENTION OF DAMAGE DUE TO SHARP EDGES

After the cables have been laid in the trench and until the cables are covered with protective covering, no sharp metal tool shall be used in the trench or placed in such a position that may fall into the trench.

Straight and curved rollers used shall have no sharp projecting parts liable to damage the cable. While pulling through pipes and ducts, the cable shall be protected to avoid damage due to sharp edges.

The cables shall never be bent, beyond the specified bending radius.

2.18 ROAD, RAIL & CANAL CROSSINGS

The road cutting, whether cement concrete asphalt or macadam road surface shall be taken after obtaining approval for cutting from the civic authorities, traffic police, telephone authorities and work should be planned to be completed in the shortest possible time. Where necessary the work shall be planned during night or light traffic periods. HDPE pipes shall be used for cable.

Trenchless Digging:

It is envisaged that trench less digging shall be used for crossing National highways and this shall be in the scope of bidder. Trench less digging shall also be used where the concerned authorities do not permit open cut method and it is essentially required to carry out for installation of underground cables. The trench less digging methods shall generally conform to ITU-T L.38. The various methods of trenchless digging such as hand/manual auguring (up to 15m), impact moling (from 16m to about 40-50m). HDD (above 40-50m) shall be adopted based on the soil/site conditions and the requirement and exact method for trench less digging shall be finalised during detail engineering as per actual site/soil condition. The equipment used for HDD shall be capable of drilling at least 100m at one go. The contractor shall propose the exact methods and procedures for implementation of trench less digging at various crossings taking into consideration the following guidelines, for approval by the Employer.

- a) Excavation and backfilling of trial pits and verification of soil condition.
- b) Excavation of entry and Exit pits.
- c) Erection of drill machined. Drilling of pilot hole.
- d) Placement and driving hand augur.
- e) Placement and carrying out impact moling.
- f) Reaming and widening of bore holes in steps (if required).
- g) Pulling of product pipe.

2.19 FOOTPATH CUTTING

The slabs, kerbstones, on the roads shall be removed and reinstated without damage.

2.20 REINSTATEMENT

After the cables and pipes have been laid and before the trench is backfilled all joints and cable positions should be carefully plotted and preserved till such time the cable is energized and taken over by the Engineer in charge. The protective covers shall then be provided, the excavated soil riddled, sieved and replaced. It is advisable to leave a crown of earth not less than 50 mm and not more than 100 mm in the centre and tapering towards the sides of the trench.

The temporary reinstatement of roadways should be inspected at regular intervals, more frequently in rainy season and immediately after overnight rain for checking settlement and if required the temporary reinstatement should be done.

After the subsidence has ceased the trench may be permanently reinstated and the surface restored to the best possible condition.

2.21 MANHOLES

Manholes shall be provided at every proposed joint location for jointing bays. The bidder shall identify the location of the joint bays after carrying out detailed survey of the cable route and excavation of the trial pits. The delivery lengths of the cables shall match the location.

The Contractor shall get inspected, by a representative of the Employer, all manholes before carrying out the backfilling. Pipe & cable sealing, installation of joint box and cable service loops as per approved drawings shall be visually inspected and checked for tightness.

The contractor shall submit design and drawing of joint bay including manholes for Withstanding a live load of 20 ton vehicle plus 30% for impact from moving vehicle. The Contractor shall propose a suitable procedure for testing the manhole for approval by the Employer. Manholes type approved by the Employer only shall be acceptable. The manhole shall include sufficient number of suitable entries.

All works shall be carried out under supervision of the engineer in charge or his representative.

2.22 TOOLS AND PLANTS

The successful bidder shall have all necessary tools, plant and equipment to carry out the survey and cable installation work.

The bidders are instructed to give all the details of equipment at their disposal, to carry out the work successfully and speedily.

2.23 BENDING RADIUS:

The minimum bending radius of XLPE insulated cables are as follows:

Cable

Bending radius

“D” means the overall diameter of the completed cable.

3.0 JOINTING AND TERMINATION OF CABLES

The cable jointing personnel and his crew shall have good experience in the type of joints and terminations that are used. The jointing work shall commence as soon as two or three lengths of cables have been laid. All care should be taken to protect the factory-plumbed caps/seals on the cable ends, and the cable end shall be sealed whenever the end is exposed for tests.

Jointing of cables in carriage ways, drive ways under costly pavings, under concrete or asphalt surfaces and in proximity to telephone cables and water mains should be avoided whenever possible.

Sufficient over lap of cables shall be allowed for making the joints.

The joint bay should be of sufficient dimensions to allow the jointers to work with as much freedom of movement and comfort as possible. Sufficient space should be kept below the cable to be jointed.

The joints of different phases shall be staggered in the jointing bay.

3.1 SUMPHOLES

When jointing cables in water logged ground or under unforeseen rainy conditions, a sumphole should be made at one end of the joint bay, in such a position so that the accumulated water can be pumped or baled out by buckets, without causing interference to the jointing operation.

3.2 TENTS/COVERS

An enclosure or suitable protection cover shall be used in all circumstances wherever jointing work is carried out in the open irrespective of the weather conditions. The joint shall be made in dust free, moisture free and clean atmosphere.

3.3 PRECAUTIONS BEFORE MAKING A JOINT

The cable end seals should not be opened until all necessary precautions have been taken to prevent circumstances arising out of rainy/ inclement weather conditions, which might become uncontrollable.

If the cable end seals or cable ends are found to have suffered damage the cables should not be jointed, without tests and rectification.

3.4 MEASUREMENT OF INSULATION RESISTANCE

Before jointing, the insulation resistance of both sections of cables shall be checked.

3.5 IDENTIFICATION

The identification of each phase, shall be clearly and properly noted. The cables shall be jointed as per the approved design. Each cable shall have identification for phase at joint bays.

3.6 MAKING A JOINT

Comprehensive jointing instructions should be obtained from the manufacture of jointing kits and meticulously followed.

The materials used in the joints like ferrules, screen/sheath continuity bonds, lugs etc., shall be of good quality and conform to standards.

The jointing tools shall be appropriate and as per the requirement of jointing HV XLPE cables.

3.7 CABLE TERMINATIONS

The preparation of the cable end for installing the terminations and the precautions to be taken before fixing the terminations shall be followed as in the case of the cable jointing procedures. The instructions furnished by the termination manufacturer shall be strictly followed.

At cable terminating end, the following provisions for supply and erections are to be included.

- (i) A sufficient length of spare cable shall be left in the ground, for future needs.
- (ii) The rise of the cable immediately from the ground shall be enclosed in PVC/PE pipe of suitable diameter to protect against direct exposure to the sun.
- (iii) The cable shall be properly fastened using non-metallic clamps.
- (iv) Appropriate labels shall be fixed identifying the phase circuit, voltage and date of commissioning etc., on the cable supporting structure.
- (v) The sealing end shall be mounted on pedestal insulators to isolate them from their supporting steel work.
- (vi) Protection from contact with the exposed metal work at the termination shall be provided by resin bonded glass fibre shroud.
- (vii) Providing earth stations with all required materials, like leads, connectors etc. Earth pits shall conform to IS -3043: 1987 (Code of practice for earthing)/ or equivalent International standards.

3.8 BONDING OF SCREEN/ SHEATH

The screens/sheath shall be bonded under each segment of specified route in accordance with this specification and applicable national/International codes & practices. The bidder shall offer complete cable system in order to limit maximum sheath voltage in accordance with standards and furnish complete set of calculations in support of the same. The screen/sheath shall be connected to the earth stations

through disconnecting type link boxes or through SVL wherever applicable.

All required materials used in the bonding & termination of cables along with earth continuity cable to comply with specification/salutatory requirements shall be in the scope of bidder and should be of good quality and compatible with the cable.

3.9 CONNECTION OF RADIAL WATER BARRIER AND CABLE SCREEN

If the metallic radial water barrier is insulated from the metallic wire screen a connection suitable to carry the currents occurring during operation must be installed between metallic radial water barrier of the cable and metallic wire screen in joints and sealing ends.

3.10 CABLE TERMINATING STRUCTURES.

The terminating structure being provided should be designed as per the requirement of the cable end sealing, bushing, lightning arrestor etc.

The mounting structure shall be fixed on the owner's tower as described in Section- Project of the specifications.

After fixing the end termination, the cable shall be suitably fixed to the tower members, with non-magnetic material clamps to the required height securely. Arrangement of the same shall be proposed by bidder.

The mounting structure includes the supports for cable end boxes, link boxes and any other structure required for the intent of the contract. All steel sections used shall be free from all imperfections, mill scales, slag intrusions, laminations, fillings, rust etc. that may impair their strength, durability and appearance. All materials shall be of tested quality only unless otherwise permitted by the Employer/JKPDD.

3.11 LIGHTNING ARRESTOR (LA)

Requirement of Arrestor is annexed at Appendix-1.

SURGE ARRESTERS

1.0 GENERAL:

- 1.1** The Surge arresters shall conform to IEC: 60099-4 except to the extent modified in the specification.
- 1.2** Arresters shall be of hermetically sealed units, self-supporting construction, suitable for mounting on support structures to be supplied by the Contractor.
- 1.3** The Surge Arrestors shall be designed for use in the geographic and meteorological conditions as given in Section-Project.

2.0 DUTY REQUIREMENTS:

- a. The surge arresters shall be of heavy duty station class and gapless type without any series or shunt gaps.
- b. The surge arresters shall be capable of discharging over-voltages occurring during switching of unloaded transformers, reactors and long lines.
- c. 245 kV class arrester shall be capable for discharging energy equivalent to class 3 of IEC for 245 kV system on two successive operations.
- d. The reference current of the arresters shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage.
- e. The surge arresters are being provided to protect 220 kV XLPE cable being supplied under specifications.

3.0 CONSTRUCTIONAL FEATURES :

The features and constructional details of surge arresters shall be in accordance with requirement stipulated hereunder :

- a) The non-linear blocks shall be of sintered metal oxide material. These shall be provided in such a way as to obtain robust construction, with excellent mechanical and electrical properties even after repeated operations.
- b) The surge arresters shall be fitted with pressure relief devices suitable for preventing shattering of porcelain housing and providing path for flow of rated fault currents in the event of arrester failure. Details shall be furnished in the bids alongwith quality checks.

- c) The arresters shall not fail due to arrester porcelain contamination.
- d) Seals shall be provided in such a way that these are always effectively maintained even when discharging rated lightning current.
- e) Outer insulator shall conform to requirements stipulated in specifications. Terminal connectors shall also conform to requirements stipulated under specifications.

Housing shall be so coordinated that external flashover will not occur due to application of any impulse or switching surge voltage upto the maximum design value for arrester.

- f) The end fittings shall be made of corrosion proof material and preferably be nonmagnetic.
- g) The name plate shall conform to the requirements of IEC incorporating the year of manufacture.
- h) The heat treatment cycle details alongwith necessary quality checks used for individual blocks alongwith insulation layer formed across each block are to be furnished. Metalizing coating thickness for reduced resistance between adjacent discs is to be furnished with additional information schedule of bid proposal sheets alongwith procedure for checking the same. Details of thermal stability test for uniform distribution of current on individual disc is to be furnished.
- i) The manufacturer will submit Data for rejection rate of ZnO blocks during manufacturing/operation for the past three years.
- j) The sealing arrangement of the Surge Arrester stacks shall be done incorporating grooved flanges with the O-rings/elliptical cross-section gaskets of Neoprene or Butyl rubber.
- k) The Surge arrester with porcelain housing shall have cantilever strength of not less than 350 kg for 216kV surge arresters or as per the value obtained vide Section-Project, whichever is higher. For Surge arrester with polymer housing, the cantilever strength shall not be less than 150kg.

4.0 FITTINGS AND ACCESSORIES:

- a) Arresters shall be complete with insulating base having provision for bolting to flat surface of structure.
- b) Self contained discharge counters, suitably enclosed for outdoor use and requiring no auxiliary or battery supply for operation shall be provided

for each single pole unit alongwith necessary connection. Suitable leakage current meters should also be provided. The reading of milliammeter and counters shall be visible through an inspection glass panel. The terminals shall be robust and of adequate size and shall be so located that incoming and outgoing connections are made with minimum possible bends.

- c) Surge monitor consisting of discharge counters and milliammeters should be suitable to be mounted on support structure of the arrester and should be tested for IP66 degree of protection. The standard supporting structure for surge arrester should be provided with a mounting pad, for fixing the surge monitor. The surge monitor should be suitable for mounting on this standard mounting pad. Also all nuts, bolts, washers etc. required for fixing the surge monitor shall have to be supplied by the Contractor. The arrangement for Surge Monitor enclosure fixing to the structure shall be at its rear/bottom. Connection between the Surge Arrester base and Surge Monitor shall be through a 2.0 m(minimum) long insulated copper rod/strip of at least 75 sq.mm cross sectional area. The cable shall be terminated at rear/bottom side of the Surge Monitor. The gaskets of the surge monitors shall be of Neoprene, Butyl or equivalent material.
- d) Grading/corona rings shall be provided on each complete arrester unit as required. Suitable terminal connectors shall be supplied by the Contractor.

5.0 TESTS:

- 5.1 The surge arresters should have been type tested as per IEC/IS and shall be subjected to routine and acceptance tests in accordance with IEC document. For Contamination test, procedures outlined in 60099-3 shall be followed.

The test reports of the type tests and the following additional type tests shall also be submitted for the owner's review.

- i) Radio interference voltage test as per IEC 60099-4.
- ii) Seismic withstand test.
- iii) Contamination test.
- iv) Test to verify the Power frequency versus time characteristics. Temporary over voltage withstand test procedure to be mutually agreed)

Each metal oxide block of surge arresters shall conform for the guaranteed specific energy capability in addition to the routine/acceptance test as per IEC-60099-4.

5.2

(a) **Acceptance Tests:**

1. Measurement of power frequency reference voltage of the arrester units.
2. Lightning Impulse Residual voltage on arrester units (IEC clause 6.3.2).
3. Internal Ionisation or partial Discharge test.

(b) **Special Acceptance Test:**

1. Thermal stability test on three sections (IEC Clause 7.2.2).
2. Aging & Energy Capability test on blocks (procedure to be mutually agreed).
3. Watt loss test.

(c) **Routine Tests:**

1. Sealing test: Water dip test at 1.5m depth from top of Surge Arrestor for 30 minutes shall be performed during assembly of Surge Arrester stacks (followed by other routine tests, i.e. P.D. Measurement, Reference Voltage, Residual Voltage & IR measurement).
2. Measurement of reference voltage.
3. Residual voltage test of arrester unit.
4. Internal Ionization test or partial discharge test.
5. Verticality check on completely assembled Surge arresters as a sample test on each lot.

6.0

SPARE PARTS AND MAINTENANCE EQUIPMENT:

Bidder shall include in his proposal recommended spare parts and maintenance equipment.

7.0

TECHNICAL PARAMETERS:

A. 245 kV CLASS SURGE ARRESTER

(a)	Rated arrester voltage	216 kV
(b)	Nominal discharge current	10 kA of 8/20 microsecond wave

(c)	Minimum discharge capability	5kJ/kV (referred to rated arrester voltage corresponding to minimum discharge characteristics.
(d)	Continuous operating voltage at 50 deg.C	168 kV rms
(e)	Max. switching surge residual voltage (1kA)	500 kVp
(f)	Max. residual voltage at	
	i) 5 kA	560 kVp
	ii) 10 kA nominal discharge current	600 kVp
(g)	Max. steep current impulse residual voltage at 10 kA.	650 kVp
(h)	Long duration discharge class	3
(i)	High current short duration test value (4/10 micro second wave)	100 kAp
(j)	Current for pressure relief test	40 kA rms/50 kA rms (as applicable)
(k)	Low current long duration test value (2000 micro sec)	As per IEC.
(l)	Pressure relief class	40 kA rms/50 kA rms (as applicable)

8.0 PRE-COMMISSIONING TESTS

8.1 An indicative list of tests is given below.

- (a) Operation checks of LA counter.
- (b) Insulation resistance measurement.
- (c) Capacitance and Tan delta measurement of individual stacks.
- (d) Third harmonic resistive current measurement (to be conducted after energisation).

Contractor shall perform any additional test based on specialties of the items as per the field Q.P./Instructions of the equipment Supplier or Purchaser without any extra cost to the Purchaser. The Contractor shall arrange all instruments required for conducting these tests alongwith calibration certificates and shall furnish the list of instruments to the Purchaser for approval.

SECTION: GENERAL TECHNICAL REQUIREMENT

1.0 FOREWORD

- 1.1** The provisions under this section are intended to supplement general requirements for the materials, equipments and a service covered under other sections of bidding documents and is not exclusive. However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall prevail.

2.0 GENERAL REQUIREMENT

- 2.1** The bidders shall submit the technical requirements, data and information as per the technical data sheets provided along with bid documents.
- 2.2** The bidders shall furnish catalogues, engineering data, technical information, design documents, drawings etc fully in conformity with the technical specification.
- 2.3** It is recognized that the Bidder may have standardized on the use of certain components, materials, processes or procedures different from those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered provided such proposals meet the specified designs, standard and performance requirements and are acceptable to the Employer. Unless brought out clearly, the Bidder shall be deemed to conform to this specification scrupulously. All deviations from the specification shall be clearly brought out in the respective schedule of deviations. Any discrepancy between the specification and the catalogues or the bid, if not clearly brought out in the specific requisite schedule, will not be considered as valid deviation.
- 2.4** Wherever a material or article is specified or defined by the name of a particular brand, Manufacturer or Vendor, the specific name mentioned shall be understood as establishing type, function and quality and not as limiting competition.
- 2.5** Equipment furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the Technical Specifications unless included in the list of exclusions. Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation of the work unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost. All similar standard components/parts of similar standard equipment provided, shall be inter-changeable with one another.

3.0 STANDARDS

- 3.1** The works covered by the specification shall be designed, engineered, manufactured, tested and commissioned in accordance with the Acts, Rules, Laws and Regulations of India.
- 3.2** The equipment to be furnished under this specification shall conform to latest issue with all amendments of standards specified under Annexure - A of this section, unless specifically mentioned in the specification.
- 3.3** The Bidder shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves, but intended to compliment each other.
- 3.4** The Bidder shall also note that list of standards presented in this specification is not complete. Whenever necessary the list of standards shall be considered in conjunction with specific IS/IEC.
- 3.5** When the specific requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation of the specification shall take precedence.
- 3.6** Other internationally accepted standards which ensure equivalent or better performance than that specified in the standards referred shall also be accepted. Copies of such standards shall be submitted by the bidder along with the bid.
- 3.7** In case governing standards for the equipment is different from IS or IEC, the salient points of difference shall be clearly brought out in additional information schedule along with English language version of standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Employer approval.
- 3.8** The bidder shall clearly indicate in his bid the specific standards in accordance with which the works will be carried out.

4.0 SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED

- 4.2** All equipments shall perform satisfactorily under various other electrical, electromechanical and meteorological conditions of the site of installation.
- 4.3** All equipment shall be able to withstand all external and internal mechanical, thermal and electromechanical forces due to various factors like wind load, temperature variation, ice & snow, (wherever applicable) short circuit etc for the equipment.

5.0 ENGINEERING DATA AND DRAWINGS

- 5.1** The engineering data shall be furnished by the Bidder in accordance with the Schedule for each set of equipment as specified in the Technical Specifications.

- 5.2** The list of drawings/documents which are to be submitted during detailed engineering to the Employer shall be discussed and finalized at the time of award.
- The Bidder shall necessarily submit all the drawings/ documents unless anything is waived.
- The Bidder shall submit 4 (four) sets of drawings/ design documents /data/ test reports as may be required for the approval of the Employer.
- 5.3 Drawings**
- 5.3.1** All drawings submitted by the Bidder including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, dimensions, internal & the external connections, fixing arrangement required and any other information specifically requested in the specifications.
- 5.3.2** Each drawing submitted by the Bidder shall be clearly marked with the name of the Employer, the unit designation, the specifications title, the specification number and the name of the Project. If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.
- 5.3.3** Further work by the Bidder shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Employer, if so required.
- 5.4** The review of these data by the Employer will cover only general conformance of the data to the specifications and documents, interfaces with the equipment provided under the specifications, external connections and of the dimensions which might affect substation layout. This review by the Employer may not indicate a thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicated or the accuracy of the information submitted. This review and/or approval by the Employer shall not be considered by the Bidder, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.
- 5.5** All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the Bidder's risk. The Bidder may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Employer. Approval of Bidder's drawing or work by the Employer shall not relieve the bidder of any of his responsibilities and liabilities under the Contract.
- 5.6** All engineering data submitted by the Bidder after final process including review and approval by the Employer shall form part of the Contract

Document and the entire works performed under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the Employer in Writing.

5.7

Approval Procedure

The scheduled dates for the submission of the drawings as well as for, any data/information to be furnished by the Employer would be discussed and finalized at the time of award. The following schedule shall be followed generally for approval and for providing final documentation.

i)	Approval/comments/ by Employer on initial submission	As per agreed schedule
ii)	Resubmission (whenever required)	Within 2 week from date of comments including both ways postal time).
iii)	Approval or comments of resubmission.	Within 2 week of receipt
iv)	Furnishing of distribution copies in bound volume (5 copies)	2 weeks from the date of final approval
v)	Furnishing of distribution copies of test reports	
	(a) Type test reports (two copies)	2 weeks from the date of final approval
	(b) Routine Test Reports (one copy)	---do-----
vi)	Furnishing of instruction/ operation manuals (4 copies)	As per agreed schedule
(vii)	As built drawings	On completion of entire works
	(a) Hard copies- 4 (Four) sets	
	(b) Soft copies- 2 (Two) sets on CDs	

NOTE :

- (1) The bidder may please note that all resubmissions must incorporate all comments given in the earlier submission by the Employer or adequate justification for not incorporating the same must be submitted failing which the submission of documents is likely to be returned.

- (2) The drawings, which are required to be referred frequently during execution, should be submitted on cloth-lined paper. The list of such drawings shall be finalized with the Bidder at the time of Award.
- (3) All major drawings should be submitted in latest Auto Card Version.
- (4) The instruction Manuals shall contain full details of drawings of all equipment being supplied under this contract, their exploded diagrams with complete instructions for storage, handling, erection, commissioning, testing, operation, trouble shooting, servicing and overhauling procedures.
- (5) If after the commissioning and initial operation, the instruction manuals require any modifications/ additions/changes, the same shall be incorporated by the bidder in the final submission.
- (6) The Bidder shall furnish to the Employer catalogues of spare parts.

6.0 MATERIAL/ WORKMANSHIP

6.1 General Requirement

- 6.1.1 Where the specification does not contain references to workmanship, equipment, materials and components of the covered equipment, it is essential that the same must be new, of highest grade of the best quality of their kind, conforming to best engineering practice and suitable for the purpose for which they are intended.
- 6.1.2 In case where the equipment, materials or components are indicated in the specification as "similar" to any special standard, the Employer shall decide upon the question of similarity. When required by the specification or when required by the Employer the Bidder shall submit, for approval, all the information concerning the materials or components to be used in manufacture. Machinery, equipment, materials and components supplied, installed or used without such approval shall run the risk of subsequent rejection, it being understood that the cost as well as the time delay associated with the rejection shall be borne by the Bidder.
- 6.1.3 The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general, screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from the Employer.
- 6.1.4 Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall also be interchangeable and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the

Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

- 6.1.5 All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be considered as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances, instructions and the Specification.

6.2 Provisions for Exposure to Hot and Humid climate

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favourable to the growth of fungi and mildew.

7.0 DESIGN IMPROVEMENTS / CO-ORDINATION

- 7.1 The bidder shall note that the equipment offered by him in the bid only shall be accepted for supply. However, the Employer or the Bidder may propose changes in the specification of the equipment or quality thereof and if the Employer & bidder agree upon any such changes, the specification shall be modified accordingly.

- 7.2 If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any change in the price and/or schedule of completion before the Bidder proceeds with the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly.

- 7.3 The Bidder shall be responsible for the selection and design of appropriate equipments to provide the best co-coordinated performance of the entire system. The basic design requirements are detailed out in this Specification. The design of various components, sub-assemblies and assemblies shall be so done that it facilitates easy field assembly and maintenance.

- 7.4 The Bidder has to coordinate designs and terminations with the agencies (if any) who are Consultants/Bidder for the Employer. The names of agencies shall be intimated to the successful bidder.

8.0 QUALITY ASSURANCE PROGRAMME

- 8.1 To ensure that the equipment and services under the scope of this Contract whether manufactured or performed within the Bidder's Works or at his Sub-bidder's premises or at the Employer's site or at any other place of Work are

in accordance with the specifications, the Bidder shall adopt suitable quality assurance programme to control such activities at all points necessary. Such programme shall be outlined by the Bidder and shall be finally accepted by the Employer after discussions before the award of Contract. A quality assurance programme of the bidder shall generally cover the following:

- (a) His organization structure for the management and implementation of the proposed quality assurance programme ;
- (b) Documentation control system;
- (c) Qualification data for bidder's key personnel;
- (d) The procedure for purchases of materials, parts components and selection of sub-Bidder's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.
- (e) System for shop manufacturing and site erection controls including process controls and fabrication and assembly control;
- (f) Control of non-conforming items and system for corrective actions;
- (g) Inspection and test procedure both for manufacture and field activities.
- (h) Control of calibration and testing of measuring instruments and field activities;
- (i) System for indication and appraisal of inspection status;
- (j) System for quality audits;
- (k) System for authorising release of manufactured product to the Purchaser.
- (l) System for maintenance of records;
- (m) System for handling storage and delivery and
- (n) A quality plan detailing out the specific quality control measures and procedures adopted for controlling the quality characteristics relevant to each item of equipment furnished and/or services rendered.

The Employer or his duly authorised representative reserves the right to carry out quality audit and quality surveillance of the system and procedure of the Bidder/his vendor's quality management and control activities.

8.2 Quality Assurance Documents

The Bidder shall be required to submit the following Quality Assurance Documents within three weeks after dispatch of the equipment.

- (a) All Non-Destructive Examination procedures, stress relief and weld repair procedure actually used during fabrication and reports including radiography interpretation reports.
- (b) Welder and welding operator qualification certificates.

- (c) Welder's identification list, listing welder's and welding operator's qualification procedure and welding identification symbols.
- (d) Raw material test reports on components as specified by the specification and/or agreed to in the quality plan.
- (e) Stress relief time temperature charts/oil impregnation time temperature charts.
- (f) Factory test results for testing required as per applicable codes/mutually agreed quality plan/standards referred in the technical specification.
- (g) The quality plan with verification of various customer inspection points (CIP) as mutually agreed and methods used to verify the inspection and testing points in the quality plan were performed satisfactorily.

9.0 TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE

9.1 All equipment being supplied shall conform to type tests including additional type tests as per technical specification and shall be subject to routine tests in accordance with requirements stipulated under respective sections. Employer reserves the right to witness any or all the type tests. The Bidder shall intimate the Employer the detailed programme about the tests at least three (3) weeks in advance in case of domestic supplies & six (6) weeks in advance in case of foreign supplies.

9.2 The reports for all type tests and additional type tests as per technical specification shall be furnished by the Contractor along with equipment / material drawings. The type tests conducted earlier should have either been conducted in accredited laboratory (accredited based on ISO / IEC Guide 25 / 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by the representative(s) of RECTPCL or Utility. The test reports submitted shall be of the tests conducted within last 5 (five) years prior to the date of bid opening. In case the test reports are of the test conducted earlier than 5 (five) years prior to the date of bid opening, the contractor shall repeat these test(s) at no extra cost to the purchaser.

In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design / manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the Technical Specification or any/all additional type tests not carried out, same shall be carried out without any additional cost implication to the Purchaser.

9.3 The Purchaser intends to repeat the type tests and additional type tests on cables for which test charges shall be payable as per provision of contract. The price of conducting type tests and additional type tests shall be included in Bid price and break up of these shall be given in the relevant schedule of Bid Proposal Sheets. These Type test charges would be considered in bid evaluation. In case Bidder does not indicate charges for any of the type tests or does not mention the name of any test in the price schedules, it will be presumed that the particular test has been offered free of charge. Further, in case any Bidder indicates that he shall not carry out a particular test, his offer shall be considered incomplete and shall be liable to be rejected.

- 9.4** The Employer, his duly authorized representative and/or outside inspection agency acting on behalf of the Employer shall have at all reasonable times free access to the Bidder's premises or Works and shall have the power at all reasonable times to inspect and examine the materials and workmanship of the Works during its manufacture or erection if part of the Works is being manufactured or assembled at other premises or works, the Bidder shall obtain for the Engineer and for his duly authorized representative permission to inspect as if the works were manufactured or assembled on the Bidder's own premises or works. Inspection may be made at any stage of manufacture, dispatch or at site at the option of the Employer and the equipment if found unsatisfactory due to bad workmanship or quality, material is liable to be rejected.
- 9.5** The Bidder shall give the Employer/Inspector thirty (30) days written notice of any material being ready for testing. Such tests shall be to the Bidder's account except for the expenses of the Inspector. The Employer/inspector, unless witnessing of the tests is virtually waived, will attend such tests within thirty (30) days of the date of which the equipment is notified as being ready for test/inspection, failing which the Bidder may proceed with the test which shall be deemed to have been made in the Inspector's presence and he shall forthwith forward to the Inspector duly certified copies of tests intriplicate.
- 9.6** The Employer or Inspector shall, within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Bidder, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Bidder shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the Employer/Inspector giving reasons therein, that no modifications are necessary to comply with the Contract.
- 9.7** When the factory tests have been completed at the Bidder's or Sub-Bidder's works, the Employer/inspector shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Employer/Inspector, the certificate shall be issued within fifteen (15) days of receipt of the Bidder's Test certificate by the Engineer/Inspector. Failure of the Employer/Inspector to issue such a certificate shall not prevent the Bidder from proceeding with the Works. The completion of these tests or the issue of the certificate shall not bind the Employer to accept the equipment should, it, on further tests after erection, be found not to comply with the Contract. The equipment shall be dispatched to site only after approval of test reports and issuance of MICC by the Employer.
- 9.8** In all cases where the Contract provides for tests whether at the premises or at the works of the Bidder or of any Sub-Bidder, the Bidder except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Employer /Inspector or his authorized

representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the Employer /Inspector or to his authorized representative to accomplish testing.

9.9 The inspection by Employer and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Bidder in respect of the agreed quality assurance programme forming a part of the Contract.

9.10 The Employer will have the right of having at his own expenses any other test(s) of reasonable nature carried out at Bidder's premises or at site or in any other place in addition of aforesaid type and routine tests, to satisfy that the material comply with the specification.

9.11 The Employer reserves the right for getting any field tests not specified in respective sections of the technical specification conducted on the completely assembled equipment at site. The testing equipments for these tests shall be provided by the Employer.

10. TESTS

10.1 Pre-commissioning Tests

On completion of erection of the equipment and before charging, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the Employer and the Bidder for correctness and completeness of installation and acceptability for charging, leading to initial pre-commissioning tests at Site.

10.2 Commissioning Tests

10.2.1 The available instrumentation and control equipment will be used during such tests and the bidder will use all such measuring equipment and devices duly calibrated as far as practicable. However, unmeasurable parameters shall be taken into account in a reasonable manner by the bidder for the requirement of these tests. The tests will be conducted at the specified load points and as near the specified cycle condition as practicable. The bidder will apply proper corrections in calculation, to take into account conditions which do not correspond to the specified conditions.

10.2.2 Any special equipment, tools and tackles required for the successful completion of the Commissioning tests shall be provided by the Bidder, free of cost.

10.2.3 The specific tests to be conducted on equipment have been brought out in the respective chapters of the technical specification.

10.3 The Bidder shall be responsible for obtaining statutory clearances from the concerned authorities for commissioning of the equipment.

11.0 PACKAGING & PROTECTION

11.1 All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the Employer, the Bidder shall

also submit packing details/associated drawing for any equipment/material under his scope of supply, to facilitate the Employer to repack any equipment/material at a later date, in case the need arises. While packing all the materials, the limitation from the point of view of availability of Railway wagon sizes in India should be taken into account. The Bidder shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Bidder. Employer takes no responsibility of the availability of the wagons.

- 11.2** All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves and piping and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner.

12.0 FINISHING OF METAL SURFACES

- 12.1** All metal surfaces shall be subjected to treatment for anti-corrosion protection. All ferrous surfaces for external use unless otherwise stated elsewhere in the specification or specifically agreed, shall be hot-dip galvanized after fabrication. High tensile steel nuts & bolts and spring washers shall be electro galvanized to service condition 4. All steel conductors including those used for earthing/grounding (above ground level) shall also be galvanized according to IS: 2629.

12.2 HOT DIP GALVANISING

- 12.2.1** The minimum weight of the zinc coating shall be 610 gm/sq. m and minimum thickness of coating shall be 85 microns for all items thicker than 6mm. For items lower than 6mm thickness requirement of coating thickness shall be as per relevant ASTM. For surface, which shall be embedded in concrete, the zinc coating shall be 610 gm/sq. mm minimum.
- 12.2.2** The galvanized surfaces shall consist of a continuous and uniform thick coating of zinc, firmly adhering to the surface of steel. The finished surface shall be clean and smooth and shall be free from defects like discolored patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surface, flaking or peeling off, etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.
- 12.2.3** After galvanizing, no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

12.2.4 The galvanized steel shall be subjected to six one minute dips in copper sulphate solution as per IS-2633.

12.2.5 Sharp edges with radii less than 2.5 mm shall be able to withstand four immersions of the Standard Preece test. All other coatings shall withstand six immersions. The following galvanizing tests should essentially be performed as per relevant Indian Standards.

- Coating thickness
- Uniformity of zinc
- Adhesion test
- Mass of zinc coating

12.2.6 Galvanized material must be transported properly to ensure that galvanized surfaces are not damaged during transit. Application of zinc rich paint at site shall not be allowed.

12.3 PAINTING

12.3.1 All sheet steel work shall be degreased, pickled, phosphated in accordance with the IS-6005 "Code of practice for phosphating iron and sheet". All surfaces which will not be easily accessible after shop assembly shall beforehand be treated and protected for the life of the equipment. The surfaces, which are to be finished painted after installation or require corrosion protection until installation, shall be shop painted with at least two coats of primer. Oil, grease, dirt and swarf shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

12.3.2 After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying. The phosphate coating shall be sealed with application of two coats of ready mixed, stoving type zinc chromate primer. The first coat may be "flash dried" while the second coat shall be stoved.

12.3.3 After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoving. The second finishing coat shall be applied after inspection of first coat of painting.

12.3.4 The exterior color of the paint shall be as per shade no:697 of IS-5 and inside shall be glossy white for all equipment, marshalling boxes, junction boxes, control cabinets, panels etc. unless specifically mentioned under respective sections of the equipments. Each coat of primer and finishing paint shall be of slightly different shade to enable inspection of the painting. A small quantity of finishing paint shall be supplied for minor touching up required at site after installation of the equipments.

12.3.5 In case the Bidder proposes to follow his own standard surface finish and protection procedures or any other established painting procedures, like

electrostatic painting etc., the procedure shall be submitted along with the Bids for Employer's review & approval.

13.0 HANDLING, STORING AND INSTALLATION

- 13.1** In accordance with the specific installation instructions as shown on manufacturer's drawings or as directed by the Employer or his representative, the Bidder shall unload, store, erect, install, wire, test and place into commercial use all the equipment included in the contract. Equipment shall be installed in a neat, workmanlike manner so that it is level, plumb, square and properly aligned and oriented. Commercial use of switchyard equipment means completion of all site tests specified and energisation at rated voltage.
- 13.2** Bidder may engage manufacturer's Engineers to supervise the unloading, transportation to site, storing, testing and commissioning of the various equipment being procured by them separately. Bidder shall unload, transport, store, erect, test and commission the equipment as per instructions of the manufacturer's supervisory Engineer(s) and shall extend full cooperation to them.
- 13.3** In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the Employer. Bidder shall be held responsible for any damage to the equipment consequent to not following manufacturer's drawings/instructions correctly.
- 13.5** Bidder shall be responsible for examining all the shipment and notify the Employer immediately of any damage, shortage, discrepancy etc. for the purpose of Employer's information only. The Bidder shall submit to the Employer every week a report detailing all the receipts during the weeks. However, the Bidder shall be solely responsible for any shortages or damages in transit, handling and/or in storage and erection of the equipment at Site. Any demurrage, wharf age and other such charges claimed by the transporters, railways etc. shall be to the account of the Bidder.
- 13.6** The Bidder shall be fully responsible for the equipment/material until the same is handed over to the Employer in an operating condition after commissioning. Bidder shall be responsible for the maintenance of the equipment/material while in storage as well as after erection until taken over by Employer, as well as protection of the same against theft, element of nature, corrosion, damages etc.
- 13.7** Where material/equipment is unloaded by Employer before the Bidder arrives at site or even when he is at site, Employer by right can hand over the same to Bidder and there upon it will be the responsibility of Bidder to store the material in an orderly and proper manner.
- 13.8** The Bidder shall be responsible for making suitable indoor storage facilities, to store all equipment, which require indoor storage.

- 13.9 The words 'erection' and 'installation' used in the specification are synonymous.
- 13.10 Exposed live parts shall be placed high enough above ground to meet the requirements of electrical and other statutory safety codes.
- 13.11 The design and workmanship shall be in accordance with the best engineering practices to ensure satisfactory performance throughout the service life. If at any stage during the execution of the Contract, it is observed that the erected equipment(s) do not meet the above minimum clearances as given in clause 4.7.1 the Bidder shall immediately proceed to correct the discrepancy at his risks and cost.

14.0 TOOLS AND TACKLES

The Bidder shall supply with the equipment one complete set of all special tools and tackles for the erection, assembly, dis-assembly and maintenance of the equipment. However, these tools and tackles shall be separately, packed and brought on to Site.

LIST OF SPECIFICATIONS

GENERAL STANDARDS AND CODES

India Electricity Rules

Indian Electricity Act

Indian Electricity (Supply) Act

Indian Factories Act

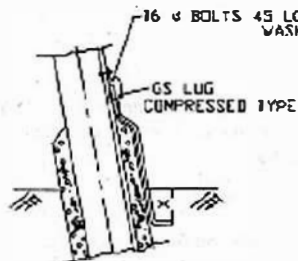
IS 7098: Part 3: 1993	Cross-linked polyethylene insulated thermoplastic sheathed cables: For working voltages from 66 kV upto and including 220 kV.
IS 8130: 1984	Conductors for insulated electric cables and flexible cords
IS 5831: 1984	PVC insulation and sheath of electric cables
IS 1255: 1983	Code of practice for installation and maintenance of power cables upto and including 33 kV rating.
IS 3975 : 1999	Mild steel wires, formed wires and tapes for armouring of cables.
IS 5831 : 1984	PVC insulation and sheath of electric cables.
IS 6380 : 1984	Elastomeric insulation and sheath of electric cables
IS 8130 : 1984	Conductors for insulated electric cables and flexible cords
IS 10418:1982	Drums for electric cables
IS 3975 : 1999	Mild steel wires, formed wires and tapes for armouring of cables
IS 5 : 1994	Colours for ready mixed paints and enamels.
IS 617 : 1994	Aluminium and aluminium alloy ingots and castings for general engineering purposes (Superseded IS 20:1977)
IS 3043 : 1987	Code of practice for earthing.
IS 5578 : 1984	Guide for marking of insulated conductors.
IS 11353 : 1985	Guide for Uniform System of Marking and Identification of Conductors and Apparatus Terminals.
IS 5216 : Part I : 1982	Recommendations on Safety Procedures and Practices in Electrical Work
IS 2071 : 1993	High voltage test techniques
IEC-60840:1999	Power cables with extruded insulation and their accessories for rated voltages above 30 KV up to 150KV- Test methods and requirements.
IEC-60540	Test methods for insulation and sheaths of electric cables and cords.
EC 60060:1989	High Voltage Test Techniques.
IEC-60502:1998	Extruded solid dielectric insulated power cables for rated voltages from 1 kV up to to 30 kV.

IEC-60754:1991	Tests on gases evolved during combustion of electric cables.-
IEC-60183 :1990	Guide to the Selection of High Voltage Cables.
IEC-60228 :1993	Conductors of insulated cables
IEC-60230 :1996	Impulse tests on cables and their accessories.
IEC-60287 :1995	Calculation of the continuous current rating of cables (100% load factor).
IEC-60304 :1982	Standard colours for insulation for low-frequency cable and wires.
IEC-60331 :1970	Fire resisting characteristics of Electric cables.
IEC-60332 :1992	Tests on electric cables under fire conditions.
BS-5468	Cross-linked polyethylene insulation of electric cables.
IEC-60228:1978	Conductors of insulated cables.
IEC-60332:1993	Test on electric cables under fire conditions.
IEC -60066	Environmental Test
IEC-60117	Graphical Symbols
IEC-60270, 2000	Partial Discharge Measurements.
CSA-Z299.1-1978h	Quality Assurance Program Requirements
CSA-Z299.2-1979h	Quality Control Program Requirements CSA-
Z299.3-1979h	Quality Verification Program Requirements
CSA-Z299.4-1979h	Inspection Program Requirements
ASTMD-2863	Measuring the minimum oxygen concentration to support candle like combustion of plastics (oxygen index)

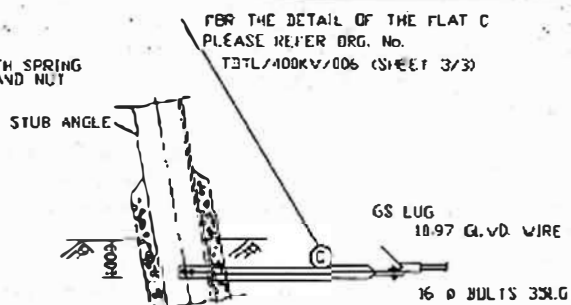
SECTION-X
Typical Drawings

CONTENT

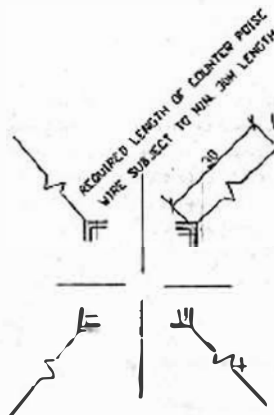
S.No	Description	Drawing no.
1	Counterpoise Earthing Arrangement	RECTPCL/TL/220KV/001
2	Detail of Danger Plate	RECTPCL/TL/220KV/002
3	Double Suspension String Disc/Long Rod Insulator	RECTPCL/TL/220KV/003
4	Double Tension String Disc/Long Rod Insulator	RECTPCL/TL/220KV/004
5	Drum drawing of GS Eartwire	RECTPCL/TL/220KV/005
6	Drum drawing of Deer conductor	RECTPCL/TL/220KV/006
7	Drum drawing of Panther conductor	RECTPCL/TL/220KV/007
8	Detail for FLAT Earthing	RECTPCL/TL/220KV/008
9	Details of anti-climbing device	RECTPCL/TL/220KV/009
10	Tower phase plate	RECTPCL/TL/220KV/10
11	Detail for Pipe Type Earthing	RECTPCL/TL/220KV/11
12	Single Suspension String Disc/Long Rod Insulator	RECTPCL/TL/220KV/12
13	Step Bolt Drawing	RECTPCL/TL/220KV/13
14	Protection of Tower Footing Down Up Hill	RECTPCL/TL/220KV/14
15	Tentative shape of tower footing	RECTPCL/TL/220KV/15
16	Typical 220 kV S/C Transmission Tower	RECTPCL/TL/220KV/16
17	Tower Number Plate	RECTPCL/TL/220KV/17
18	Typical 220kV D/C Transmission Tower	RECTPCL/TL/220KV/18
19	Insulator	RECTPCL/TL/220KV/19
20	Insulator	RECTPCL/TL/220KV/20
21	Indicative Details for Avalanche protection structure	RECTPCL/TL/220KV/21
19	Typical drawing Avalon Prone Area	RECTPCL/TL/220KV/22
20	Typical Buried Cable Trench Cross-Sectional Drawing	RECTPCL/TL/220KV/23



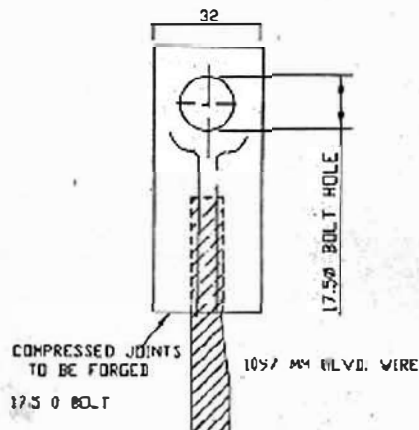
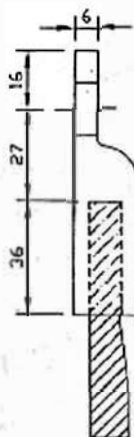
LUG FITTING (TYPICAL)
FOR THREE LEGS



LUG FITTING ON FOURTH LEG



BASE OF TOWER



DETAIL OF LUG

LIST OF BOLTS & NUTS/TOWER

S. No	SIZE	QTY.
1	M16 X 45LG	3
2	M16 X 35LG	1
3	35 THK.SWG WASHER	4

NOTES

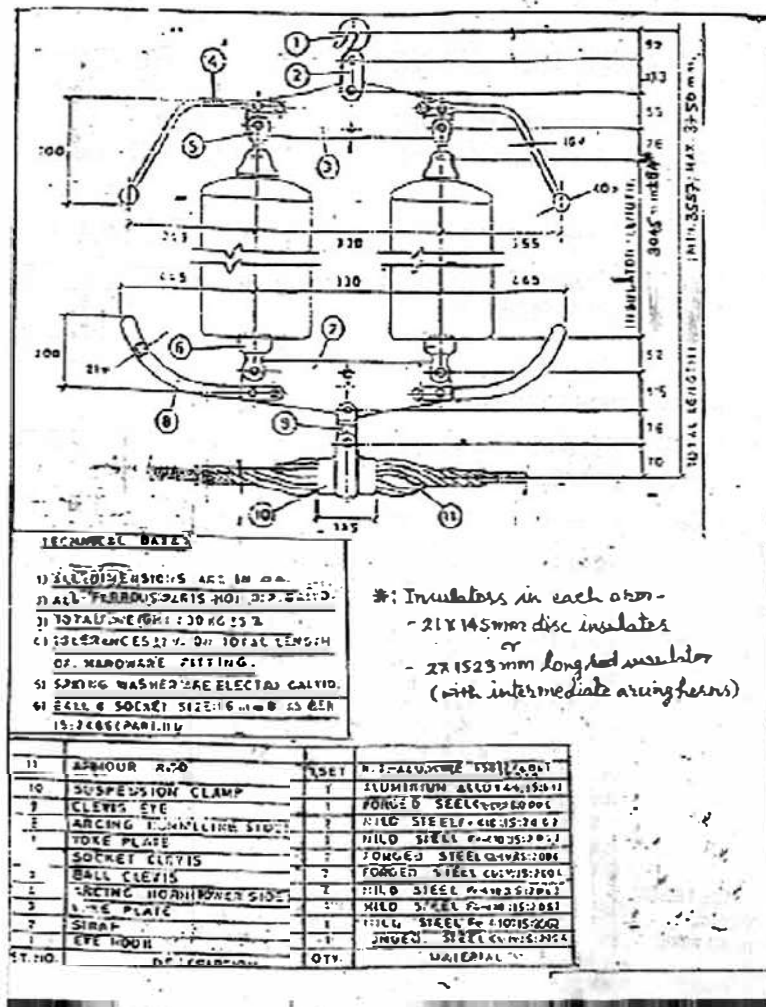
- 1: ALL DIM. ARE IN MM
- 2: 10.97mm GALVANISED WIRE WITH G.S LUG FORGED AT ONE END OTHER END FREE FOR A REQUIRED LENGTH OF COUNTERPOISE WIRE
- 3: FOUR G.S. LUG WILL BE REQUIRED PER TOWER. THREE LUGS WILL BE CONNECTED ON 3 LEGS & FOURTH LUG WILL BE CONNECTED WITH FLAT TYPE 'C' PROVIDED FOR PIPE TYPE EARTHING.
- 4: 10.97 MM WIRE SHALL BE OUTSIDE COPPING.
- 5: ONE SET COMPRISING OF FOUR NUMBERS OF REQUIRED LENGTH OF COUNTERPOISE WIRE

FOR BID PURPOSE ONLY

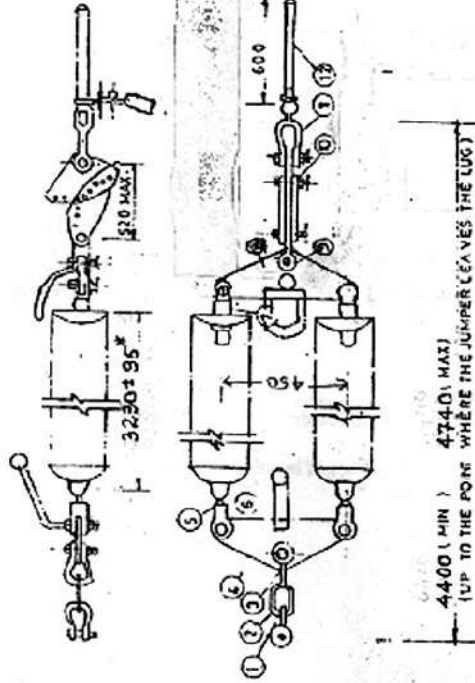
Drawing No. RECTPCL/TL/220KV/01

REC TRANSMISSION PROJECTS COMPANY LTD.	
PROJECT	220KV TRANSMISSION SYSTEM
TITLE	COUNTERPOISE EARTHING ARRANGEMENT
DRG. NO.	TL/220KV/006 (SHEET 2/3)
REV.	0

1



For Tender Purpose Only
 REC TRANSMISSION PROJECTS COMPANY LTD.
 For 220kV Transmission Line Only
 Title : DOUBLE SUSPENSION STRING DISC/LONG ROD INSULATOR
 Drawing No. RECTPCL/TL/220kV/03



* : Insulators in each arm
 19X 170 mm Disc insulators
 or
 2X 16/5 mm long rod insulators (with intermediate arcing horns)

Drawing No. RECTPCL/TL/220kV/04

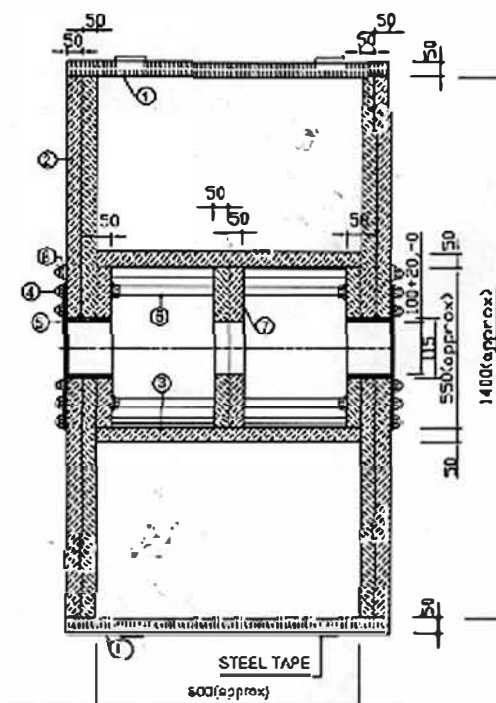
SN	DESCRIPTION	QTY	MATERIAL	MIN UTILITY TENSILE STRENGTH
1	ANCHOR SHACKLE	1	FORGED STEEL	320 KN
2	CHAIN LINK	1	FORGED STEEL	320 KN
3	ANCHOR SHACKLE	1	FORGED STEEL	320 KN
4	YOKE	1	MILD STEEL	320 KN
5	BALL-ELEVIS	2	FORGED STEEL	160 KN
6	BRACING IRON	1	MILD STEEL	NA
7	SOCKET CLEVIS	2	FORGED STEEL	160 KN
8	YOKE	1	MILD STEEL	320 KN
9	CLEVIS EYE	2	FORGED STEEL	160 KN
10	SAG ADJUSTING PLATE	2	MILD STEEL	160 KN
11	ANCHOR SHACKLE	2	FORGED STEEL	160 KN
12	TENSION CLAMP	2	EC GRADE STEEL	152 MN SLIP STRENGTH

1. SPRING WASHER ELECTRO GALVANISED.
2. OTHER FERROUS PARTS NOT OP GALVANISED.
3. BALL AND SOCKET SIZE 20 MM DESIGNATION.
4. THE OVER ALL MIN AND MAX DIMENSIONS INDICATED ARE INCLUSIVE OF MAX VARIATION IN LENGTH DUE TO:-
 - A) INSULATOR DISC TOLERANCE OF ± 5 MM
 - B) TOLERANCE ON TOTAL LENGTH OF HARD WARE FITTING OF ± 2 %
 - C) ADJUSTMENT OF SAG ADJUSTMENT DEVICE
5. THE TYPES OF THE VARIOUS FITTING AND MODE OF ATTACHMENT AS SHOWN ARE INDICATIVE ONLY AND NOT MANDATORY
6. ALL DIMENSIONS ARE IN MM

FOR BID PURPOSE ONLY

REC TRANSMISSION PROJECTS COMPANY LTD.

CLEARING	PROJEC	220KV DOUBLE STRING WITH DISC/ROD INSULATOR
FILE	WITH	SCALE
DATE	DRN	CHKD
	DATE	DATE
	N.T.S	220 - 01-DEER-H



- 1: ALL DIM. ARE IN MM
- 2: CLEARANCE FROM OUTER SURFACE OF OUTER LAYER OF EARTH WIRE
TO INNER SURFACE OF PROTECTIVE LAGGING IS AT LEAST 50mm
- 3: TWO LENGTHS OF EARTH WIRE ARE WOUND ON EVERY DRUM
THE LENGTHS ARE WELDED AND ENDS OF WELD ARE MARKED BY RED TAPE
- 4: THICKNESS OF PROTECTIVE LAGGING SHOULD BE 50 mm.
- 5: STANDARD LENGTH OF EARTH WIRE 2031m $\pm 6\%$
- 6: TOLERANCE ON WOOD DIMENSION = ± 3 MM

FOR BID PURPOSE ONLY

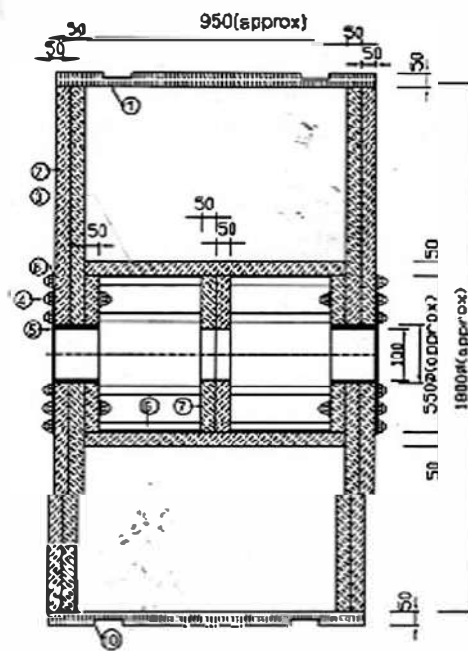
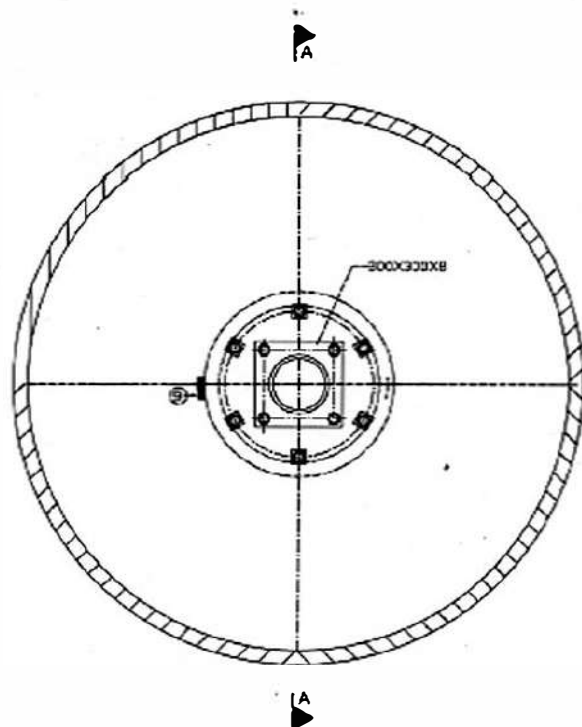
REC TRANSMISSION PROJECTS COMPANY LTD

220 KV TRANSMISSION SYSTEM

DRUM FOR 7:4.27mm G.S EARTHWIRE

Unit 1

REV.



S.NO	DESCRIPTION
10	PIECES FOR BINDER
9	DOT FOR INNER END OF CONDUCTOR
8	WASHER
7	BARREL STUD
6	BARREL STUD FOR ROD
5	MILD STEEL BUSH & PLATE
4	BARREL STUD
3	BARREL
2	FLANGE
1	PROTECTIVE EXTERNAL LAGGING

NOTES

- 1: ALL DIM. ARE IN MM
- 2: CLEARANCE FROM OUTER SURFACE OF OUTER LAYER OF CONDUCTOR TO INNER SURFACE OF PROTECTIVE LAGGING IS AT LEAST 75mm
- 3: THICKNESS OF PROTECTIVE LAGGING SHOULD BE 50mm
- 4: TOLERANCE ON DIMENSION OF WOOD ONLY IS EQUAL TO +3mm
- 5: STANDARD LENGTH OF CONDUCTOR EQUAL TO 1800 MTS.
- 6: TOLERANCE ON LENGTH CONDUCTOR IS EQUAL TO 5% OF STANDARD LENGTH

REC/TP/C/T/220KV/006

FOR BID PURPOSE ONLY

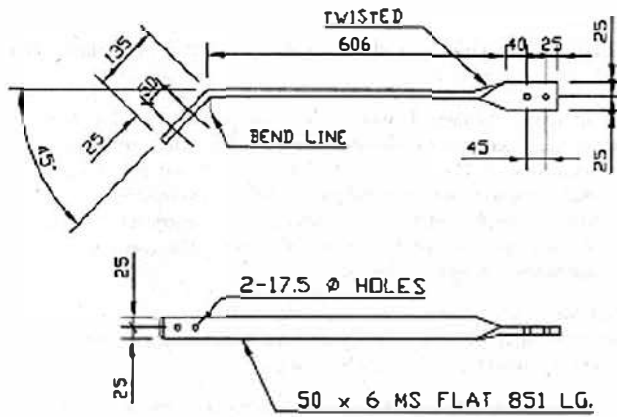
REC TRANSMISSION PROJECTS COMPANY LTD.

220 K.V. TRANSMISSION SYSTEM

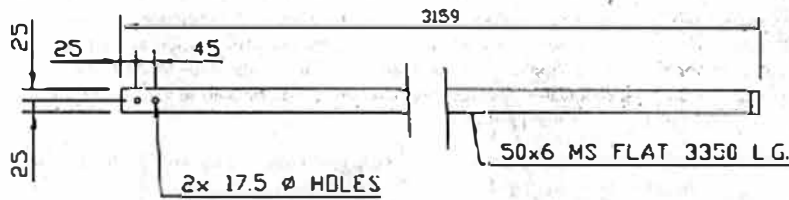
ORLAY FOR ACER DEER CONDUCTOR

DRG. NO.

2



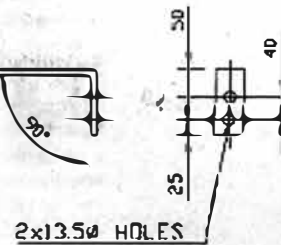
DETAIL OF FLAT TYPE 'C'



DETAIL OF FLAT TYPE 'D'

NOTES

- 1: ALL DIM. ARE IN MM
- 2: AFTER FABRICATION, BOTH FLATES ARE TO BE HOT DIP GALVINISED AS PER IS - 2829.
- 3: 'FLAT TYPE 'C' IS TO BE PROVIDED ON ONE LEG OF EACH TOWER
- 4: 'FLAT TYPE 'D' IS TO BE PROVIDED WITH PIPE EARTH ARRANGEMENT AND TO BE CONNECTED WITH FLAT 'C' FOR THE LOCATION WHERE TOWER FOOTING RESISTANCE IS MORE THAN 10 OHMS



RECTPCL/TL/220kV/08

FOR BID PURPOSE ONLY

LIST OF BOLTS & NUTS WITH SP. WASHER

S.NO.	SIZE	QTY.	REMARKS
1	M 160 x 45 LG.	2	PER TOWER
2	M 160 x 35 LG.	2	PER PIPE TYPE EARTHING
3	M 120 x 30 LG.	2	PER PIPE TYPE EARTHING

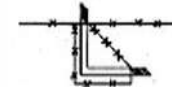
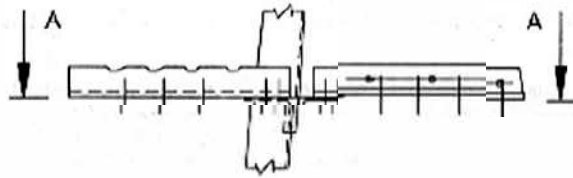
REC TRANSMISSION PROJECTS COMPANY LTD.

PROJECT 220KV TRANSMISSION SYSTEM

TITLE DETAILS FOR FLATS FOR EARTHING

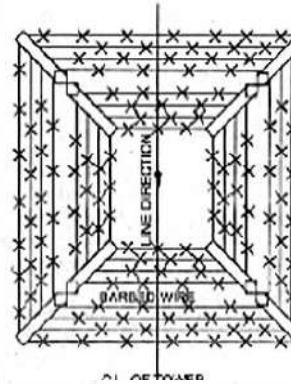
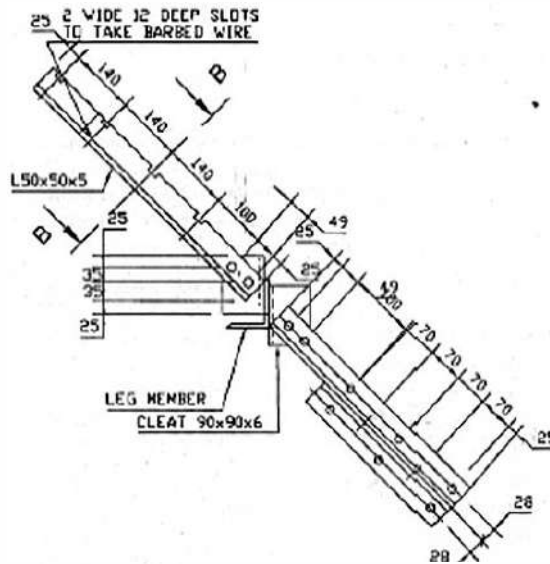
DWG NO.)

REF 0



SEC- B-B

METHOD OF WRAPPING BARBED WIRE



GATE DETAIL PLAN AT A-A

NOTES

- 1 : ALL DIMENSION ARE IN MILLIMETERS
- 2 : ALL HOLES ARE 17.5MM Ø TO SUIT 10mm Ø BOLTS
- 3 : BLANK HOLES AT GATES ARE TO RECEIVE BARBED WIRE
- 4 : ONE 3 MM SPRING WASHER TO BE PROVIDED UNDER EACH NUT
- 5 : BARBED WIRE SHALL CONFORM TO IS 278 (SIZE DESIGNATION A1)

FOR BID PURPOSE ONLY

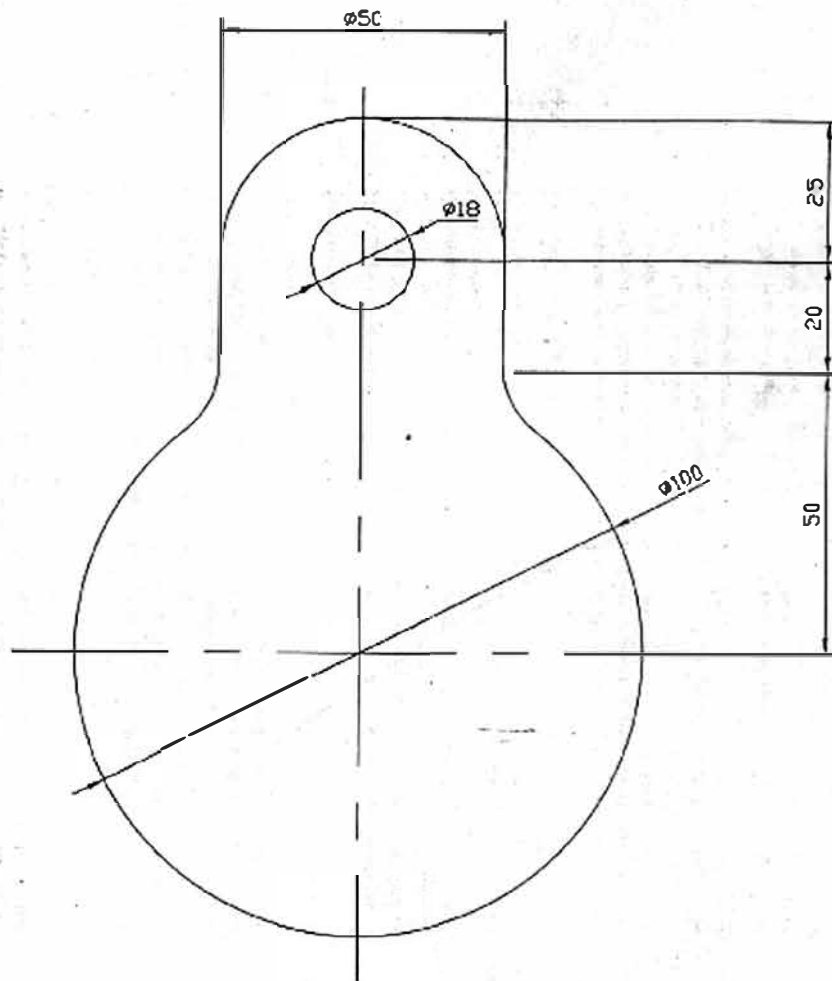
RECTPCL/TL/220kV/09

REC TRANSMISSION PROJECTS COMPANY LTD.

PROJECT 220KV TRANSMISSION SYSTEM

TITLE DETAIL OF ANTI CLIMBING DEVICE

REV. 4



QUANTITIES PER TOWER

- 1 : ONE OF EACH COLOUR FOR S/C TENSION TOWER
- 2 : TWO NO. OF EACH COLOUR FOR D/C TOWER

NOTES

- 1 : ALL DIM. ARE IN MM
- 2 : M.S. PLATE 1.8 MM THICK
- 3 : PHASE PLATES TO BE ENAMELLED RED, YELLOW AND BLUE ON FRONT AND BACK
- 4 : 2 NOS 2MM THK. LEAD WASHERS TO BE PROVIDED WITH EACH PLATE
- 5 : 1 NO. 16MM DIA BOLT FASTENERS & WASHERS PER PLATE

RECTPCL/TL/220kV/10

FOR BID PURPOSE ONLY

REC TRANSMISSION PROJECTS COMPANY LTD.

PROJECT

220 KV TRANSMISSION SYSTEM

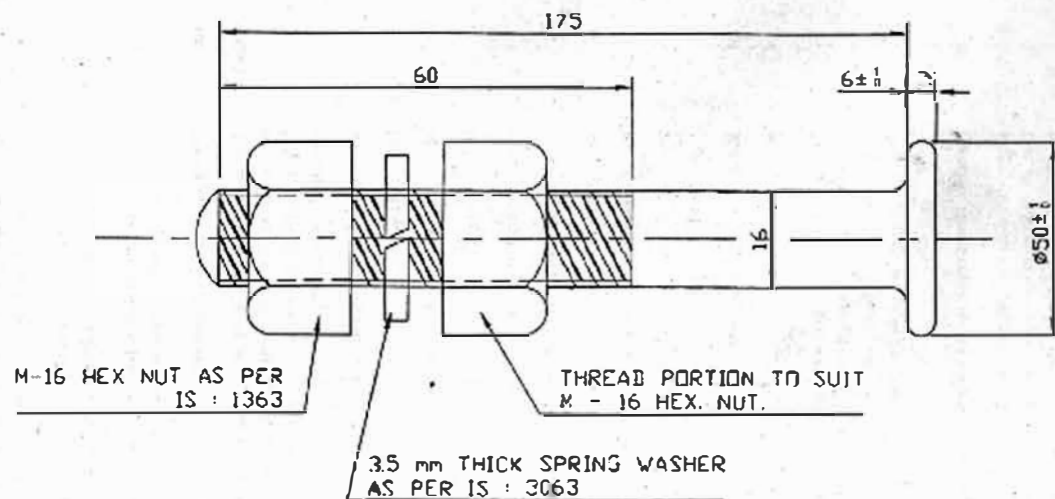
TITLE

TOWER PHASE PLATE DRAWING

DATE

REV.

0



NOTES

- 1: ALL DIM. ARE IN MM
- 2: STEP BOLT SHALL BE HOT DIPPED GALVANISED
- 3: WEIGHT / PIECE WITH TWO NUTS 0.41 K.G.
- 4: THREADS TO BE UNDER CUT BY 0.3 MM
- 5: STEP BOLT SHALL BE CAPABLE OF WITHSTANDING A VERTICAL LOAD NOT LESS THAN 1.5 K.N.
- 6: SPRING WASHER SHOULD BE ELECTRO GALVANISED.
- 7: PROPERTY OF BOLT SHALL BE CLASS AS PER IS : 10238
- 8: THE STEP BOLT SHALL WITHSTAND CANTILEVER TEST AS PER IS : 10238
- 9: NUTS SHALL BE OF CLASS 8 CONFORMING TO IS : 1387 (PART - IV)

RECTPCL/TL/220kV/13

FOR BID PURPOSE ONLY

REC TRANSMISSION PROJECTS COMPANY LTD.

220 KV TRANSMISSION SYSTEM

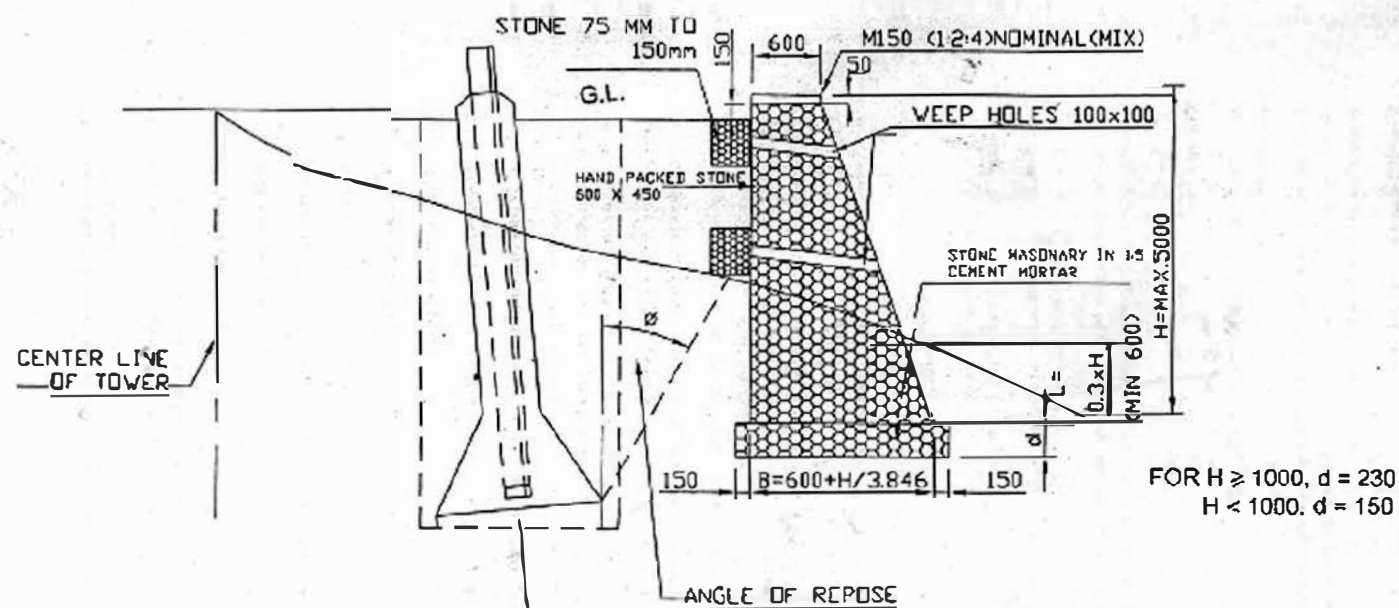
TITLE

STEP BOLT DRWG

DRG. NO.

REV.

0



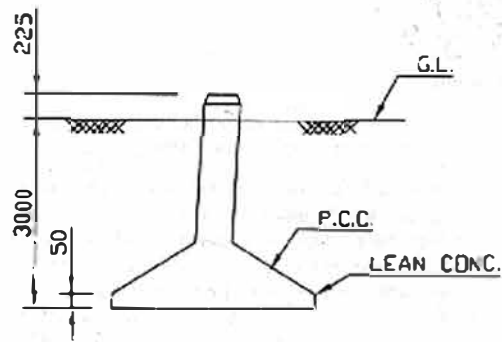
NOTES

1. ALL DIM. ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. WEEP HOLES SHOULD BE OF SIZE 100mm x 100mm OR 150mm x 150mm IN CASE OF LARGE SIZE REVELTMENT.
3. WEEP HOLES SHOULD BE 2.5M C-C APART HORIZONTAL
4. CENTER OF TOP MOST WEEP HOLES TO BE NOT LESS THAN 300 mm BELOW TOP
5. THE MIN DEPTH OF REVELTMENT WALL BELOW G.L. WILL BE 600mm
6. DIM. 'B' ARE VALID ONLY FOR 'H' NOT EXCEEDING 500 METER
7. SIZE OF STONE FOR MASONARY WORK, 300 x 150 x 150 & BELOW
8. THE MASONRY WORK SHOULD BE CARRIED OUT IN 1:5 CEMENT MORTAR
9. SIZE OF STONE PACKING AT WEEP HOLE 75 mm TO 150mm

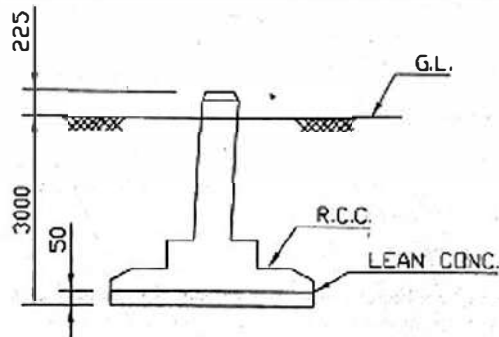
RECTPCL/TL/220kV/14

[FOR BID PURPOSE ONLY]

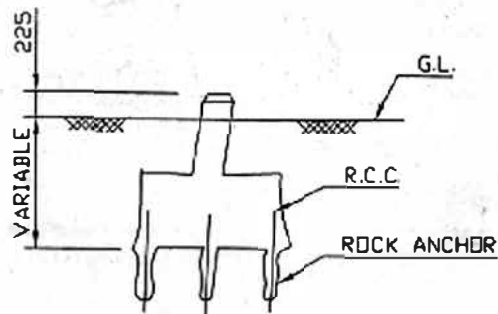
REC TRANSMISSION PROJECTS COMPANY LTD.	
PROJECT	220 KV TRANSMISSION SYSTEM
TITLE	PROTECTION OF TOWER FOOTING (DOWN/UP HILL)
DRG NO.	REV. 9



TYP. FOUNDATION SHAPE FOR P.C.C. TYPE



TYP. FOUNDATION SHAPE FOR R.C.C. TYPE



TYP. FOUNDATION SHAPE FOR HARD ROCK

RECTPCL/TL/220kV/15

[FOR BID PURPOSE ONLY]

RECTRANSMISSIONPROJECTSCOMPANYLTD..

PROJECT

220 KV TRANSMISSION SYSTEM

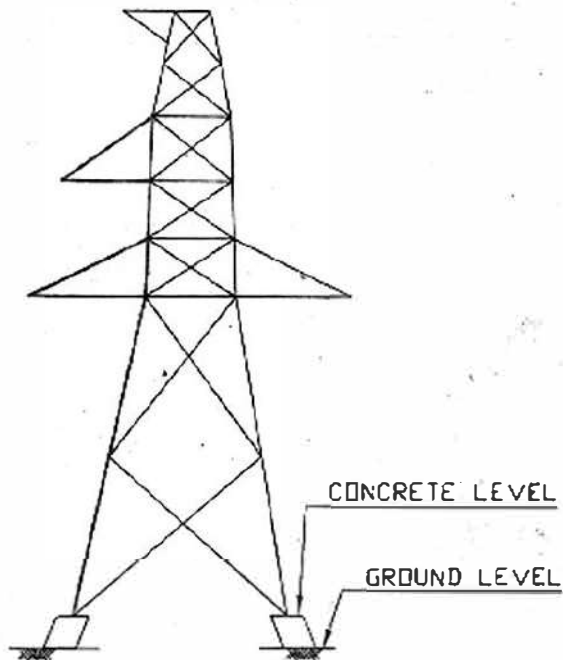
TITLE

TENTATIVE SHAPE OF TOWER FOOTINGS

DRG. NO.

REV

C



TYPICAL. S/C TOWER

RECTPCL/TL/220kV/16

FOR BID PURPOSE ONLY

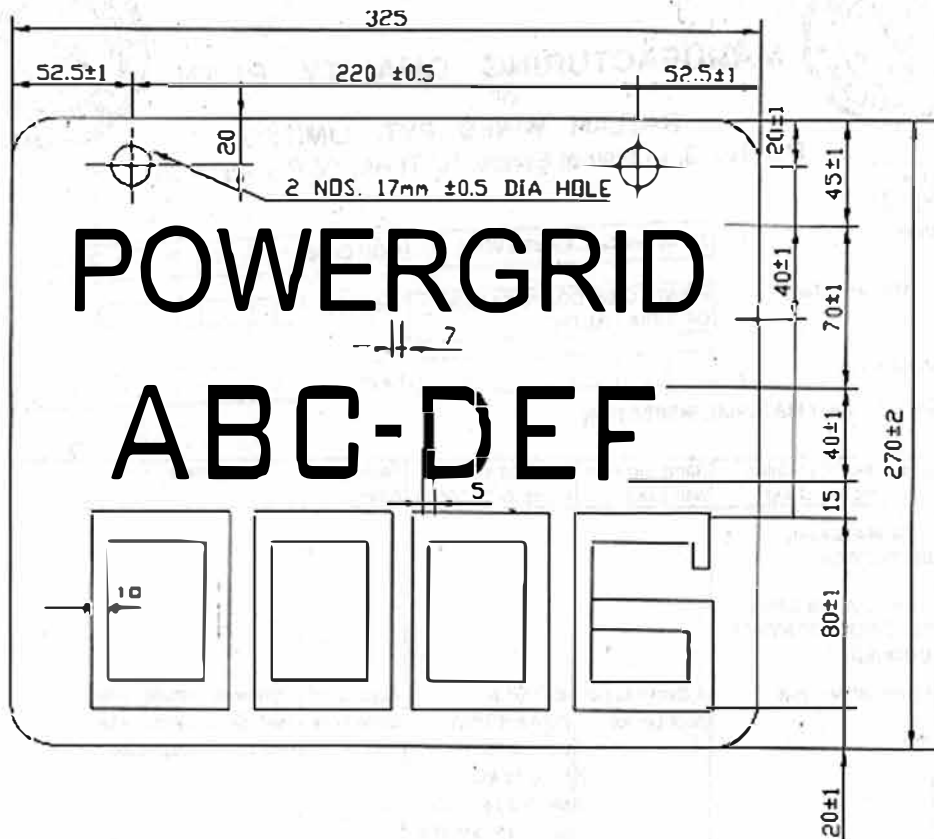
REC TRANSMISSION PROJECTS COMPANY LTD

PROJECT
220 KV TRANSMISSION SYSTEM

TITLE
TYPICAL 220 KV S/C TRANSMISSION LINE TOWER

CRG NO.

REV.
0



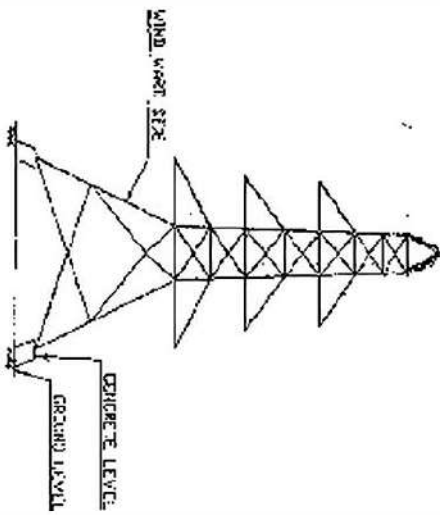
NOTES

- 1: ALL DIM. ARE IN MM
- 2: LETTER RED ENAMELLED
- 3: GROUND WHITE VITREOUS ENAMELLED
- 4: BACK: BLACK VITREOUS ENAMELLED
- 5: 1.6 MM THICK MS PLATE
- 6: 2 NOS. 2 MM THICK LEAD WASHER TO BE PROVIDED WITH EACH PLATE
- 7: EACH NO. WILL HAVE FOUR DIGITS AS SHOWN,
NO TO BE STARTED FROM 1 DOWNWARDS
- 8: TWO NO 16 MM DIA H.R.H. BOLTS x 35 MM LONG ARE TO BE SUPPLIED ALONG WITH EACH PLATE
- 9: ABC CODE FOR SENDING END AND DEF CODE FOR RECEIVING END.

FOR BID PURPOSE ONLY

RECTPCL/TL/220kV/17

REC TRANSMISSION PROJECTS COMPANY LTD.	
PROJECT	220 KV TRANSMISSION SYSTEM
TITLE	TOWER NUMBER PLATE
DRAWN BY	REV.



For Bid Purpos Only

TYPICAL D/C TOWER

REC TRANSMISSION PROJECTS COMPANY LTD.

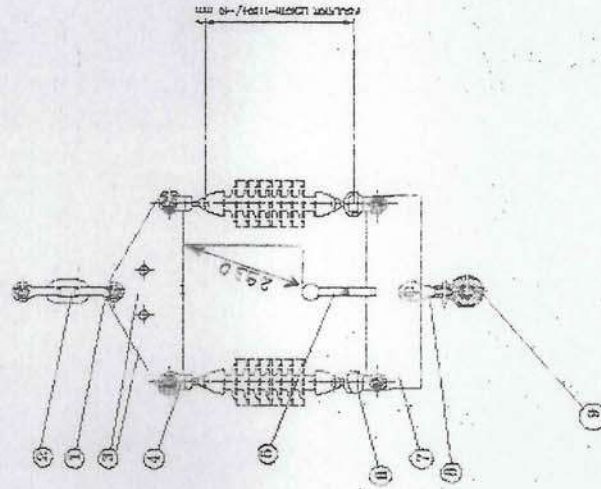
For 220kV Transmission System Only

RECTPCL/TL/220kV/18

TECHNICAL DATA:

- 1) ALL DIMENSIONS ARE IN mm.
- 2) TOLERANCE ON TOTAL LENGTH OF MEMBER WITHIN 10%.
- 3) HOLE & TAPER ARE 20mm AS PER IS:8000 (PART-1)
- 4) ALL TENSILE PARTS NOT TO BE SAWCUT AS PER STANDARD SPECIFICATION.
- 5) SPHERE NUMBER ARE BEING SAWCUT.

FOR TENDER PURPOSE ONLY



THESE
BY ORDER & SUPERVISION FROM THE
ENGINEERING DEPARTMENT

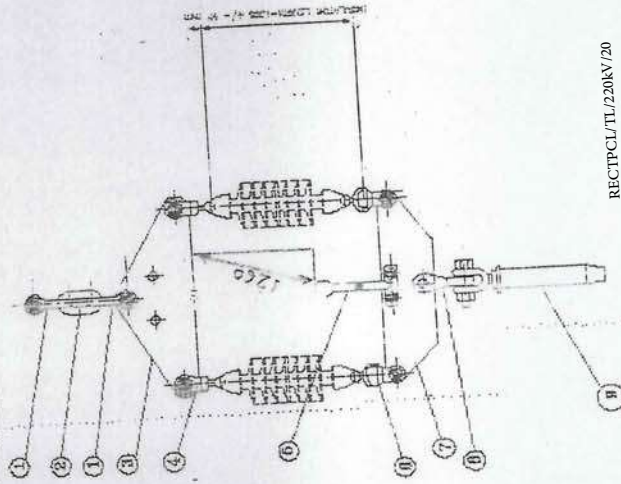
DRG. NO. 09 KV DS REV 1

NO.	REV.	DESCRIPTION	DATE	BY	CHK.
1	1	AS PER IS:8000 (PART-1)	20.11.19	...	...
2	2	AS PER IS:8000 (PART-1)	20.11.19	...	...
3	3	AS PER IS:8000 (PART-1)	20.11.19	...	...
4	4	AS PER IS:8000 (PART-1)	20.11.19	...	...
5	5	AS PER IS:8000 (PART-1)	20.11.19	...	...
6	6	AS PER IS:8000 (PART-1)	20.11.19	...	...
7	7	AS PER IS:8000 (PART-1)	20.11.19	...	...
8	8	AS PER IS:8000 (PART-1)	20.11.19	...	...
9	9	AS PER IS:8000 (PART-1)	20.11.19	...	...
10	10	AS PER IS:8000 (PART-1)	20.11.19	...	...

TECHNICAL DATA:

- 1) ALL DIMENSIONS ARE IN mm.
- 2) TOLERANCE ON TOTAL LENGTH 10mm.
- 3) ROLL & JOINTS SHALL BE 25mm AS PER IS 8000 (Part-1).
- 4) ALL DIMENSIONS SHALL BE IN mm.
- 5) SPRING WAGON AND ELECTRIC LAMP SHALL BE AS PER IS 8000 (Part-1).

FOR TENDER PURPOSE ONLY



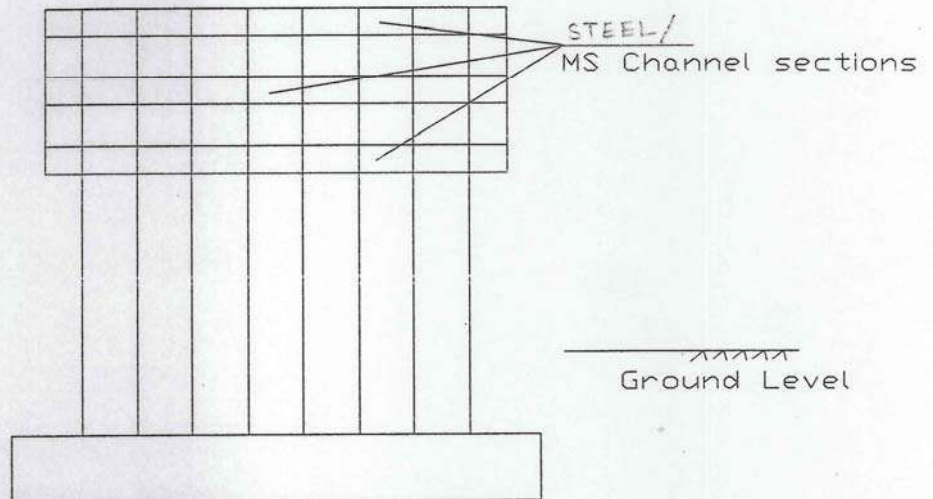
RECTPCL/TL/220KV/20

REC TRANSMISSION PROJECTS COMPANY LTD.

ITEM NO.	DESCRIPTION	QUANTITY	UNIT
1	ALUMINIUM ALLOY & STEEL LATTICE TOWER	1	NO.
2	STEEL RAIL D=100mm	1	NO.
3	STEEL RAIL D=100mm	1	NO.
4	STEEL RAIL D=100mm	1	NO.
5	STEEL RAIL D=100mm	1	NO.
6	STEEL RAIL D=100mm	1	NO.
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95	STEEL RAIL D=100mm	1	NO.
96	STEEL RAIL D=100mm	1	NO.
97	STEEL RAIL D=100mm	1	NO.
98	STEEL RAIL D=100mm	1	NO.
99	STEEL RAIL D=100mm	1	NO.
100	STEEL RAIL D=100mm	1	NO.

THESE DIMENSIONS & TOLERANCES SHALL BE AS PER IS 8000 (PART-1) & IS 8000 (PART-2).

DWG NO. 08/01/REV1



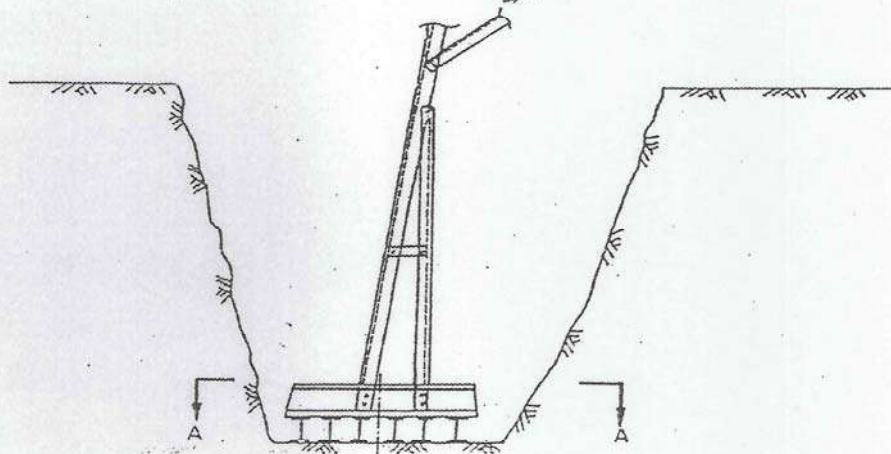
For Tender Purpose Only

For 220kV Transmission Line

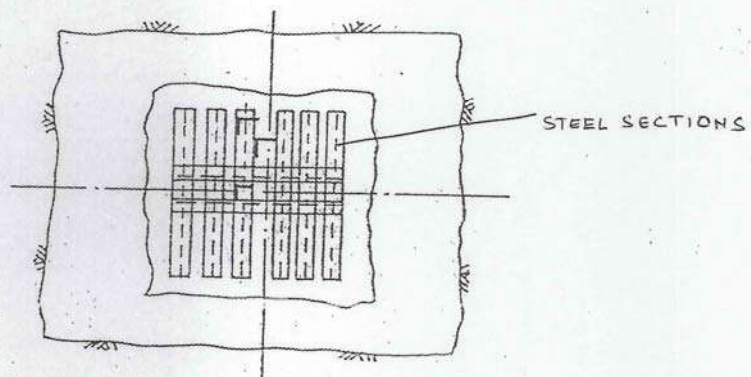
REC TRANSMISSION PROJECTS COMPANY LTD.

Title: INDICATIVE DETAILS OF AVALANCHE PROTECTION
STRUCTURE

Drawing No.: RECTPCL/TL/220kV/21

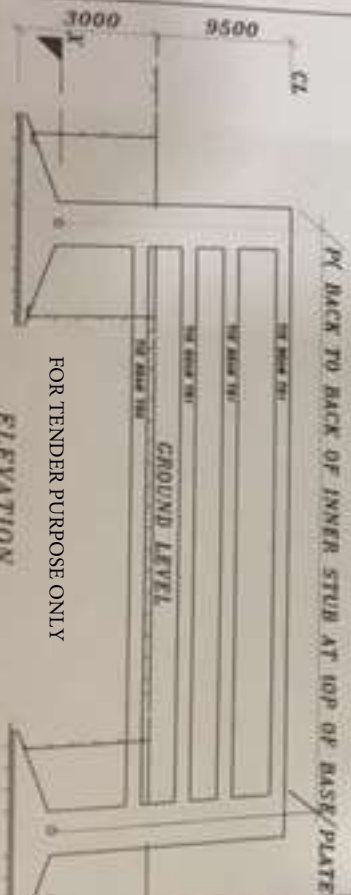
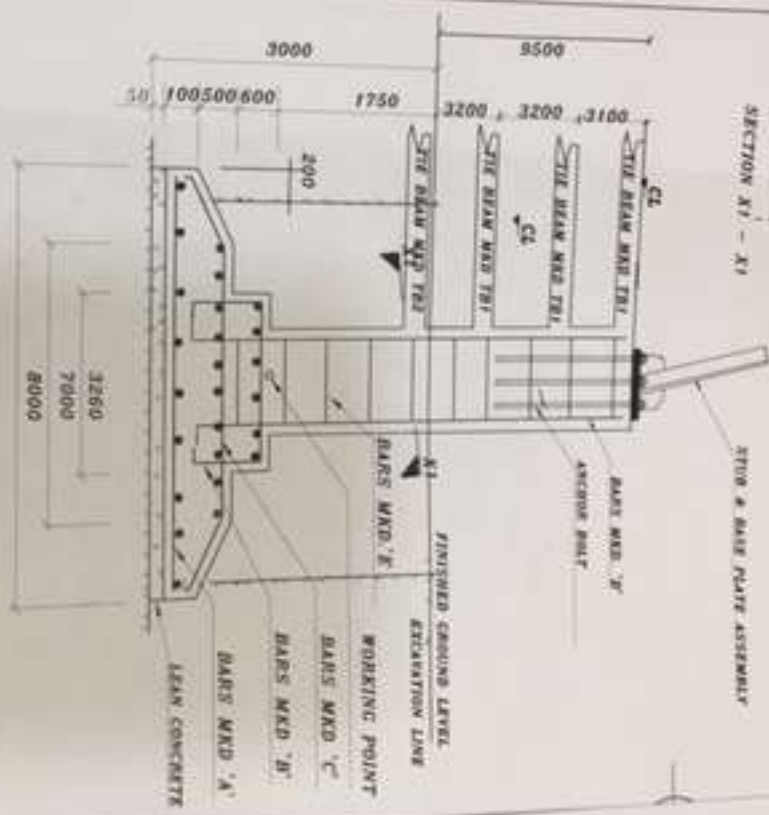


ELEVATION



PLAN 'A-A'

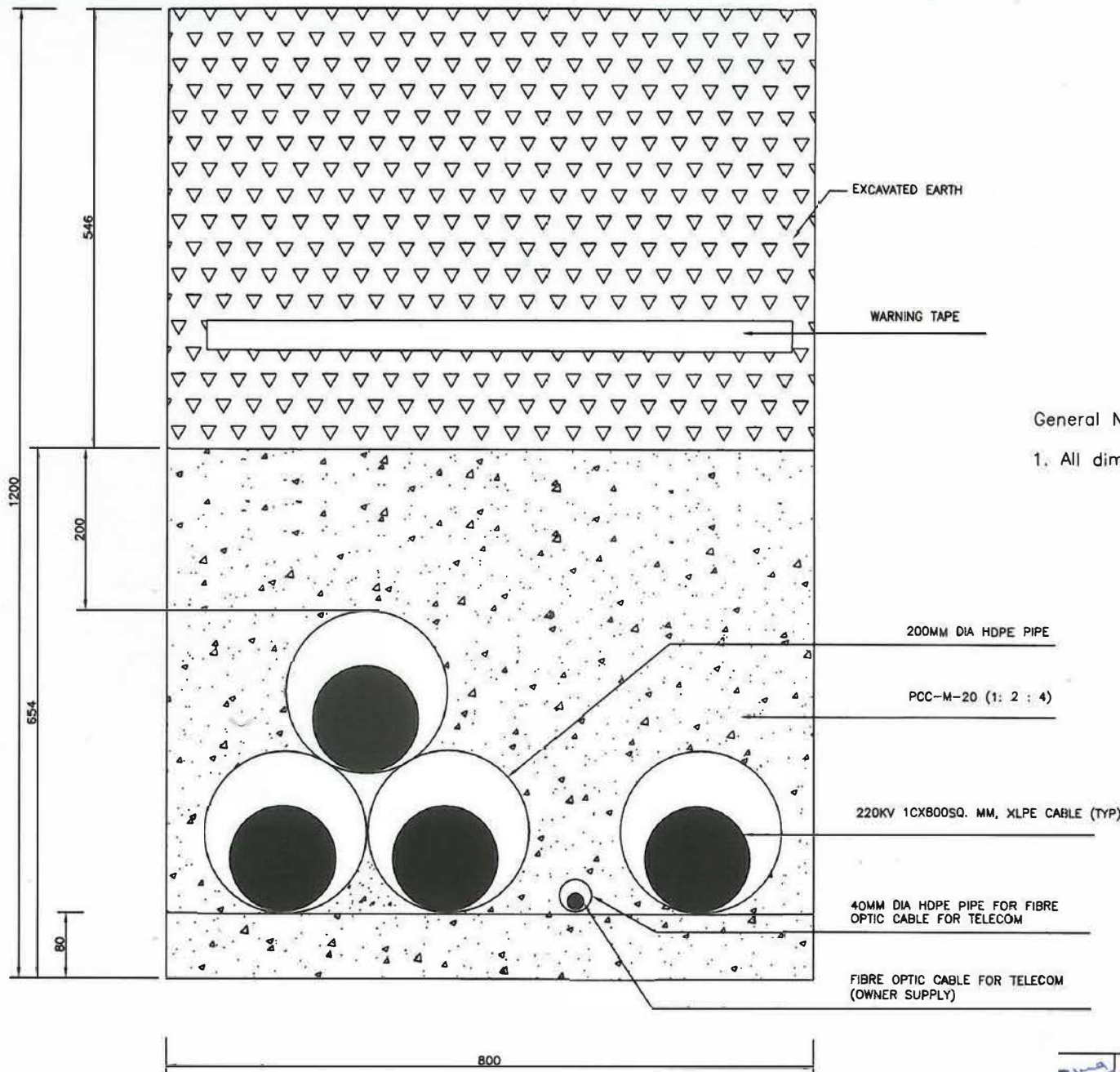
Indicative for Steel Grillage Type Foundation



FOR TENDER PURPOSE ONLY

ELEVATION

Typical drawing for Avalon Prone area
 REC TRANSMISSION PROJECTS COMPANY LTD
 Drawing No. RECTPCL/TL/220KV/22



S.NO.	TRENCH SIZE	TYPE OF CABLE
1.0	800(W)x1200(D)	220KV,1CX800 SQ.MM. XLPE

General Notes:-

1. All dimensions are in MM unless otherwise specified

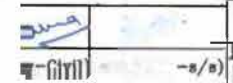
RECTPCL/TL/220KV/23

FOR TENDER PURPOSE ONLY

REC TRANSMISSION PROJECTS
COMPANY LIMITED

PROJECT :
SUPPLY & INSTALLATION OF 220KV XLPE CABLE

TITLE :
TYPICAL BURIED CABLE TRENCH
CROSS-SECTIONAL DRAWING



REC TRANSMISSION PROJECTS COMPANY LIMITED



On Behalf of POWER DEVELOPMENT DEPARTMENT J&K GOVERNMENT

As Project Implementation Agency

(Invites bid through e-Tendering mode only)

FOR TURNKEY CONTRACT PACKAGE OF

Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”.

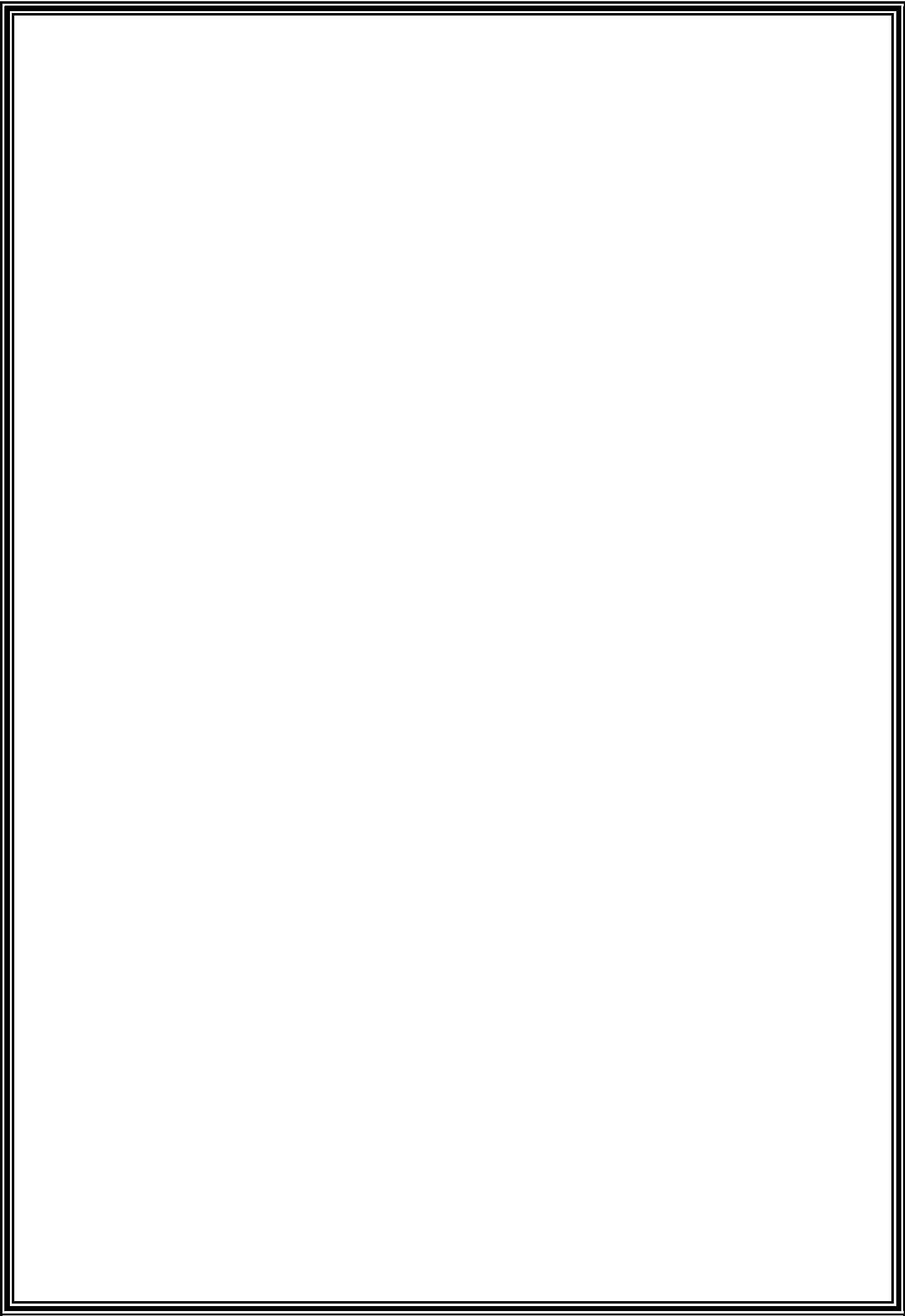
**Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik
Package 04- RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum
Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum**

Dated: 11-10-2019

VOL-III

October 2019

REC Transmission Projects Company Limited
(A wholly owned subsidiary of REC, a 'Navratna CPSE'
Under the Ministry of Power, Govt of India)
ECE House, 3rd Floor, Annexe – II,
28 A, K G MARG, NEW DELHI – 110 001
Website: www.rectpcl.in



General guidelines for filling up the Attachments	
"Package-05-TL-05 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Rangdum to Padum.	
1	Fill up only green shaded cells in the relevent attachments.
2	In case Bidder is participating for both the Packages, separate Form is required to be filled for each Package
3	Attachments 3(JV),3(QR), 4, 4(A), 4(B), 5, 5(A) 6, 9, 10, 11, 12, 13, 14, 15, 16, 17 , 18 ,19 & 20 and Bid Form for 1st Envelope are included here.
4	Attachment 1 Bid Security : To be submitted as per performa provided in the Bidding Document.
5	Attachment 2 Power of Attorney : Bidder shall use prescribed format as provided in Section IX, Vol-I
6	Attachment 8 Manufacturer's Authorisation Form : To be furnished as per proforma provided in the bidding document (Vol-III), on the letter head of the each Manufactures proposed to supply main items.
7	Attachment 14 Integrity Pact : To be submitted as per ITB Clause No. 9.3(o) and as per remarks in the Attach 14.
8	Attachment 18 Safety Pact : To be submitted as per ITB Clause No. 9.3 (s) and as per remarks in the Attach 18.
Click for Detailed General Instructions	Click to skip Instructions & Proceed
REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Website: www.rectpcl.in	

*Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPD under PMDP Scheme-15 From Drass to Kochik.			
Attachment-3(QR)			
(Qualifying Requirement Data)			
Bidder's Name and Address:		To, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in	
For our Qualifying Requirements Data, please refer Schedule-QR of this VOLUME			
Date :	.....	Printed Name :	.....
Place :	.....	Designation :	.....



*Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPD under PMDP Scheme-15 From Drass to Kochik.	
Attachment-3(JV)	
(Joint Venture Agreement and Power of Attorney for Joint Venture*)	
Bidder's Name and Address:	
Name :	To, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Website: www.rectpl.in
Address :	



Dear Sir,

The Joint Venture Agreement (as per the proforma attached at no. 13 in Section-IX, Sample Forms and Procedures, Conditions of Contract, Vol-I of the Bidding Documents) and Power of Attorney for Joint Venture (as per the proforma attached at no. 12 in Section-IX, Sample Forms and Procedures, Conditions of Contract, Vol-I of the Bidding Documents) are enclosed herewith.

Date :	Printed Name :
Place :	Designation :

"Package-01- TL-01 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Phyang to North Pullu

Attachment-4

(Form of Certificate of Origin and Eligibility)

Bidder's Name and Address :

Name :

Address :

To,
REC Transmission Projects Company Limited
(A wholly owned subsidiary of REC, a 'Navratna CPSE'
Under the Ministry of Power, Govt of India)
ECE House, 3rd Floor, Annexe - II,
28 A, K G MARG, NEW DELHI - 110 001
Website: www.rectpcl.in

Dear Sir,

We hereby certify that equipment and materials to be supplied are produced in [Name of Countries], eligible source country. We hereby certify that our company is incorporated and registered in [Name of Countries], eligible source country.

Sl No	Equipment and material produced in (Name of Countries)	Company incorporated & registered in (Name of Countries)
1	(Name of Countries)	(Name of Countries)
2		
3		
4		
5		
6		
7		
8		
9		

Date :	.....	Printed Name :	.....
Place :	.....	Designation :	.....

Click here for next attachment

"Package-04-TL-04 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Kochik to Rangdum.

Attachement4(A)

(List of Special Maintenance Tools & Tackles)

Click here for next attachment



Bidder's Name and Address:

Name :

Address :

To,
REC Transmission Projects Company Limited
(A wholly owned subsidiary of REC, a 'Navratna CPSE'
Under the Ministry of Power, Govt of India)
ECE House, 3rd Floor, Annexe – II,
28 A, K G MARG, NEW DELHI - 110 001
Website: www.rectpcl.in

Dear Sir,

We are furnishing below the list of special maintenance tools & tackles for various equipment under the subject package. The prices for these tools & tackles which are to be taken back after the completion of the work by us are not included in our lumpsum bid price. We further confirm that the list of special maintenance tools & tackles includes all the items specifically identified in your bidding documents as brought out below:

S. No.	For Equipment	Item Description	Unit	Quantity
1				
2				
3				
4				
5				

Notwithstanding what is stated above, we further confirm that any additional special maintenance tool and tackels required for the equipment under this package shall be furnished by us at no extra cost to the employer.

Date :	.....	Printed Name :	.....
Place :	.....	Designation :	.....

"Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.

Attachement4(B)

(List of Special Maintenance Tools & Tackles)

Bidder's Name and Address :

Name :

Address :

To,
REC Transmission Projects Company Limited
(A wholly owned subsidiary of REC, a 'Navratna CPSE'
Under the Ministry of Power, Govt of India)
ECE House, 3rd Floor, Annexe - II,
28 A, K G MARG, NEW DELHI - 110 001
Website: www.rectpcl.in

Click here for next

Dear Sir,

We are furnishing below the list of special maintenance tools & tackles for various equipment under the subject package. The prices for these tools & tackles which are to be taken back after the completion of the work by us are not included in our lumpsum bid price. We further confirm that the list of special maintenance tools & tackles includes all the items specifically identified in your bidding documents as brought out below:

(a)	
(b)	
(c)	
(d)	
(e)	
(f)	

Date :	.....	Printed Name : :	.....
Place :	.....	Designation : :	.....

*Package-01- TL-01 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Phyang to North Pullu																																			
Attachment-5																																			
(Brought out & Sub-contracted Items)																																			
Bidder's Name and Address :		To, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in																																	
Name :																																			
Address :																																			
Dear Sir, 1.We hereby furnish the details of the items/ sub-assemblies (supply items), we propose to buy for the purpose of furnishing and installation of the subject Package :																																			
<table border="1"> <thead> <tr> <th rowspan="2">Sl. No.</th> <th rowspan="2">Item Description</th> <th rowspan="2">Quantity proposed to be bought/sub-contracted</th> <th colspan="2">Details of the proposed sub-contractor/sub-vendor</th> </tr> <tr> <th>Name</th> <th>Nationality</th> </tr> </thead> <tbody> <tr><td>1</td><td></td><td></td><td></td><td></td></tr> <tr><td>2</td><td></td><td></td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td></tr> </tbody> </table>				Sl. No.	Item Description	Quantity proposed to be bought/sub-contracted	Details of the proposed sub-contractor/sub-vendor		Name	Nationality	1					2					3					4					5				
Sl. No.	Item Description	Quantity proposed to be bought/sub-contracted	Details of the proposed sub-contractor/sub-vendor																																
			Name	Nationality																															
1																																			
2																																			
3																																			
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5																																			
We hereby declare that we would not subcontract the erection portion of the contract without prior approval of the Employer. We hereby furnish the details of the items/ sub-assemblies post to supply from our own work (i.e. as direct transactions) in addition to the supplies the same from other vendors(i.e. as bought-out transactions) as detailed in the table given above.																																			
<table border="1"> <thead> <tr> <th rowspan="2">Sl. No.</th> <th rowspan="2">Item Description</th> <th rowspan="2">Quantity proposed to be supplied</th> <th colspan="2">Details of the plant from where supplies are proposed</th> </tr> <tr> <th>Name of plant</th> <th>Address</th> </tr> </thead> <tbody> <tr><td>1</td><td></td><td></td><td></td><td></td></tr> <tr><td>2</td><td></td><td></td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td></tr> </tbody> </table>				Sl. No.	Item Description	Quantity proposed to be supplied	Details of the plant from where supplies are proposed		Name of plant	Address	1					2					3														
Sl. No.	Item Description	Quantity proposed to be supplied	Details of the plant from where supplies are proposed																																
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<table border="1"> <tr> <td>Date :</td> <td>.....</td> <td>Printed Name :</td> <td>.....</td> </tr> <tr> <td>Place :</td> <td>.....</td> <td>Designation :</td> <td>.....</td> </tr> </table>				Date :		Printed Name :		Place :		Designation :																									
Date :		Printed Name :																																	
Place :		Designation :																																	



"Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.				
ATTACHMENT-5A				
(Items, Components, Raw Material, Services proposed to be sourced from Micro and Small Enterprises)				
Bidder's Name and Address :			To:	
Name :			REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in	
Address :				
Dear Sir,				
1. We hereby furnish the details of the items, components, raw material, services which we propose to buy/avail from Micro and Small Enterprises (MSEs) for the purpose of completion of works under the subject package :				
Sl. No.	Item Description	Quantity proposed to be brought/sub-contracted	Name of Micro and Small Enterprises (MSEs)	
			Name	Category (Micro or Small)
1				
2				
3				
4				
5				
2. The above is a list of items we propose to procure from MSEs. However, based on the situations during the execution of the contract, the above list may undergo changes. We hereby confirm that the details regarding actual procurement from MSEs carried out by us, as per the format provided at Section IX, Forms and Procedures, Volume-I of bidding documents, shall be submitted along with the bills for payment against supplies made/works done during execution of contract.				
Date :			Printed Name :	
Place :			Designation :	


Click here for

"Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.			
ATTACHMENT-6			
(Alternative, Deviations and Exceptions to the Provisions)			
Bidder's Name and Address:		To, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Website: www.rectpcl.in	
Name :			
Address :			
Dear Sir,			
The bidder shall itemize any deviation from the Specifications included in his bid. Each item shall be listed (separate sheets may be used and enclosed with this Attachment) with the following information:			
Sl. No.	Reference clause in the Specifications	Deviation	Cost of withdrawal of the deviation
1			
2			
3			
4			
5			
We agree that any deviations, conditionality or reservation introduced in this Attachment-6 will be reviewed by RECTPCL to conduct a determination of the substantial responsiveness of the bid.			
Date :		Printed Name :	.....
Place :		Designation :	.....


 Click here for next

"Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.			
ATTACHMENT-7			
(Details of Alternative Bid)			
Bidder's Name and Address :		To, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in	
Name :			
Address :			
No Alternative Bid is allowed			
Date :	.....	Printed Name :	.....
Place :	.....	Designation :	.....

Click here for next



"Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.			
Attachment-9			
(Work Completion Schedule)			
Bidder's Name and Address:		To, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in	
Name :			
Address :			
Dear Sir, We hereby declare that the following Work Completion Schedule shall be followed by us in furnishing and installation of the subject Package i.e., Construction of 220kV S/C Phyang to Diskit Transmission on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15			
Sl. No.	Description of Work	Period in months from the effective date of contract	
1	Detailed Engineering and drawing submission		
	a) commencement		
	b) completion		
2	Procurement of equipment/ components & assembly		
	a) commencement		
	b) completion		
3	Type Tests		
	a) commencement		
	b) completion		
4	Manufacturing		
	a) commencement		
	b) completion		
5	Shipments & Delivery		
	a) commencement		
	b) completion		
6	Establishment of site office		
7	Installation at Site		
	a) commencement		
	b) completion		
8	Testing & Pre-commissioning		
	a) commencement		
	b) completion		
9	Trial Operation		
	a) commencement		
	b) completion		
Date :	.....	Printed Name :	.....
Place :	.....	Designation :	.....
Note :	Bidders to enclose a detailed network covering all the activities to be undertaken for completion of the project indicating key dates for various milestones for each phase constituent-wise.		

*Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.			
Attachment-10			
(Guarantee Declaration)			
Bidder's Name and Address:		To, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Website: www.rectpl.in	
Name :			
Address :			
Dear Sir, We conform that the equipments offered shall have minimum performance specified in Technical Specification. We further guarantee the performance /efficiency of the equipments in response to the Technical Specifications.			
Date:	.....	Printed Name:	.....
Place:	.....	Designation:	.....

Click here for next 

"Package-03-TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor; 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.

Attachment-11			
Bidder's Name and Address:		To,	
Name :		REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India)	
Address :		ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in	
Information Regarding Ex-employee of RECTPCL (NOT APPLICABLE FOR THIS TENDER)			
Dear Sir, We declare that we are aware of and have gone through the "Code of Business Conduct and Ethics for Senior Management Personnel"1 and "Code of Business Conduct and Ethics for Board Members"1 of RECTPCL (hereinafter referred to as the "Code of Conduct"). We further understand that as per the "Code of Conduct", Senior Management Personnel including Board Members, who have retired/resigned from RECTPCL, shall not accept any appointment or post, as detailed in the referred "Code of Conduct", within 1 year from the date of cessation of service/directorship unless approved by the Competent Authority. Accordingly,We hereby furnish the details of ex-employees of RECTPCL who had retired/ resigned at the level of General Manager and above from RECTPCL and subsequently have been employed by us:			
Sl. No.	Name of the person with designation in RECTPCL	Date of Retirement/ resignation from RECTPCL	Date of joining and designation in our organisation
1			
2			
3			
4			



Package 30: 30.41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865,									

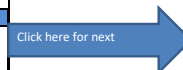
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"Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.			
Attachment-13			
(Declaration regarding Social Accountability)			
Bidder's Name and Address:		To,	
Name :		REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India)	
Address :		ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in	
Dear Sir, We conform that we stand committed to comply to all requirements of Social Accountability Standards i.e., SA8000 (latest Standard available at www.sa-intl.org) and maintain the necessary records.			
Date :	.....	Printed Name :	.....
Place :	.....	Designation :	.....

Click here for next



"Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.			
Attachment-14			
Integrity Pact			
Bidder's Name and Address:		To, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in1	
Name :			
Address :			
Bidders are requested to refer Section-IX of VOL-I for the format of			
Date :	.....	Printed Name :	.....
Place :	.....	Designation :	.....



*Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.			
Attachment-15			
Option for Initial Advance (either Interest Bearing Initial Advance or No Initial Advance) and Information for E-payment, PF details and declaration regarding Micro/Small & Medium Enterprises			
Bidder's Name and Name :	TO. REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpd.in		
Address :			
Dear sir,			
I	We have read the provisions in the Bidding Documents regarding furnishing the option for advance payment. Accordingly, as per the provision of the Bidding Documents, we hereby confirm to opt the following:		
Interest Bearing Initial Advance			
	Supply Portion:		
	Services Portion:		
II	We are furnishing the following details of Statutory Registration Numbers and details of Bank for electronic payment.		
1.	Name of the Supplier/ Contractor in whose favour payment is to be made		
	Address with PIN Code and State		
	Registered Office:		
2.	Branch Office:		
	Correspondence Address:		
3.	Status - Company/others		
	(Declaration of Micro/ Small/ Medium Enterprise under Micro/ Small &		
4.	Permanent Account (PAN) No.		
5.	GSTIN Numbers		
I.	GSTIN in the States/UT from where the supply of goods take place		
	Name of the States/UT	GSTIN number	
(i)			
(ii)			
(iii)			
II.	GSTIN in the States/UT where the supply for services take place (states where sites		
	Name of the States/UT	GSTIN number	
6.	PF Registration No. of the Company		
7.	PF Regional Office covered (with Address)		
8.	Name of Contact Person		
	Designation		
9.	Contact Details		
	Landline(s):		
	Mobile(s):		
	Email ID:		
	Bank Details for Electronic Payment		
	Name of the Bank:		
	Address of Branch:		
10.	Account No.:		
	Type of Account:		
	Saving Account Current Account		
	Current Account		
11.	9 digit MICR code printed at bottom in middle, next to cheque no.		
12.	IFSC (for RTGS)/NEFT Code (to be obtained from the Bank) Sample Cancelled Cheque to be enclosed		
We hereby declare that the above information are true and correct and we agree that the payment on account of this Contract, in the event of award, be made in the above account maintained in the above mentioned Bank.			
Date :	.....	Printed Name :	.....
Place :	.....	Designation :	.....

Click here for next attachment

"Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.

Attachment-16

(Additional Information)

Bidder's Name and Address:

Name : **To,**
REC Transmission Projects Company Limited
(A wholly owned subsidiary of REC, a 'Navratna CPSE'
Under the Ministry of Power, Govt of India)
Address : **ECE House, 3rd Floor, Annexe - II,**
28 A, K G MARG, NEW DELHI - 110 001
Website: www.rectpcl.in

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Dear Sir

In support of the additional information required as per ITB Sub-Clause 9.3 (q) of the Bidding Documents, we furnish herewith our data/details/documents etc., alongwith other information, as follows (the stipulations have been reproduced in italics for ready reference):

1.0	The Bidder shall furnish a certificate from their Banker(s) (as per prescribed formats in Form 14, Section-IX: Sample Forms and Procedures) indicating various fund based/non fund based limits sanctioned to the Bidder and the extent of utilization as on date. Such certificate should have been issued not earlier than three months prior to the date of bid opening. Wherever necessary the Employer may make queries with the Bidders' Bankers. [Reference ITB clause 9.3(q)(i)]				
1.1	In accordance with 1.0, certificate(s) from banker as per requisite format, indicating various fund based/non fund based limits sanctioned to the bidder or each member of the joint venture and the extent of utilization as on date is/are enclosed, as per the following details:				
	Name of the Bidder				
	Name of the Banker by whom certificate issued				
	Date of certificate (should not be earlier than 3 months prior to date of bid opening)				
	Whether fund based/non fund based limits are indicated in the certificate				
	Whether extent of utilization is indicated in the certificate				
1.2	The Bidder should accordingly also provide the following information/documents				
	(i) Details of Banker:				
	Name of Banker				
	Address of Banker				
	Telephone No.				
	Contact Name and				
	Fax No.				
	E-mail ID				
	(ii) As per para 1.0, Authorization Letter(s) from the bidder (in case of JV bidder, from all the partners) addressed to the Banker(s), authorizing RECTPCL to seek queries about the bidder with the Banker(s) and advising the Banker(s) to reply the same promptly, is/are enclosed as per following details:				
	Sl.	Letter Ref.	Date	Addressed to (name of the Bank)	
	1				
	2				
	(iii) As per para 1.0, Authorization Letter(s) from the bidder (in case of JV bidder, from all the partners) addressed to the Banker(s), authorizing RECTPCL to seek queries about the bidder with the Banker(s) and advising the Banker(s) to reply the same promptly, is/are enclosed as per following details:				
	Sl. No.	Name of Bidders/JV Partners	Provident Fund Code	Details	
	1				
	2				
2.0	Litigation History				
	The bidder should provide detailed information on any litigation or arbitration arising out of contracts completed or under execution by it over the last five years. A consistent history of awards involving litigation against the Bidder or any partner of JV may result in rejection of Bid. [Reference ITB clause 9.3(q)(ii)]				
2.1	Details of litigation history resulting from Contracts completed or under execution by the bidder over the last five years				
	Year	Name of client, cause of litigation/arbitration and matter in dispute	Details of Contract and date	Award for or against the bidder	Disputed amount
	1				
	2				

	3										
	4										
	5										
3.0	OTHER INFORMATION										
3.1	Current Contract Commitments of works										
	Bidders (individual firms or each partners of JV) should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.										
	Details of Contract		Value of outstanding work (Rs.)				Estimated completion date				
3.2	Financial Data:										
											Figures Rs in
	Details	Actual (Previous five years)					Projection for next five years				
		2018-19	2017-18	2016-17	2015-16	2014-15	2019-20	2020-21	2021-22	2022-23	2023-24
	Total Assets										
	Current Assets										
	Total Liability										
	Current Liability										
	Profit before taxes										
	Profit after taxes										
4	Details of provident fund for no. of the bidder (ref. ITB9.3(q))										
Date :	.....		Printed Name :		.....						
Place :	.....		Designation :		.....						

*Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDD Scheme-15 From Drass to Kochik.

Attachment-17

(Declaration for tax exemptions, reductions, allowances or benefits)

Bidder's Name and Address:

Name :

Address :

To,
REC Transmission Projects Company Limited
(A wholly owned subsidiary of REC, a 'Navratna CPSE'
Under the Ministry of Power, Govt of India)
ECE House, 3rd Floor, Annexe - II,
28 A, K G MARG, NEW DELHI - 110 001
Website: www.rectpcl.in

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Dear Sir,

1. We confirm that we are solely responsible for obtaining following tax exemptions, reductions, allowances or benefits in respect of supplies under the subject package, in case of award. We further confirm that we have considered the same in our bid thereby passing on the benefit to RECTPCL while quoting our prices. In case of our failure to receive such benefits, partly or fully, for any reason whatsoever, the Employer will not compensate us.

2. We are furnishing the following information required by the Employer for issue of requisite certificate if and as permitted in terms of the applicable Govt. of India policies/procedures (in case of award):

Applicable Act, Notification No. and Clause Ref. No.	Sl. No.	Description of item on which applicable	Country of origin	Remarks, if any

(The requirements listed above are as per current Notification of Govt. of India indicated above. These may be modified, if necessary, in terms of the Notifications.)

Date :

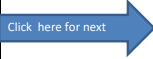
Printed Name :

Place :

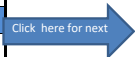
Designation :

"Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.			
Attachment-18 (Safety Pact)			
Bidder's Name and Address:		TO, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpclin	
Name :			
Address :			
Dear Sir,			
Bidders are requested to refer Section-IX of VOL-I for the format of SAFETY PACT			
Date :	.....	Printed Name :	.....
Place :	.....	Designation :	.....

Click here for next



*Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.			
Attachment-19 (Declaration)			
Bidder's Name and Address:		To, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Website: www.rectpcl.in	
Name :			
Address :			
Dear Sir, We confirm that Bid Form and Price Schedules in the Second Envelope have been filled up by us as per the provisions of the Instruction to Bidders. Further, we have noted that the same shall be evaluated as per the provisions of the Bidding Documents. Further, we hereby confirm that except as mentioned in the Attachment – 6 (Alternative, Deviations and Exceptions to the Provisions) hereof forming part of our First Envelope : (i) there are no discrepancies/inconsistencies and deviations/omissions/ reservations to the Bidding Documents, in the Second Envelope bid; (ii) the description of items and the unit thereof in the price schedules in the Second Envelope bid are in conformity with those indicated in the price schedule of the Bidding Documents without any deviation to the specified scope of work. We also confirm that in case any discrepancies/ inconsistencies and deviations/ omissions/ reservations, as referred to in para (i) and (ii) above, is observed in the Second Envelope, the same shall be deemed as withdrawn/rectified without any financial implication, whatsoever to RECTPCL. However, in case of any arithmetical errors, the same shall be governed as per the provision of ITB Sub-Clause 27.2 .			
Date :	*****	Printed Name :	*****
Place :	*****	Designation :	*****



*Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.

Attachment-20

(Confirmation regarding correctness of Bid submitted)

Bidder's Name and Address:

Name :

Address :

To,
REC Transmission Projects Company Limited
(A wholly owned subsidiary of REC, a 'Navratna CPSE'
Under the Ministry of Power, Govt of India)
ECE House, 3rd Floor, Annexe – II,
28 A, K G MARG, NEW DELHI – 110 001
Website: www.rectpcl.in

Bidder has to submit an Affidavit (submission of Hard Copy in 'Original') signed and stamped with company seal by a full time Director/ CEO/ Chairman-cum-Managing Director and attested/ notarized by a Magistrate/ Notary for correctness of all the information/details/data/documentary evidences etc. as submitted by the bidder are correct.

Date :

.....

Printed Name:

.....

Place :

.....

Designation:

.....

[Click here for Next](#)

"Package-03- TL-03 Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 From Drass to Kochik.	
BID FORM (First Envelope)	
Bid Proposal Ref. No.	
To, Additional Chief Executive Officer, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001	
Name of Contract :	"Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages".
Dear Ladies and/or Gentlemen,	
1.0	Having examined the Bidding Documents, including Amendment Nos. ...[Enter the Amendment]... dated ...[Enter the Date in dd-mm-yyyy]... the receipt of which is hereby acknowledged, we the undersigned, offer to design, manufacture, test, deliver, install and commission (including carrying out Trial operation, Performance & Guarantee Test as per the provision of Technical Specification) the Facilities under the above-named package in full conformity with the said Bidding Documents. In accordance with ITB Clause 9.1 of the Bidding Documents, as per which the bid shall be submitted by the bidder under "Single Stage - Two Envelope" procedure of bidding. Accordingly, we hereby submit our Bid, in two envelopes i.e. First Envelope - Techno - Commercial Part & Second Envelope - Price Part (to be opened subsequently). The above amounts are in accordance with the price schedules attached herewith and are made part of this bid
2.0	Attachments to the Bid Form (First Envelope)
0	
(a) Attachment 1	Bid Security, in a separate envelope, in the form of Bank Guarantee for a sum INR 6975000 (Rs Sixty Nine lakh Seventy Five Thousand Only) Bid security shall remain valid for a period of thirty (30) days beyond the original bid validity period i.e., for a period of TEN (10) months after the last date of bid submission, and beyond any extension subsequently requested under ITB Sub-Clause 14.2.
(b) Attachment 2	A power of attorney duly authorized by a Notary Public indicating that the person(s) signing the bid have the authority to sign the bid and thus that the bid is binding upon us during the full period of its validity in accordance with the ITB Clause 14.
(c) Attachment 3	The documentary evidence that we are eligible to bid in accordance with ITB Clause 2. Further, in terms of ITB Clause 9.3 (c) & (e), the qualification data has been furnished as per your format enclosed with the bidding documents Attachment- 3(QR). Further, the required joint venture Agreement signed by us and our partners has also been furnished as per your format Attachment 3 (JV).
(d) Attachment 4	The documentary evidence establishing in accordance with ITB Clause 3, Vol-I of the Bidding Documents that the facilities offered by us are eligible facilities and conform to the Bidding Documents has been furnished as Attachment 4. A list of Special Tools & Tackles to be used by us for erection, testing & Commissioning and to be handed over to Employer, the cost of which is included is our Bid Price, is also enclosed as per your format as Attachment 4A. A list of Special Tools & Tackles to be brought by the contractor for erection, testing & Commissioning and to be taken back after completion of work, whose cost is not included in our bid price, is enclosed as per your format as Attachment 4B.
(e) Attachment 5	The details of all major items of services or supply which we propose subletting in case of award, giving details of the name and nationality of the proposed subcontractor/sub-vendor for each item.
(f) Attachment 6	The variation and deviations from the requirements of the Conditions of Contract, Technical Specification and Drawings (excluding critical provisions as mentioned at clause 6.0 below) in your format enclosed with the Bidding Documents, including, inter alia, the cost of withdrawal of the variations and deviations indicated therein.
(g) Attachment 7	The details of Alternative Bids made by us indicating the complete Technical Specifications and the deviation to contractual and commercial conditions. (Not Applicable)
(i) Attachment 8	Manufacturer's Authorisation Forms.
(j) Attachment 9	Work Completion Schedule.
(k) Attachment 10	Guarantee Declaration.
(l) Attachment 11	Not Applicable
(m) Attachment 12	Filled up information regarding Price Adjustment Data as per the format enclosed in the bidding documents.
(n) Attachment 13	Declaration regarding Social Accountability.
(o) Attachment 14	Integrity Pact, in a separate envelope, duly signed on each page by the person signing the bid.
(p) Attachment 15	Option for Initial Advance
(q) Attachment 16	Additional Information.
(r) Attachment 17	Declaration for tax exemptions, reductions, allowances or benefits
(s) Attachment 18	Safety Pact, in a separate envelope, duly signed on each page by the person signing the bid.
(t) Attachment 19	Declaration
(u) Attachment 20	confirmation regarding Correctness of Bid Submitted
2.2	We are a Micro and Small Enterprise (MSE) registered with a designated Authority of GoI under the Public Procurement Policy for MSEs order 2012. (applicable for MSE only)
3.0	We are aware that, in line with Clause No. 27.1 (ITB), our Second Envelope (Price Part) is liable to be rejected in case the same contains any deviation/omission from the contractual and commercial conditions and technical Specifications other than those identified in this First Envelope.
3.1	We are aware that the Price Schedules do not generally give a full description of the Work to be performed under each item and we shall be deemed to have read the Technical Specifications and other sections of the Bidding Documents and Drawings to ascertain the full scope of Work included in each item while filling-in the rates and prices in Second Envelope.
3.2	We declare that as specified in Clause 11.5, Section -II:ITB, Vol-I of the Bidding Documents, prices quoted by us in the Price Schedules in <u>Second Envelope</u> shall be subject to Price Adjustment during the execution of Contract in accordance with Appendix-2 (Price Adjustment) to the Contract Agreement.
4.0	We confirm that except as otherwise specifically provided our Bid Prices in Second Envelope include all GST and charges as may be assessed on us, our Sub-Contractor/Sub- Vendor or their employees by all municipal, state or national government authorities in connection with the Facilities, in and outside of India.
4.1	100% of applicable GST which are payable by the Employer under the Contract, shall be reimbursed by the Employer on production of satisfactory documentary evidence by the Contractor in accordance with the provisions of the Bidding Documents.

4.2	We further understand that notwithstanding 4.0 above, in case of award on us, you shall also bear and pay/reimburse to us, GST in respect of supplies by us to you, imposed on the Plant & Equipment including Mandatory Spare Parts to be incorporated into the Facilities including Type Test charges for Type test to be conducted specified in Schedule No. 1, Installation Services specified in Schedule No. 3 and Charges for Training to be imparted specified in Schedule No. 4 of the Price Schedule in Second Envelope, by the Indian Laws.				
4.3	We confirm that we have also registered/we shall also get registered in the GST Network with a GSTIN, in all the states where the project is located and the states from which we shall make our supply of goods				
5.0	Construction of the Contract				
5.1	We declare that we have studied Clause ITB 31.4.1 relating to mode of contracting for Domestic Bidders and we are making this proposal with a stipulation that you shall award us two separate Contracts viz 'First Contract' for ex-works supply of all equipment and materials including mandatory spares and 'Second Contract' for providing all the services i.e. inland transportation for delivery at site, insurance, unloading, storage, handling at site, installation, testing and commissioning including Trial operation in respect of all the equipment supplied under the 'First Contract' and other services specified in the Contract Documents. We declare that the award of two contracts, will not, in any way, dilute our responsibility for successful operation of plant/equipment and fulfillment of all obligations as per Bidding Documents and that both the Contracts will have a cross-fall breach clause i.e. a breach in one Contract will automatically be classified as a breach of the other contract which will confer on you the right to terminate the other contract at our risk and cost.				
6.0	We have read the provisions of following clauses and confirm that the specified stipulations of these clauses are acceptable to us:				
(a)	ITB 13	Bid Security			
(b)	GCC 5(i)(b)	Governing Law			
(c)	GCC 7 (i)	Contractor's Responsibility			
(d)	GCC 9.0	Performance Security			
(e)	GCC 27	Liquidity Damage			
(f)	GCC 31(i)(a)	Defect Liability			
(g)	GCC 33	Payment Terms			
(h)	GCC 39	Limitations of Liability			
(i)	GCC 47	Settlement of Disputes			
(j)	GCC 48	Arbitration			
(k)	SCC 4	Taxes & Duties			
(l)	Appendix 2 to Form of Contract Agreement	Price Adjustment			
Further we understand that deviation taken in any of the above clauses by us may make our bid non-responsive as per provision of bidding documents and be rejected by you.					
7.0	We undertake, if our bid is accepted, to commence the work immediately upon your Notification of Award to us, and to achieve the delivery of goods and related services within the time stated in the Bidding Documents.				
8.0	If our bid is accepted, we undertake to provide a Performance Security in the form and amounts, and within the times specified in the Bidding Documents.				
9.0	We agree to abide by this bid for a period of nine (09) months from the date fixed for opening of bids as stipulated in the Bidding Documents, and it shall remain binding upon us and may be accepted by you at any time before the expiration of that period.				
10.0	Until a formal Contract is prepared and executed between us, this bid, together with your written acceptance thereof in the form of your Notification of Award shall constitute a binding contract between us.				
11.0	We understand that you are not bound to accept the lowest or any bid you may receive.				
12.0	Commissions or gratuities, if any, paid or to be paid by us to agents relating to this Bid, and to contract execution, if we are awarded the contract, are listed below:-				
	Name and address of agent	Amount and Currency	Purpose of Commission or gratuity		
	(If none, state				
13.0	# (For Joint Venture only) We, the partners of Joint Venture submitting this bid, do agree and confirm that in case of Award of Contract on the Joint Venture, we shall be jointly and severally liable and responsible for the execution of the Contract in accordance with Contract terms and conditions.				
14.0	We, hereby, declare that only the persons or firms interested in this proposal as principals are named here and that no other persons or firms other than those mentioned herein have any interest in this proposal or in the Contract to be entered into, if the award is made on us, that this proposal is made without any connection with any other person, firm or party likewise submitting a proposal is in all respects for and in good faith, without collusion or fraud.				
Thanking you.					
				Yours faithfully,	
				For and on behalf of	
	Date	Printed Name :			
	Plac	Designation :			
Please provide additional information of the Bidder					
Business Address :					
Country of Incorporation					
State/Province to be					
Name of Principal Officer					
Address of Principal Officer :					

Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”.

**Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik
 Package 04- RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum
 Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum**

(Qualifying Requirement Data)

Bidders Name & Address:

To
 REC Transmission Projects Company Limited
 (A wholly owned subsidiary of REC, a 'Navratna CPSE')
 Under the Ministry of Power, Govt of India)
 ECE House, 3rd Floor, Annexe – II,

Dear Ladies and/or Gentlemen,

In support of the Qualification Requirements (QR) for bidders, stipulated in Section - III, Volume-I & additional information required as per **ITB clause 9.3(c)** of the Bidding Documents, we furnish herewith our QR data/details/documents etc., alongwith other information, as follows (The QR stipulations have been reproduced in italics for ready reference, however, in case of any discrepancy the QR as given in Section-III, Vol-I shall prevail).

* We have submitted bid as individual firm.

* We have submitted bid as joint venture of following firms:

- (i)
 - (ii)
 - (iii)
- (* ***Strike-off whichever is not applicable***)

[For details regarding Qualification Requirements of a Joint Venture, please refer para 4.0 below.]

We are furnishing the following details/document in support of qualifying requirement for the subject package.

- A. Attached copies of original documents defining:
 - a) The constitution or legal status;
 - b) The principal place of business;
 - c) The place of incorporation (for bidders who are corporations); or the place of registration and the nationality of the Owners (for applicants who are partnerships or individually-owned firms).
- B. Attached original & copies of the following documents.
 - a) Written power of attorney of the signatory of the Bid to commit the bidder.
 - b) Joint Venture Agreement** (in case of bid from JV , the Joint Venture Agreement & Power of Attorney of Joint Venture Agreement, both in original)

*[** To be submitted only in case of Joint Ventures. Strike off in case of individual firms.]*

1.0 General Information

[The information in this form is to be completed for individual firms and each Partner of a Joint Venture]

Where the Bidder proposes to use named subcontractor(s) for critical components of the works or for work contents in excess of 10 percent of the bid price, the following information should also be furnished for the subcontractor(s)].

Sl. No.	Particulars	For Individual Firm	In case of Joint Venture		
			For Lead Partner	For Other Partner - 1	For Other Partner - 2
1.	Name of the Firm				
2.	Head Office/ Registered Office Address				
3.	Telephone				
4.	Fax				
5.	Contact Person				
5(a)	Email				
6.	Place of Incorporation/ Registration				
7.	Year of Incorporation/ Registration				
8.	Nationality of				
	Owner (i)				
	Owner (ii)				
	Owner (iii)				

(Necessary documents to establish legal status of the bidder (all the partners in case of Joint Venture) should be enclosed with the bid.

2.0 *Technical Experience*

2.1 *(Reference: Para 1.1, 1.2 of QR mentioned in Section-III of Vol-I)*

2.2 On a separate page, using the following format, Bidder is requested to furnish the details of the previous experience, on the basis of which the Bidder wishes to qualify, as detailed at para 2.0 above. The information is to be summarised using following formats, as applicable, for each previous experience of the Bidder.

(Documentary evidence, such as copies of utility certificates etc., in support of its experience shall be attached with the filled-up format for each experience/Contract)

Format A Format for the Bidder (Single Firm / Partner in case of Joint Venture) [In case of Joint Venture bidder, the QR data of each of the partner (in support of meeting the requirement of QR mentioned in Section-III of Vol-I, Conditions of Contract, Volume-I of the bidding documents is also to be furnished, as applicable, using this format

Name of the Bidder (Single Firm/Lead partner/Partners of a JV)			
A1.	Name of Contract: (executed during the last 7 years as on the date of bid opening):		
A2.	Contract Reference No. & Date of Award:		
A3.	Name and Address of the Employer/Utility by whom the Contract was awarded e-mail ID _____ Telephone No. _____ Fax No. _____		
A4	Scope of work executed under the above contract (Tick only whichever is/are applicable)	Single Firm • Foundation • Erection • Stringing of TL • Supply of Tower • Supply of Tower Parts • Supply of Conductor • Supply of Insulator • Supply of Hardware fitting	JV Partner • Foundation • Erection • Stringing of TL • Supply of Tower • Supply of Tower Parts • Supply of Conductor • Supply of Insulator • Supply of Hardware fitting
A5	Detail/features of the Contract undertaken relevant to the stipulated QR (Sec-III, Vol-I)	Single Firm	JV Partner
	i) Route length of Transmission Length (in Kms)		
	ii) Tower locations (in nos)		
	iii) Voltage level of Transmission Line (in KV)		
A5	Date of successful commissioning of the Contract		
A6.	Capacity in which the Contract was undertaken (Check One)	☐ Prime Contractor ☐ Sub Contractor ☐ Partner of JV (Tick whichever is applicable)	
A7.	Details/documentary evidence submitted in support of stated experience/Contract		

Manufacturing facilities		Single Firm	JV Partner/ or proposed manufacturer
1	Manufacturing capacity per financial Year		
2	Average quantity of lattice steel structure:		

	FY 2018-19 FY2017-18 FY 2016-17		

3.0 Financial Position

3.1 (Reference: Para 1.3 of QR mentioned in Section-III, Vol-I)

3.2 In support of its 'Financial Position', in line with the above, the Bidder (Individual firm or all the JV partners in case of JV bidder) must provide the relevant information, alongwith documentary evidence, in the following formats A & B:

Name of the Bidder [Single Firm / Lead Partner of a JV / Partner of a JV]		
A. Annual Turnover details:		
Sl. No.	Financial year	Annual turnover in Rs. Million
1.0	2018-19	
2.0	2017-18	
3.0	2016-17	
4.0	2015-16	
5.0	2014-15	
Average annual turnover for best three years is:		
B. Liquid Assets		
Details of evidence of having Liquid assets (LA)		
Or		
Details of evidence of access to or availability of credit facilities		

4.0 Joint Venture (JV) Firms

4.1 (Reference: Para 1.4 of QR mentioned in Section-III, Vol-I)

4.2 In accordance with the above, in case of JV bidders, it should be ensured that necessary details including those pertaining to each JV partner are furnished and the documents are submitted alongwith the bid. Further, the JV bidders should also ensure that other requirements are complied with. The lists of documents furnished are to be indicated below:

- i)
- ii)
- iii)
- iv)
- v)

5.0 **The Bidder shall also furnish following documents/details with its bid. {Reference ITB clause 9.3 (c)}**

5.1 The complete annual reports together with Audited statement of accounts of the company for last five years of its own (separate) immediately preceding the date of submission of bid.
Note:

- I. In the event the bidder is not able to furnish the information of its own (i.e. separate), being a subsidiary company and its accounts are being consolidated with its group/holding/parent company, the bidder should submit the audited balance sheets, income statements, other information pertaining to it only (not of its group/Holding/Parent Company) duly certified by any one of the authority [(i) Statutory Auditor of the bidder /(ii) Company Secretary of the bidder or (iii) A certified Public Accountant] certifying that such information/documents are based on the audited accounts as the case may be.
- II. Similarly, if the bidder happens to be a Group/Holding/Parent Company, the bidder should submit the above documents/information of its own (i.e. exclusive of its subsidiaries) duly certified by any one of the authority mentioned in Note-I above certifying that these information/documents are based on the audited accounts, as the case may be.

5.2 The Bidder should accordingly also provide the following information /documents (**In case of JV bidders, information should be provided separately for all the Partners of JV in the given format**):

Audited balance sheet and income statements for the last five years as per the following:

Years preceding to the bid opening	Audited Balance Sheet and Income Statements enclosed	
1 st Year	☐ Yes	☐ No
2 nd Year	☐ Yes	☐ No
3 rd Year	☐ Yes	☐ No
4 th Year	☐ Yes	☐ No
5 th Year	☐ Yes	☐ No

Date:.....

(Signature)

Place:.....

(Printed Name)

(Designation)

Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”.

Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik
Package 04- RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum
Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum

(Manufacturer’s Authorization Form)

(On Manufacturer’s Letterhead, see Clause 9.3(c) of the ITB)

To: [Insert: name of Employer]

Dear Ladies and/or Gentlemen,

WE [insert: **name of Manufacturer**] who are established and reputable manufacturers of [insert: **name and/or description of the plant & equipment**] having production facilities at [insert: **address of factory**] do hereby authorize [insert: **name & address of Bidder**] (hereinafter, the “Bidder”) to submit a bid, and subsequently negotiate and sign the Contract with you against IFB [insert: **title and reference number of Invitation for Bids**] including the above plant & equipment or other goods produced by us.

We hereby extend our full guarantee and warranty for the above specified plant & equipment materials or other goods offered supporting the supply, installation and achieving of Operational Acceptance of the plant by the Bidder against these Bidding Documents, and duly authorize said Bidder to act on our behalf in fulfilling these guarantee and warranty obligations. We also hereby declare that we and, [insert: **name of the Bidder**] have entered into a formal relationship in which, during the duration of the Contract (including warranty / defects liability) we, the Manufacturer or Producer, will make our technical and engineering staff fully available to the technical and engineering staff of the successful Bidder to assist that Bidder, on a reasonable and best effort basis, in the performance of all its obligations to the Purchaser under the Contract.

For and on behalf of the Manufacturer

Signed: _____

Date: _____

In the capacity of [insert: **title of position or other appropriate designation**] and this should be signed by a person having the power of attorney to legal bind the manufacturer.

Date:.....

Place:.....

(Signature).....
(Printed Name).....
(Designation).....
(Common Seal).....

- Note 1. The letter of Undertaking should be on the letterhead of the Manufacturer and should be signed by a person competent and having Power of Attorney to legally bind the Manufacturer. It shall be included by the bidder in its bid.*
- 2. Above undertaking shall be registered or notarized so as to be legally enforceable.*

LEGENDS

Service Unit Description		
S.No	Legend	Description
1	B50	BAG PER 50 KG OF CEMENT
2	CM	Centimeter
3	EA	each
4	JHR	Years
5	KG	Kilogram
6	KL	Kilolitre
7	KM	Kilometer
8	L	Liter
9	LOT	LOT
10	LS	LUMP SUM
11	M	Meter
12	M2	Square meter
13	M3	Cubic meter
14	MND	MAN DAYS
15	MNW	MAN WEEKS
16	MT	Metric Ton
17	PAA	Pair
18	QTL	QUINTAL
19	RM	RUN. MTR.
20	SET	SET
21	STD	Hours
22	TAG	Days
23	DAY	Days
24	YR	Years

Material Unit Description		
S.No	Legend	Description
1	EA	each
2	FT	Foot
3	FT2	Square foot
4	G	Gram
5	H	Hour
6	KG	Kilogram
7	KL	Kilolitre
8	KM	Kilometer
9	L	Liter
10	LOT	LOT
11	LS	LUMP SUM
12	M	Meter
13	M2	Square meter
14	ML	Milliliter
15	MON	Months
16	MT	Metric Ton
17	PAA	Pair
18	RM	RUN. MTR.
19	ROL	Role
20	SET	SET
21	PAK	Pack
22	CS	Case
23	TAG	Days

Second Envelope (Price Schedule)

General guidelines for filling up the Price Schedules, Sch-1 to Sch-7	
“Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”. Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik	
Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik	
1	Fill up only green shaded cells in Sch-1, Sch-2, Sch-3, Sch-4, Sch-5, Sch-7, and Bid Form 2nd Envelope.
2	All the cells in Sch-6 are auto filled, therefore no cell is required to be filled up there.
3	Instructions / error messages, if any, will be displayed automatically after selecting the cell.
Click for Detailed General Instructions Click to skip Instructions & Proceed	
REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a ‘Navratna CPSE’ Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Website: www.rectpcl.in	

Summary Sheet		
Name of Participating Bidder (To be filled by the bidder)		
Price Quoted (as per Schedule-6 after discount)		
Values in INR	Total Evaluated Price	0.00

“Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages”.
Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik

Click to Proceed



I	While filling up the worksheets following may please be observed :
	(i) Fill up only green shaded cells.
	(ii) Certain data type entries have been restricted, such as Numeric values or limits of numeric values.
	(iii) Select only the options provided in pull down menus.
	(iv) Do not link any cell of this work book with any other work book.
	(v) Do not use copy & paste or cut & paste options for filling up the data.
	(vi) Do not reformat any of the cell of the work book.
II	This Workbook consists of following worksheets :
	Cover :
	Opening page of the workbook.
	Names of Bidder :
	• Select Sole Bidder or JV (Joint Venture) from the pull down menu. Do not leave this cell blank.
	• Select nos. of the JV Partners other than the Lead Partner from drop down
	• In case of JV partners more than 2, enter details of 3 rd & more partners along with details of 2 nd partner.
	• Fill up names and address of the Sole Bidder and /or Joint Venture.
	• Fill up date in dd-mm-yyyy format from drop down menu.
	• Click for Sch-1 given at the right top of the worksheet to go to Sch-1.
	Sch-1 (Ex-works Prices) :
	• Fill up unit rates for all the items in numeric values greater than 0 (zero). If unit rate is left blank, the corresponding item shall be deemed to be included in the total price.
	• Total amount shall get calculated automatically.
	• Type Test charges shall appear automatically in Sch-1, after filling up Sch- 7 appropriately.
	Sch-2 (Freight & Insurance Charges) :
	• Fill up unit rates for all the items in numeric values greater than 0 (zero). If unit rate is left blank, the corresponding item shall be deemed to be included in the total price.
	• Total amount shall get calculated automatically.
	Sch-3 (Erection Charges) :
	• Fill up unit rates for all the items in numeric values greater than 0 (zero). If unit rate is left blank, the corresponding item shall be deemed to be included in the total price.
	• Total amount shall get calculated automatically.

	Sch-4 (Training Charges) :	
	•	Not applicable, hence no cell is required to be filled up.
	Sch-5 (Summary of GST applicable on Supply of Goods and	
	•	Amount of GST shall be calculated automatically
	Sch -6 :	
	•	Summary of all the Schedules without considering discount (mentioned in the work sheet discount) shall be displayed automatically.
	•	No cell is required to be filled in by the bidder in this worksheet.
	Sch-7 (Type Test Charges) :	
	•	Fill up the rates & location where type tests are proposed.
	•	Total of this Sch-7 shall automatically appear in Sch-1.
	Bid form 2nd Envelope :	
	•	Fill up ref. no. as bidder's ref no. of this letter.
	•	This letter shall consider the net price as per Sch-6 (After Discount).
	•	Fill up names & Designation of the representatives of other JV partner(s) if the bidder is JV (Joint Venture) .
	•	Fill up additional information as required.

"Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages".
Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik

Click for Sch. 1

Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik

Enter following details of the bidder

Specify type of Bidder [Select from drop down menu]	SoleBidder
Name of the Sole Bidder	
Address of the Sole Bidder	

Printed Name	.....
Designation	...
email -id of Bid signatory	
Mobile No. of Bid signatory	
Fax No. of Bid signatory	
Date	.....
Place	.....

Package 03- RECTPCL/PIA/JKPPD/TL-03: 220 kV Drass to Kochik							Schedule - 1				
"Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPPD under PMDP Scheme-15 for the following packages". Package 03- RECTPCL/PIA/JKPPD/TL-03: 220 kV Drass to Kochik											
(SCHEDULE OF RATES AND PRICES)											
Bidder's Name and Address :						To: Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Website: www.rectpcl.in			REC		
Name :											
Address :											
PLANT AND EQUIPMENT (INCLUDING MANDATORY SPARES PARTS) TO BE SUPPLIED: All Prices are in Indian Rupees.											
Sl. No.	HSN Code	Whether HSN in column '2' is confirm. If not indicate applicable HSN*	Rate of GST Applicable (%)	Whether rate of GST in column '4' is confirm. If not indicate applicable GST*	Item Description	Unit	Qty.	Unit Ex-works price(excluding GST)	Total Ex-works price(excluding GST)	GST Tax as Confirmed by Bidder	
1	2	3	4	5	6	7	8	9	10=9x8	11	
Drass (Gantry) to Kochik Transmission Line											
1.0					TOWERS						
1.1					Fabrication, galvanizing & supply of various type of tower & tower parts, tower extensions (complete), Gantry excluding bolts & nuts, step bolts and stubs but including hangers, D-Shackles, pack washers etc.						
	73082011		18%		Normal Towers	MT	5240		0.00	0.00	
1.2					Fabrication, galvanizing & supply of stubs & cleats of various type of towers, tower extensions (complete) excluding bolts & nuts						
	73082011		18%		I) Mild Steel (Grade C)	MT	210		0.00	0.00	
1.3					Supply of bolts and nuts including step bolts and spring washers						
					i) For Towers & tower extns.						
	73181500		18%		(a) Hexagonal Bolts & Nuts including Step Bolts	MT	273		0.00	0.00	
	73181500		18%		ii) For stubs	MT	6		0.00	0.00	
2.1					Fabrication, galvanizing & supply of steel parts Channel /angle/ sections for grillage foundation (including stub reinforcements, frames etc) for various type of towers with pack washers excluding supply of bolts & nuts						
	73082011		18%		i) Mild Steel (Grade C)	MT	272		0.00	0.00	
2.2	73181500		18%		Supply of Bolt & Nuts (Hexagonal) for grillage foundations	MT	5		0.00	0.00	
2.0					Supply of earthing of towers						
	73082011		18%		a) Pipe type earthing	Nos.	42		0.00	0.00	
	73082011		18%		b) Counterpoise type (120 m length)	Nos.	138		0.00	0.00	
	73082011		18%		c) Counterpoise type (280 m length)	Nos.	42		0.00	0.00	
					d) Shielding Earthwire including PG clamps, Downlead clamps but excluding earthwire bits	Nos.					
	73082011		18%		i) Pipe type earthing	Sets	5		0.00	0.00	
	73082011		18%		ii) Counterpoise type earthing	Sets	6		0.00	0.00	
3.0					Supply of following tower accessories						
	73082011		18%		a) Danger plate	Nos.	233		0.00	0.00	
	73082011		18%		b) Number plate	Nos.	233		0.00	0.00	
	73082011		18%		c) Phase Plate (Set of three)	Sets.	466		0.00	0.00	
	73082011		18%		d) Circuit Plate (Set of two)	Sets	233		0.00	0.00	
	73082011		18%		e) Anticlimbing device	Nos.	233		0.00	0.00	
	73082011		18%		f) Bird Guards (Set of three)	Sets.	18		0.00	0.00	
4.0					Design, manufacture and supply of the following line materials						
4.1	76141000		18%		ACSR "DEER" Conductor	Kms.	196		0.00	0.00	
4.2	73121020		18%		7/4.27mm G.S. Earthwire	kms.	65		0.00	0.00	
					OPGW , Approach Cable etc						
4.3 (a)	85447090		18%		Optical Fiber Ground Wire 24 Fibres (DWSM) For very heavy snow hilly terrain	Kms.	67		0.00	0.00	
(b)	85447090		18%		FODP 48F: Indoor type rack mounted with FCPC coupling and pig tails (5 mtrs each) - 1 No. for each end	Nos.	48		0.00	0.00	

Click to Sch. 2

Sl. No.	HSN Code	Whether HSN in column '2' is confirm. If not indicate applicable HSN*	Rate of GST Applicable (%)	Whether rate of GST in column '4' is confirm. If not indicate applicable GST*	Item Description	Unit	Qty.	Unit Ex-works price(excluding GST)	Total Ex-works price(excluding GST)	GST Tax as Confirmed by Bidder
1	2	3	4	5	6	7	8	9	10=9x8	11
(c)	85447090		18%		Fibre Optic Approach cable 24 Fibre (DWDM) - 1km for each end	Kms.	1		0.00	0.00
d)	85447090		18%		Installation hardware set for above 24 Fibre, fibre optic approach cable - 1 No. for each end	Set	1		0.00	0.00
4.4					DISC INSULATORS					
	85469090		18%		120KN	Nos.	7075		0.00	0.00
	85469090		18%		160KN	Nos.	60456		0.00	0.00
4.5					Hardware fittings (Grade C)					
	73082011		18%		a) Double 'T' Suspension Insulator string (2x120KN)for ACSR "DEER"	Sets	28		0.00	0.00
	73082011		18%		b) Single suspension string (Pilot) (1x120KN) for ACSR "DEER"	Sets	227		0.00	0.00
	73082011		18%		c) Single tension string for ACSR "DEER"	Sets	0		0.00	0.00
	73082011		18%		d) Double Tension String (2x160KN) for ACSR "DEER"	Sets	1374		0.00	0.00
4.6					Accessories for Conductor & OPGW					
i)	76169990		18%		Midspan Compression Joint for ACSR 'DEER' Conductor	Nos.	120		0.00	0.00
ii)	76169990		18%		Repair Sleeves for ACSR DEER Conductor	Nos.	40		0.00	0.00
iii)			18%		Flexible Copper bonds	Nos.	285		0.00	0.00
iv)	73082011		18%		Vibration Damper for ACSR 'DEER' Conductor	Nos.	2776		0.00	0.00
v)	76169990		18%		Mid span compression joint for 7/4.27mm E/W	Nos.	36		0.00	0.00
vi)	73082011		18%		Vibration Damper for earthwire	Nos.	926		0.00	0.00
vii)	73082011		18%		Suspension clamp assembly for E/W	Nos.	10		0.00	0.00
viii)	73082011		18%		Tension clamp assembly for E/W	Nos.	454		0.00	0.00
ix)	82057000		18%		Vibration Damper for OPGW	Nos.	926		0.00	0.00
x)	82057000		18%		Tension assembly set for OPGW	Nos.	2		0.00	0.00
a)	82057000		18%		Dead end Assembly	Nos.	33		0.00	0.00
b)	82057000		18%		Double Tension assembly at joint location	Nos.	33		0.00	0.00
c)	82057000		18%		Double Tension Pass Through Assembly	Nos.	419		0.00	0.00
xi)	82057000		18%		Suspension assembly for OPGW	Nos.	10		0.00	0.00
xii)	82057000		18%		Downlead Clamps for OPGW	Nos.	136		0.00	0.00
xiii)	85353090		18%		Terminal Box for OPGW	Nos.	1		0.00	0.00
xiv)	85353090		18%		Joint Box for OPGW	Nos.	17		0.00	0.00
5					River Crossing Towers					

Sl. No.	HSN Code	Whether HSN in column '2' is confirm. If not indicate applicable HSN*	Rate of GST Applicable (%)	Whether rate of GST in column '4' is confirm. If not indicate applicable GST*	Item Description	Unit	Qty.	Unit Ex-works price(excluding GST)	Total Ex-works price(excluding GST)	GST Tax as Confirmed by Bidder
1	2	3	4	5	6	7	8	9	10=9x8	11
5.1					Fabrication, galvanising and supply of special river crossing tower parts including stub/base plate, anchor bolt, platforms,ladders, hangers, D-shackles, gusset plates, pack plates & pack washers excluding bolts & nuts					
	73082011		18%		a) Mild Steel Sections	MT	NIL			
	73082011		18%		b) High Tensile Steel sections	MT	NIL			
5.2	73181500		18%		Supply of bolts & nuts and step bolts includ	MT	NIL			
5.3					Supply of following items for aviation requirements					
	85308000		18%		i) Span markers	Nos.	12		0.00	0.00
					ii) Obstruction lights (to be provided as per IS 5613)					
	85308000		18%		a) 1 Medium + 2low intensity	Sets.	12		0.00	0.00
	85308000		18%		b) 1 Medium + 4low intensity	Sets.	NIL			
5.4					Test Equipment					
a)	85171190		18%		OTDR (Optical time Domain Reflectometer) for 1310/1550nm with laser source Equivalent to Anritsu MW 9076B1 or better	No.	1		0.00	0.00
b)	85369090		18%		Optical Attenuators (Variable 1310/1550nm) Equivalent to JDSU OLA55 or better	No.	1		0.00	0.00
c)	90303390		18%		Optical Power meter (1310/1550nm) with laser source Equivalent to JDSU OLP55 or better	No.	1		0.00	0.00
d)	90132000		18%		Laser Light Source (Equivalent to EXFO FLS300-23BL or better	No.	1		0.00	0.00
e)	90304000		18%		Optical Talk Set - Equivalent to JDSU OTS 55 or better	No.	1		0.00	0.00
f)	85158090		18%		Optical Fiber Fusion Splicer incl. Fibre cleaver Equivalent to Sumitomo T-39-SE or better	No.	1		0.00	0.00
g)					Calibrated Fibre	No.	1		0.00	0.00
h)					Connectorization kit (FIS - FI - 0053- FC - INST or equivalent)	No.	1		0.00	0.00
i)	85369090		18%		Splice Kit (FIS - FI - 0053 -FF or equivalent)	No.	1		0.00	0.00
j)	82079090		18%		Optical test accessory kit including all necessary connectors, adaptors, cables, terminations and other items required for testing (FIS - FI-0053-TS-ST or equivalent)	No.	1		0.00	0.00
6.0					220 kV XLPE Cable					
i)	85446090		18%		220 kV grade 1 core, 800sq.mm.XLPE insulated copper cable as per technical specification (lead metallic sheath and PE outer sheathed with graphite coating suitable for low temperature upto -45° C and short circuit current 40kA for 1 sec) including one spare cable as per technical specification	kM	4		0.00	0.00
ii	85367000		18%		Cable joints suitable for cable at sl. No. 1 above	Nos	10		0.00	0.00
iii	85359090		18%		Cable end termination(s) alongwith terminating structure No. 1 above as per technical specification	Nos	6		0.00	0.00
iv	85354010		18%		216 kV Lightning Arrestor alongwith terminating structure as per technical specification	Nos	6		0.00	0.00
v					HDPE Pipes					
a)	39174000		18%		200 NB	kM	4		0.00	0.00
b)	39174000		18%		40 NB	kM	1		0.00	0.00
c)	39174000		18%		Terminal connectors	LS	1		0.00	0.00

Sl. No.	HSN Code	Whether HSN in column'2' is confirm. If not indicate applicable HSN*	Rate of GST Applicable (%)	Whether rate of GST in column'4' is confirm. If not indicate applicable GST*	Item Description	Unit	Qty.	Unit Ex-works price(excluding GST)	Total Ex-works price(excluding GST)	GST Tax as Confirmed by Bidder
1	2	3	4	5	6	7	8	9	10=9x8	11
d)			18%		Miscellaneous installation materials for Cable laying, jointing and bonding including link boxes, sheath Voltage limiters, earth continuity cable, earthing material, ground mat, cables makers, warning tapes and all other materials etc required as per technical specifications and as per statutory requirements for 1 ckt Km	LS	1		0.00	0.00

Sl. No.	HSN Code	Whether HSN in column '2' is confirm. If not indicate applicable HSN*	Rate of GST Applicable (%)	Whether rate of GST in column '4' is confirm. If not indicate applicable GST*	Item Description	Unit	Qty.	Unit Ex-works price(excluding GST)	Total Ex-works price(excluding GST)	GST Tax as Confirmed by Bidder
1	2	3	4	5	6	7	8	9	10=9x8	11
7.0					MANDATORY SPARES (XLPE Cable)					
i			18%		Cable joint	No.	1		0.00	0.00
ii	85369030		18%		Link Box	No.	1		0.00	0.00
iii	85354000		18%		Sheath Voltage Limiter	No.	1		0.00	0.00
iv	85359090		18%		Cable termination	No.	1		0.00	0.00
TOTAL										
TOTAL EX-Works PRICE									0.00	
TOTAL Ex Works TYPE TEST CHARGES As Per Schedule- 7									0.00	
TOTAL EX-Works PRICE Including Type Test Charges									0.00	
GST Tax as Confirmed by Bidder as per Schedule-1										0.00
GST Tax as Confirmed by Bidder as per Schedule-7										0
GST Tax as Confirmed by Bidder										0.00
Note :	Specify amount of GST on the transaction between contractor and employer.									
	1) To facilitate the bidders, Employer has indicated an HSN/SAC code and rate of GST against each item in the Price Schedule except for some of lumpsum quantities/lot/Set as mentioned at ITB 11.3.2. It shall entirely be the responsibility of the bidder to check the HSN/SAC code and rate of GST given against each item. The bidder may either confirm the HSN/SAC and rate of GST or if the bidder opts to classify the item in question under a different HSN/SAC code or opts to indicate a different rate of GST, bidder may indicate the same in the columns provided. The bidder shall solely be responsible for HSN/SAC classification and the rate of GST for each item. Employer's liability for reimbursement/payment of GST shall be lower of the GST applicable at the rate as confirmed/deemed confirmed in the bid or actual GST paid/payable by the bidder for that item.									
	2) For Supply of plants & equipment and Services from within India, HSN/SAC has not been indicated for some of lumpsum quantities/lot/Set as each of these consists of many items for which billing break up shall be furnished during contract execution. For the purpose of evaluation, the bidder has to indicate the rate of GST applicable on these items. As it is possible that the incidence of GST on each of these items may be different, provision has been made in the price schedules for quoting the bid price in different categories based on the incidence of GST. The bidder shall accordingly quote price in different tax categories. HSN /SAC for these items shall be furnished along with billing breakup prior to payment for these items. Employer's liability for reimbursement/payment of GST shall be lower of the GST applicable at the rate as confirmed/deemed confirmed in the bid or actual GST paid/payable by the bidder for that item.									
	3) In case the bidder leaves the cell of confirmation of the HSN code and/or GST rate "blank", the HSN code and corresponding GST rate indicated by the Employer shall be deemed to be the one confirmed by the Bidder.									
	4) HSN stands for Harmonized System of Nomenclature and SAC stands for Service Accounting Code, used for classification of Goods for GST purpose..									
Date :	-----					Printed Name :	--			
Place :	0					Designation:	0			

Sl. No.	HSN Code	Whether HSN in column'2' is confirm. If not indicate applicable HSN*	Rate of GST Applicable (%)	Whether rate of GST in column'4' is confirm. If not indicate applicable GST*	Item Description	Unit	Qty.	Unit Ex-works price(excluding GST)	Total Ex-works price(excluding GST)	GST Tax as Confirmed by Bidder
1	2	3	4	5	6	7	8	9	10=9x8	11

Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik				Schedule - 2	
"Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages". Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik					
(SCHEDULE OF RATES AND PRICES)					
Bidder's Name and Address :			To: REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India)ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in		
Name :					
Address :					
LOCAL TRANSPORTATION, INSURANCE AND OTHER INCIDENTAL SERVICES					
All Prices are in Indian Rupees.					
Sl. No.	Description	Unit	Quantity	Unit Freight, In-transit, Insurance, Loading & Unloading Charges	Total Freight, In-transit, Insurance, Loading & Unloading Charges
1	2	3	4	5	6 = 4 x 5
Drass (Gantry) to Kochik Transmission Line					
1.0	TOWERS				
1.1	Fabrication, galvanizing & supply of various type of tower & tower parts, tower extensions (complete), Gantry excluding bolts & nuts, step bolts and stubs but including hangers, D-Shackles, pack washers etc.				
	Normal Towers				
	I) Mild Steel (Grade C)	MT	5240		0.00
1.2	Fabrication, galvanizing & supply of stubs & cleats of various type of towers, tower extensions (complete) excluding bolts & nuts				
	I) Mild Steel (Grade C)	MT	210		0.00
1.3	Supply of bolts and nuts including step bolts and spring washers				
	i) For Towers & tower extns.				
	(a) Hexagonal Bolts & Nuts including Step Bolts	MT	273		0.00
	ii)For stubs	MT	6		0.00
2.1	Fabrication, galvanizing & supply of steel parts Channel /angle/ sections for grillage foundation (including stub reinforcements, frames etc.) for various type of towers with pack washers excluding supply of bolts & nuts				
	i) Mild Steel	MT	272		0.00
2.2	Supply of Bolt & Nuts (Hexagonal) for grillage foundations	MT	5		0.00
2.0	Supply of earthing of towers				
	a) Pipe type earthing	Nos.	42		0.00
	b) Counterpoise type (120 m length)	Nos.	138		0.00
	c) Shielding Earthwire including PG clamps, Downlead clamps but excluding earthwire bits	Nos.	42		
	i) Pipe type earthing	Sets			0.00
	ii) Counterpoise type earthing	Sets	5		0.00
3.0	Supply of following tower accessories		6		
	a) Danger plate	Nos.			0.00
	b) Number plate	Nos.	233		0.00
	c) Phase Plate (Set of three)	Sets.	233		0.00
	d) Circuit Plate (Set of two)	Sets	466		0.00
	e) Anticlimbing device	Nos.	233		0.00
	f) Bird Guards (Set of three)	Sets.	233		0.00
4.0	Design, manufacture and supply of the following line materials		18		
4.1	ACSR "DEER" Conductor	Kms.			0.00
4.2	7/4.27mm G.S. Earthwire	kms.	196		0.00
	OPGW , Approach Cable etc		65		
4.3 (a)	Optical Fiber Ground Wire 24 Fibres DWSM) For very heavy snow hilly terrain	Kms.			0.00

Click to Sch. 3

Sl. No.	Description	Unit	Quantity	Unit Freight, In-transit, Insurance, Loading & Unloading Charges	Total Freight, In-transit, Insurance, Loading & Unloading Charges
1	2	3	4	5	6 = 4 x 5
(b)	FODP 48F: Indoor type rack mounted with FCPC coupling and pig tails (5 mtrs each) - 1 No. for each end	Nos.	67		0.00
(c)	Fibre Optic Approach cable 24 Fibre (DWSM) - 1km for each end	Kms.	48		0.00
d)	Installation hardware set for above 24 Fibre, fibre optic approach cable - 1 No. for each end	Set	1		0.00
4.4	DISC INSULATORS		1		
	120KN	Nos.			0.00
	160KN	Nos.	7075		0.00
4.5	Hardware fittings (Grade C)		60456		
	a) Double 'I' Suspension Insulator string (2x120KN)for ACSR "DEER"	Sets			0.00
	b) Single suspension string (Pilot) (1x120KN) for ACSR "DEER"	Sets	28		0.00
	c) Single tension string for ACSR "DEER"	Sets	227		0.00
	d) Double Tension String (2x160KN) for ACSR "DEER"	Sets	0		0.00
4.6	Accessories for Conductor & OPGW		1374		
i)	Midspan Compression Joint for ACSR 'DEER' Conductor	Nos.			0.00
ii)	Repair Sleeves for ACSR DEER Conductor	Nos.	120		0.00
iii)	Flexible Copper bonds	Nos.	40		0.00
iv)	Vibration Damper for ACSR 'DEER' Conductor	Nos.	285		0.00
v)	Mid span compression joint for 7/4.27mm E/W	Nos.	2776		0.00
vi)	Vibration Damper for earthwire	Nos.	36		0.00
vii)	Suspension clamp assembly for E/W	Nos.	926		0.00
viii)	Tension clamp assembly for E/W	Nos.	10		0.00
ix)	Vibration Damper for OPGW	Nos.	454		0.00
x)	Tension assembly set for OPGW		926		
a)	Dead end Assembly	Nos.			0.00
b)	Double Tension assembly at joint location	Nos.	2		0.00
c)	Double Tension Pass Through Assembly	Nos.	33		0.00
xi)	Suspension assembly for OPGW	Nos.	419		0.00
xii)	Download Clamps for OPGW	Nos.	10		0.00
xiii)	Terminal Box for OPGW	Nos.	136		0.00
xiv)	Joint Box for OPGW	Nos.	1		0.00
5	River Crossing Towers		17		
5.1	Fabrication, galvanising and supply of special river crossing tower parts including stub/base plate, anchor bolt, platforms,ladders, hangers, D-shackles, gusset plates, pack plates & pack washers excluding bolts & nuts				
	a) Mild Steel Sections	MT			
	b) High Tensile Steel sections	MT	NIL		
5.2	Supply of bolts & nuts and step bolt	MT	NIL		
5.3	Supply of following items for aviation requirements		NIL		
	i) Span markers	Nos.			0.00
	ii) Obstruction lights (to be provided as per IS 5613)		12		
	a) 1 Medium + 2low intensity	Sets.			0.00
	b) 1 Medium + 4low intensity	Sets.	12		
5.4	Test Equipment		NIL		
a)	OTDR (Optical time Domain Reflectometer) for 1310/1550nm with laser source Equivalent to Anritsu MW 9076B1 or better	No.			0.00

Sl. No.	Description	Unit	Quantity	Unit Freight, In-transit, Insurance, Loading & Unloading Charges	Total Freight, In-transit, Insurance, Loading & Unloading Charges
1	2	3	4	5	6 = 4 x 5
b)	Optical Attenuators (Variable 1310/1550nm) Equivalent to JDSU OLA55 or better	No.	1		0.00
c)	Optical Power meter (1310/1550nm) with laser source Equivalent to JDSU OLP55 or better	No.	1		0.00
d)	Laser Light Source (Equivalent to EXFO FLS300-23BL or better)	No.	1		0.00
e)	Optical Talk Set - Equivalent to JDSU OTS 55 or better	No.	1		0.00
f)	Optical Fiber Fusion Splicer incl. Fibre cleaver Equivalent to Sumitomo T-39-SE or better	No.	1		0.00
g)	Calibrated Fibre	No.	1		0.00
h)	Connectorization kit (FIS - FI - 0053- FC - INST or equivalent)	No.	1		0.00
i)	Splice Kit (FIS - FI - 0053 -FF or equivalent)	No.	1		0.00
j)	Optical test accessory kit including all necessary connectors, adaptors, cables, terminations and other items required for testing (FIS - FI-0053-TS-ST or equivalent)	No.	1		0.00
6	220 kV XLPE Cable				
i	220 kV grade 1 core, 800sq.mm.XLPE insulated copper cable as per technical specification (lead metallic sheath and PE outer sheathed with graphite coating suitable for low temperature upto -45° C and short circuit current 40kA for 1 sec) including one spare cable as per technical specification	kM	4		0.00
ii)	Cable joints suitable for cable at sl. No. 1 above	Nos	10		0.00
iii	Cable end termination(s) alongwith terminating structure No. 1 above as per technical specification	Nos	6		0.00
iv	216 kV Lightning Arrestor alongwith terminating structure as per technical specification	Nos	6		0.00
v	HDPE Pipes				
a	200 NB	kM	4		0.00
b	40 NB	kM	1		0.00
vi	Terminal connectors	LS	1		0.00
vii	Miscellaneous installation materials for Cable laying, Jointing and bonding including link boxes, sheath Voltage limiters, earth continuity cable, earthing material, ground mat, cables makers, warning tapes and all other materials etc required as per technical specifications and as per statutory requirements for 1 ckt Km	LS	1		0.00
7	MANDATORY SPARES (XLPE Cable)				
i	Cable joint	No.	1		0.00
ii	Link Box	No.	1		0.00
iii	Sheath Voltage Limiter	No.	1		0.00
iv	Cable termination	No.	1		0.00
TOTAL					0.00
Grand Total of Schedule-2				0.00	
Note : Bidders to note that , the prices to be quoted in price schedule-2(F&I) shall be towards local transpotation, Insurance and other Incidental Services only in line with Clause ITB 11.4(b)					
Date :	.....	Printed Name:	.....		
Place :	.....	Designation:	...		

Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik	Schedule - 3

"Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages".
Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik

Click to Sch. 4

(SCHEDULE OF RATES AND PRICES)											
Bidder's Name and Address :						To: REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Website: www.rectpcl.in					
Name :											
Address :											
INSTALLATION CHARGES											
All Prices are in Indian Rupees.											
Sl. No.	(SAC) Service Accounting Code	Whether SAC in column'2' is confirm. If not indicate applicable SAC*	Rate of GST Applicable (%)	Whether rate of GST in column'4' is confirm. If not indicate applicable GST*	Description	Unit	Quantity	Unit Erection Charges	Total Erection Charges	Total GST as confirmed by Bidder	
1	2	3	4	5	6	7	8	9	10=8x9	11	
Drass (Gantry) to Kochik Transmission Line											
1.0					Survey						
	998344		18%		a)Detailed survey including profiling, tower spotting	Kms.	64		0.00	0.00	
	998344		18%		b) Check Survey	Kms.	64		0.00	0.00	
2.0					Soil Investigation						
2.1					Detailed Soil Investigation						
	998342		18%		i)All kinds of soil except fissured rock & hard rock	Loc.	5		0.00	0.00	
	998342		18%		ii)Fissured Rock	Loc.	10		0.00	0.00	
	998342		18%		iii) Hard Rock	Loc.	8		0.00	0.00	
	998342		18%		iv)Special/River Crossing Location	Loc.	1		0.00	0.00	
3.0					Erection of various type of towers,tower parts and tower extension (complete) with bolts and nuts, including tack welding and supply and application of zinc rich primer and two coats of enamel paint						
	995455		18%		a) Normal Tower	MT	5,450		0.00	0.00	
					b) River Crossing Tower						
4.0	995455		18%		Installation of steel grillage foundation, Stub reinforcement / frames etc. (including all related works associated with foundation.)	MT	277		0.00	0.00	
5.0					Benching						
					i)All kinds of soil except fissured rock & hard rock	CUM	4,982		0.00	0.00	
					ii)Fissured Rock	CUM	11,228		0.00	0.00	
					iii) Hard Rock	CUM	9,093		0.00	0.00	
6.0					Work associated with tower foundations (excluding river crossing foundations)						
6.1					Excavation in various type of Soils						
	995433		18%		i) Dry Soil	CUM	9,013		0.00	0.00	
	995433		18%		ii)Wet Soil	CUM	3,953				
	995433		18%		iii)Dry fissured Rock	CUM	19,197		0.00	0.00	
	995433		18%		iv) Wet Fissured Rock	CUM	7,003				
	995433		18%		v) Hard Rock	CUM	3,248		0.00	0.00	
6.2					Concreting (including all associated works related to foundation not covered in 5.1 & 5.3)						
	995454		18%		i) Nominal Concrete mix 1:1.5:3	CUM	6,525		0.00	0.00	
	995454		18%		ii) Nominal Concrete mix 1:3:6	CUM	715		0.00	0.00	
6.3	995454		18%		Supply and placement of reinforcement steel (Fe 500)	MT	657		0.00	0.00	
6.4	995455		18%		Installation of stub including bolts & nuts, Foundation Bolts for Special tower in avalanche Prone area	MT	279		0.00	0.00	
7.0					Protection of tower Footings (supply and installation)						
	995456		18%		a) Random rubble stone masonry including excavation (1:5 cement mortar)	CUM	13,500		0.00	0.00	
	995455		18%		b) Revetment of pack 6" & above stone/boulders in heavily coated GI 4mm dia performed wire mesh size 100 mmx100mm.	CUM	4,300		0.00	0.00	

Sl. No.	(SAC) Service Accounting Code	Whether SAC in column 2' is confirm. If not indicate applicable SAC*	Rate of GST Applicable (%)	Whether rate of GST in column 4' is confirm. If not indicate applicable GST*	Description	Unit	Quantity	Unit Erection Charges	Total Erection Charges	Total GST as confirmed by Bidder
1	2	3	4	5	6	7	8	9	10=8x9	11
	995454		18%		c) M 15 Nominal mix (1:2:4) concrete for top seal cover of revetment	CUM.	135		0.00	0.00
	995456		18%		d) Backfilling and gap levelling of volumes enclosed by revetment	CUM	4,850		0.00	0.00
8.0					Installation of Earthing for towers					
	995468		18%		a) Pipe type earthing	Nos	42		0.00	0.00
	995468		18%		b) Counterpoise type earthing (120m)	Nos	138		0.00	0.00
	995468		18%		c) Counterpoise type earthing (280m)	Nos	42		0.00	0.00
					d) Shielding Earthwire including PG clamps, Downlead clamps but excluding earthwire bits					
	995468		18%		j) Pipe type earthing	sets	5		0.00	0.00
	995468		18%		ii) Counterpoise type earthing	sets	6		0.00	0.00
9.0					Installation of tower accessories					
	995444		18%		a) Danger plate	Nos.	233		0.00	0.00
	995444		18%		b) Number plate	Nos.	233		0.00	0.00
	995444		18%		c) Phase Plate (Set of three)	Sets.	466		0.00	0.00
	995444		18%		d) Circuit Plate (Set of two)	Sets	233		0.00	0.00
	995444		18%		e) Anticlimbing device	Nos.	233		0.00	0.00
	995444		18%		f) Bird Guards (Set of three)	Sets.	18		0.00	0.00
10.0					Installation of insulator strings complete with arcing horns and necessary hardware, installing and stringing of conductor including fixing of conductor accessories, installing and stringing of OPGW,earthwire including fixing of OPGW, earthwire accessories for the line.					
a)					Normal Stretch					
	995468		18%		i) Single circuit	Kms.	64		0.00	0.00
	995468		18%		ii) Double circuit	Kms.	0		0.00	0.00
b)	995468		18%		River Crossing stretch(Double Circuit)	Kms	0		0.00	0.00
11.0					Aviation requirements					
11.1					Painting of towers					
a)	995473		18%		Normal tower	MT	9		0.00	0.00
b)	995473		18%		River Crossing Tower	MT	0			
11.2					Installation of following					
i)	995461		18%		Span Marker	Nos.	12		0.00	0.00
ii)					Obstruction lights (to be provided as per IS5613)					
	995461		18%		a) 1 Medium + 2 low intensity	Sets.	12		0.00	0.00
	995461		18%		b) 1 Medium + 4 low intensity		0			
12					Optical Fiber Cabling					
a					Installation of FODP					
	998336		18%		FODP 48F: Indoor type, rack mounted with FCPC coupling and pig tails (5 mtrs each) - One at each end	Nos.	1		0.00	0.00
b					Installation of Fibre Optic approach cable					
i)	998336		18%		24 Fibre (DWSM) Fibre Optic approach Cable (1 Km at each end)	Kms	1		0.00	0.00
ii)	998336		18%		Installation hardware set for above 24 Fibre, fibre optic approach cable - 1 No. for each end	Set	1		0.00	0.00
13					220 kV XLPE Cable				0.00	0.00
i)			18%		Route survey of the entire route length & clearances from relevant authorities for laying of cables.	KM	1		0.00	0.00
ii)			18%		Laying of 220 kV grade, 1 core, 800sq.mm.XLPE insulated copper cable in HDPE pipes as per technical specification	KM	4		0.00	0.00
iii)			18%		Laying of one(1) no Fibre Optic cables alongwith joints as per technical specification	KM	1		0.00	0.00
					Laying & installation of HDPE pipes (as per technical specification)					
iv)			18%		200 NB	KM	4		0.00	0.00
v)			18%		40 NB	KM	1		0.00	0.00
vi)			18%		Cable joints for 220 kV grade,1C x 800 sq.mm. XLPE insulated copper cables	LS	1		0.00	0.00

Sl. No.	(SAC) Service Accounting Code	Whether SAC in column '2' is confirm. If not indicate applicable SAC*	Rate of GST Applicable (%)	Whether rate of GST in column '4' is confirm. If not indicate applicable GST*	Description	Unit	Quantity	Unit Erection Charges	Total Erection Charges	Total GST as confirmed by Bidder
1	2	3	4	5	6	7	8	9	10=8x9	11
vii)			18%		Erection of miscellaneous installation materials for Cable laying, jointing and bonding including link boxes ,sheath Voltage limiters, earth continuity cable, earthing material ,ground mat, cables makers, warning tapes and all other materials etc required as per technical specifications and as per statutory requirements	LS	1		0.00	0.00
viii)			18%		Erection of Cable end termination(s) alongwith terminating structure for cable(s) as per technical specification	Nos.	6		0.00	0.00
ix)			18%		Erection of 216 kV Lightning Arrestor alongwith terminating structure as per technical specification	Nos.	6		0.00	0.00
x)			18%		Terminal connectors	LS	1		0.00	0.00
xi)			18%		Construction of buried cable trench along with excavation, PCC, back filling, restoration and construction of jointing bays (as per requirement) etc. as per technical specification	KM	1		0.00	0.00
xii)			18%		Road crossing through HDPE pipes in trenchless digging and restoration as per specification	Mtr	1		0.00	0.00
Grand Total of Schedule-3									0.00	
Total GST as confirmed by Bidder										0.00
Note :										
1) To facilitate the bidders, Employer has indicated an HSN/SAC code and rate of GST against each item in the Price Schedule except for some of lumpsum quantities/lot/Set as mentioned at ITB 11.3.2. It shall entirely be the responsibility of the bidder to check the HSN/SAC code and rate of GST given against each item. The bidder may either confirm the HSN/SAC and rate of GST or if the bidder opts to classify the item in question under a different HSN/SAC code or opts to indicate a different rate of GST, bidder may indicate the same in the columns provided. The bidder shall solely be responsible for HSN/SAC classification and the rate of GST for each item. Employer's liability for reimbursement/payment of GST shall be lower of the GST applicable at the rate as confirmed/deemed confirmed in the bid or actual GST paid/payable by the bidder for that item.										
2) For Supply of plants & equipment and Services from within India, HSN/SAC has not been indicated for some of lumpsum quantities/lot/Set as each of these consists of many items for which billing break up shall be furnished during contract execution. For the purpose of evaluation, the bidder has to indicate the rate of GST applicable on these items. As it is possible that the incidence of GST on each of these items may be different, provision has been made in the price schedules for quoting the bid price in different categories based on the incidence of GST. The bidder shall accordingly quote price in different tax categories. HSN /SAC for these items shall be furnished along with billing breakup prior to payment for these items. Employer's liability for reimbursement/payment of GST shall be lower of the GST applicable at the rate as confirmed/deemed confirmed in the bid or actual GST paid/payable by the bidder for that item.										
3) In case the bidder leaves the cell of confirmation of the SAC code and/or GST rate "blank", the SAC code and corresponding GST rate indicated by the Employer shall be deemed to be the one confirmed by the Bidder.										
4) HSN stands for Harmonized System of Nomenclature and SAC stands for Service Accounting Code, used for classification of Goods for GST purpose.										
Date :					Printed Name:					
Place :					Designation: ...					

Package 03- RECTPCL/PIA/JKPPD/TL-03: 220 kV Drass to Kochik										
"Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPPD under PMDP Scheme-15 for the following packages". Package 03- RECTPCL/PIA/JKPPD/TL-03: 220 kV Drass to Kochik										
(SCHEDULE OF RATES AND PRICES)										
Bidder's Name and Address :					To: Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in					
Name :										
Address :										
Traning Charges for Traning to be imparted .										
All Prices are in Indian Rupees.										
Sl. No.	SAC (Service Accounting Codes)	Whether SAC in column'2' is confirm. If not indicate applicabl e SAC*	Rate of GST applicable (in %)	Whether rate of GST in column'4' is confirm. If not indicate applicable GST*	Description	Unit	Quantity	Unit Chargers	Total Traning Charges excludng GST	Total GST as Confirmed by Bidder
1	2		3		4	5	6	7	8= 6x7	
1										
1	NOT APPLICABLE									
Total Traning Charges									0	
Total GST as Confirmed by Bidder										0
Date Place	.....				Printed Name:		----			
	.....				Designation :		---			



Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik		
"Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages". Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik		
SUMMARY OF TAXES & DUTIES APPLICABLE ON PLANT & EQUIPMENT		
Bidder's Name and Address :		To:
Name :		REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India)
Address :		ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Website: www.rectpcl.in
All Prices are in Indian Rupees.		
Sl. No.	Item Nos.	Total Price (INR)
	TOTAL GST ON GOODS	
1	Total GST for Supply of Goods (inter-alia including Type Test Charges) between the Contractor and the Employer (identified in Schedule 1') which are not included in the Ex-works price as per the provision of the Bidding Documents, as applicable.	0.00
	TOTAL GST ON SERVICES	
2	Total GST on Installation Services (Schedule-3) and Training to be imparted in India (Schedule-4)	0.00
	GRAND TOTAL [1+2]	0.00
Date :	.....	Printed Name:
Place :	.....	Designation :


Click to Sch. 7

Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik		
"Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages". Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik		
(GRAND SUMMARY)		
Bidder's Name and Address :		To: REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in
Name :		
Address :		
Sl. No.	Description	Total Price (INR)
1	TOTAL SCHEDULE NO. 1	0.00
	Ex-works price of Plant and Equipment including Type Test Charges	
2	TOTAL SCHEDULE NO. 2	0.00
	Local Transportation, In-transit Insurance, loading and unloading	
3	TOTAL SCHEDULE NO. 3	0.00
	Installation Charges	
4	TOTAL SCHEDULE NO. 4	0.00
	Training Charges	
5	TOTAL SCHEDULE NO. 5	0.00
	Taxes and Duties	
6	TOTAL SCHEDULE NO. 7	0.00
	Type Test Charges [Total of this Schedule is included in Schedule - 1 above.]	
	GRAND TOTAL [1+2+3+4+5]	0.00
Date : --	.....	Printed Name
Place :	.....	Designation ...

Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik		Schedule-6(After Discount)
"Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages". Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik		
(GRAND SUMMARY: AFTER DISCOUNT)		
Bidder's Name and Address :		To: REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectpcl.in
Name :		
Address :		
Sl. No.	Description	Total Price (INR)
1	TOTAL SCHEDULE NO. 1	0.00
	Ex-works price of Plant and Equipment including Type Test Charges	
2	TOTAL SCHEDULE NO. 2	0.00
	Local Transportation, In-transit Insurance, loading and unloading	
3	TOTAL SCHEDULE NO. 3	0.00
	Installation Charges	
4	TOTAL SCHEDULE NO. 4	0.00
	Training Charges	
5	TOTAL SCHEDULE NO. 5	0.00
	Taxes and Duties	
6	TOTAL SCHEDULE NO. 7	0.00
	Type Test Charges [Total of this Schedule is included in Schedule - 1 above.]	
	GRAND TOTAL [1+2+3+4+5]	0.00
Date : --	Printed Name	.....
Place :	Designation	...

Package 03- RECTPCL/PIA/JRPDD/TL-03: 220 kV Drass to Kochik					Schedule-7					
*Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages". Package 03- RECTPCL/PIA/JRPDD/TL-03: 220 kV Drass to Kochik										
(SCHEDULE OF RATES AND PRICES)										
Bidder's Name and Address :							To: REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a Navratna CPSE) Under the Ministry of Power, Govt of India) REC House, 3rd Floor, Annex - II, 28 A, K G MARG, NEW DELHI - 110 001 Website: www.rectplin			
Name :										
Address :										
TYPE TESTS/CHARGES										
All Prices are in Indian Rupees.										
Sl. No.	SAC Code	Whether SAC in column 2 is confirm. If not indicate applicable SAC*	Rate of GST Applicable (%)	Whether rate of GST in column 4 is confirm. If not indicate applicable GST*	Description	Unit	Qty.	Unit Ex-works price(excluding GST)	Total Ex-works price(excluding GST)	Total GST as confirmed by Bidder
1	2	3	4	5	6	7	8	9	10=8*9	11
NOT APPLICABLE										
Grand Total of Schedule-7									0	
Total GST as confirmed by Bidder									0	
Date		Printed Name								
Place		Designation								

Click to Discount



LETTER OF DISCOUNT			
To: REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Website: www.rectpcl.in			
Subject:	"Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages". Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik		
Dear Sir			
With reference to the subject tender, we hereby offer unconditional discount on the prices quoted by us as per details given here below :			
1	Discount on lum-sum basis on the Schedules as given below : [The discount shall be proportionately applicable on all the relevent items of the respective Schedules.] In Percent (%)		
	Schedule-1: Ex Works prices	In Percent %	
	Schedule-2 : Freight & Insurance	In Percent %	
	Schedule-3 : Erection Charges	In Percent %	
	Schedule-4 : Training Charges	In Percent %	
	Schedule-7 : Type Test Charges	In Percent %	
Please consider this letter of discount as the integral part of our price bid.			
		Yours faithfully,	
		For and on behalf of	
Date :	.....	Printed Name :	.....
Place :	.....	Designation :	...

BID FORM (Second Envelope)			
Bid Proposal Ref. No.			
To Additional Chief Executive Officer, REC Transmission Projects Company Limited (A wholly owned subsidiary of REC, a 'Navratna CPSE' Under the Ministry of Power, Govt of India) ECE House, 3rd Floor, Annexe – II, 28 A, K G MARG, NEW DELHI – 110 001 Website: www.rectpcl.in			
Name of Contract :		"Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for the following packages". Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik	
Dear Ladies and/or Gentlemen,			
1.0	In continuation of First Envelope of our bid, we hereby submit the Second Envelope of the Bid, both of which shall be read together and in conjunction with each other, and shall be construed as an integral part of our Bid. Accordingly, we the undersigned, offer to design, manufacture, test, deliver, install and commission (including carrying out Trial Operation, Performance & Guarantee Test as per provision of Technical Specification) under the above named package in full conformity with the said Bidding Documents for the sum of Rs (In below mentioned cell)		
	0.00	Fill the Amount in words	
or such other sums as may be determined in accordance with the terms and conditions of the Bidding Documents. The above amounts are in accordance with the price schedules attached herewith and are made part of this bid.			
2.0	Price Schedules		
2.1	In line with the requirements of the Bidding documents, we enclose herewith the following Price Schedules, duly filled - in as per your proforma:		
	Schedule 1	Plant and Equipment (Including Mandatory Spare Parts) to be supplied, including Type Test Charges.	
	Schedule 2	Local Transportation, In-transit Insurance, loading and unloading	
	Schedule 3	Installation Charges.	
	Schedule 4	Training charges for training to be imparted.	
	Schedule 5	GST not included in Schedule 1 & 3	
	Schedule 6	Grand Summary [Schedule 1 to 5]	
	Schedule 7	Break-up of Type Test Charges for Type Tests to be conducted	
2.2	We are aware that the Price Schedules do not generally give a full description of the Work to be performed under each item and we shall be deemed to have read the Technical Specifications and other sections of the Bidding Documents and Drawings to ascertain the full scope of Work included in each item while filling-in the rates and prices. We agree that the entered rates and prices shall be deemed to include for the full scope as aforesaid, including overheads and profit.		
2.3	We declare that as specified in Clause 11.5, Section –II:ITB, Vol.-I of the Bidding Documents, prices quoted by us in the Price Schedules shall be subject to Price Adjustment during the execution of Contract in accordance with Appendix-2 (Price Adjustment) to the Contract Agreement.		
2.4	We understand that in the price schedules, where there are errors between the total of the amounts given under the column for the price Breakdown and the amount given under the Total Price, the former shall prevail and the latter will be corrected accordingly. We further understand that where there are discrepancies between amounts stated in figures and amounts stated in words, the amount stated in words shall prevail. Similarly, any discrepancy in the total bid price and that of the summation of Schedule price (price indicated in a Schedule indicating the total of that schedule), the total bid price shall be corrected to reflect the actual summation of the Schedule prices.		

2.5	We declare that items left blank in the Schedules will be deemed to have been included in other items. The TOTAL for each Schedule and the TOTAL of Grand Summary shall be deemed to be the total price for executing the Facilities and sections thereof in complete accordance with the Contract, whether or not each individual item has been priced.		
3.0	We confirm that except as otherwise specifically provided our Bid Prices in this Second Envelope include all GST and charges as may be assessed on us/our Associate (applicable for Foreign Bidder), our Sub-Contractor/Sub-Vendor or their employees by all municipal, state or national government authorities in connection with the Facilities, in and outside of India.		
3.1	100% of applicable GST which are payable by the Employer under the Contract, shall be reimbursed by the Employer on production of satisfactory documentary evidence by the Contractor in accordance with the provisions of the Bidding Documents.		
3.2	We further understand that notwithstanding 3.0 above, in case of award on us, you shall also bear and pay/reimburse to us, GST applicable on supplies by us to you, imposed on the Plant & Equipment including Mandatory Spare Parts to be incorporated into the Facilities including Type Test charges for Type test to be conducted specified in Schedule No. 1, Installation Services specified in Schedule No. 3 and Charges for Training to be imparted specified in Schedule No. 4 of the Price Schedule in this Second Envelope by the Indian Laws.		
3.3	We confirm that we have also registered/we shall also get registered in the GST Network with a GSTIN, in all the states where the project is located and the states from which we shall make our supply of goods.		
4.0	# (For Joint Venture only) We, the partners of Joint Venture submitting this bid, do agree and confirm that in case of Award of Contract on the Joint Venture, we shall be jointly and severally liable and responsible for the execution of the Contract in accordance with Contract terms and conditions.		
5.0	We, hereby, declare that only the persons or firms interested in this proposal as principals are named here and that no other persons or firms other than those mentioned herein have any interest in this proposal or in the Contract to be entered into, if the award is made on us, that this proposal is made without any connection with any other person, firm or party likewise submitting a proposal is in all respects for and in good faith, without collusion or fraud.		
Thanking you, we remain,			
			Yours faithfully,
			For and on behalf of
			Signature :
Date :			Printed Name :
Place :			Designation :
In case of bid from a Joint Venture, Name & designation of representative of JV partner is to be provided and Bid Form is also to be signed by him.			
Printed Name :	.....		
Designation :	...		
Please provide additional information of the Bidder			
Business Address :			
Country of Incorporation :			
State/Province to be indicated :			
Name of Principal Officer :			
Address of Principal Officer :			
Note: Bidders may note that no prescribed proforma has been enclosed for Attachment 2 : Power of Attorney. Bidders may use their own proforma for furnishing the required information with the bid.			