OPEN TENDER NOTIFICATION

FOR

Supply, Installation, Testing and Commissioning of 220KV 1-Core 1600Sqmm Copper XLPE Lead Sheath Cable along with associated accessories for 110KV Carnac-Grant Road line Cable replacement Project in Mumbai.

Tender Enquiry No: CC25NP020
(Please note this reference number must be quoted in all submission pertaining to this tender)

The Tata Power Company Limited (Tata Power)
Corporate Contracts,

Smart Center of Procurement Excellence,
2nd Floor, Sahar Receiving Station, Near Hotel Leela,
Sahar Airport Road, Andheri (E), Mumbai 400 059

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Procedure for Participating in Tender

Tender Enquiry No.	Work Description	EMD (Rs.)	Tender Participation Fee	Last date and time for Payment of Tender Participation Fee*	Last date and time for bid submission
CC25NP020	SITC of 220KV 1CX1600Sqmm Copper XLPE Lead sheath Cable along with associated accessories for 110KV Carnac-Grant road line cable replacement project in Mumbai	Rs. 50,00,000/-	Rs. 2000/-	15th July 2024 1500 Hrs	26th July 2024 1500 Hrs

***Interested bidders are strongly advised not to wait by above time and purchase the tender immediately to get the link for bid submission. This will enable them to communicate/raise queries against the subject tender in time.**

Procedure for Participating in Tender. Following steps to be done before last date for purchase of tender,

1. Interested Vendors to refer to the Section C of the tender (Prequalification criteria).
2. Eligible and Interested Bidders to submit duly signed and stamped letter on Bidder's letterhead indicating.
    a. Tender Enquiry number
    b. Name of authorized person
    c. Contact number
    d. e-mail id
    e. Details of submission of Tender Participation Fee
3. Non-Refundable Tender Participation Fee, as indicated in table above, to be submitted in the form of Direct deposit in the following bank account and submit the receipt along with a covering letter clearly indicating the Tender Reference number –

    Beneficiary Name – The Tata Power Co. Ltd.

    Bank Name – HDFC Bank Ltd.

    Branch Name – Fort Branch, Mumbai

    Address – Maneckji Wadia Building, Nanik Motwani Marg, Fort, Mumbai 400023.

    Branch Code – 60

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Bank & Branch Code – 400240015

Account No – 00600110000763

Account type – CC

IFSC Code – HDFC0000060

E-mail with necessary attachment of 1 and 2 above to be send to naman.patel@tatapower.com with copy to vivek.mittal@tatapower.com before "Last date and time for Payment of Tender Participation Fee"

Interested bidders to submit Tender Participation Fee and Authorization Letter before Last date and time as indicated above after which link from Tata Power E-Tender system (Ariba) will be shared for further communication and bid submission.

Please note all future correspondence regarding the tender, bid submission, bid submission date extension, Pre-bid query etc will happen only through Tata Power E-Tender system (Ariba). User manual to guide the bidders to submit the bid through e-Tender system (Ariba) is also enclosed.

No e-mail or verbal correspondence will be responded. All communication will be done strictly with the bidder who have done the above steps (Payment of tender fee and submission of letter with requisite details) to participate in the Tender.

Also it may be strictly noted that once date of "Last date and time for Payment of Tender Participation Fee" is lapsed no Bidder will be sent link from Tata Power E-Tender System (Ariba). Without this link vendor will not be able to participate in the tender. Any last moment request to participate in tender will not be acknowledged.

Any payment of Tender Participation Fee / EMD by Bidder who have not done the pre-requisite within stipulated timeline will not be refunded.

Also all future corrigendum's to the said tender, if any, will be informed on Tender section on website https://www.tatapower.com

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*** To be submitted in editable excel format**

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Section A: Tender Notice including Instruction to Bidders

1. Tender Details

1.1 Key Tender Specific Details

Reference Number	**CC25NP020**
Description	**SITC of 220KV 1-Core 1600 Sqmm Copper XLPE lead sheath cable along with associated accessories for 110KV Carnac-Grant Road line Cable replacement project.**
Type of Tender	**Firm Order**
Period	**Till the completion of Contract.**
Tender Fee	**Rs 2,000/-**
Earnest Money Deposit (EMD)	**Rs 50,00,000 /-** **Rs Fifty lakhs Only** **PLEASE NOTE THAT IT IS MANDATORY TO SUBMIT EMD IN THE FORM.**
Price Basis	**Firm Price**
Executive Handling this Tender*	Name: Mr. Naman Patel Contact No.: 9029001594 E-Mail ID: naman.patel@tatapower.com

*You may contact the above personnel from Monday to Friday during office hours only.

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1.2 Calendar of Events

(a)	Access to Tender Documents through Tata Power website	05th July 2024 onwards
(b)	Last date and time for Payment of Tender Participation Fee to get e-tender link for bid submission*	Till 15th July' 2024 1500 Hrs.
(c)	Date & Time of Site visit.	16th July @ 11:00 Hrs
(d)	Last Date of receipt of pre-bid queries, if any.	By 17th July' 2024 1500 Hrs.
(e)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	By 19th July' 2024 1500 Hrs.
(f)	Last date and time of receipt of Bids	By 26th July' 2024 1500 Hrs.

Note: - * Interested bidders are strongly advised not to wait by above time and purchase the tender immediately to get the link for bid submission. This will enable them to communicate/raise queries against the subject tender in time.

These date and time in above calendar of events are as planned and tentative. In case of change the same shall be intimated to Authorized Person of Interested Bidder through E-Tender System.

Please note post submission of Bids relevant communication will be done with Authorized Person of Interested Bidder through E-Tender System.

1.3 Mandatory documents required along with the Bid

1.3.1 Bid Guarantee Fee (EMD) of requisite value and validity. PLEASE NOTE THAT BID GUARANTEE ONLY IN FORM OF BANK GUARANTEE WILL BE ACCEPTED.

1.3.2 Requisite Documents to ascertain fulfilling of Technical and Commercial Pre-Qualification Requirement as detailed in Tender Enquiry.

1.3.3 Technical Submission including Drawings, Type Test details etc. as detailed in Technical Specification.

1.3.4 Required Commercial Submission as detailed in Tender Document

1.3.5 Technical and Commercial Clarification and Deviations as per the format attached in the Tender Enquiry

1.3.6 Proper authorization letter to sign the tender and participate in Tata Power E-Tender system on the behalf of bidder.

Please note that in absence of any of the above documents, the bid submitted by a bidder shall be liable for rejection.

Also please note that whenever editable format are shared it is requested that data be filled in relevant cells. No formatting or addition / deletion of rows / columns to be done. Wherever editable Excel submission are requested the file should be free from references, macros etc.

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Checklist of Document Submission

Stage of Tendering	Document	Type of Format	Mode of submission
Before last date of Pre-Bid Query	Query / Clarification / Deviation (QCD) Format. (F1) Separate Excel sheet to be used for Technical and Commercial Pre-Bid Query	Editable Excel Format	Through message in E-tender system
Bid Submission Envelope 1 (First Part)	**Earnest Money Deposit**	**Original Bank Guarantee**	**In Sealed Envelope**
Bid Submission Envelope 2 (Second Part)	**Documents to be uploaded in Ariba only.** In case of multiple files, a zipped folder can be attached for the same (size limit of 100 MB per zipped file)		
To be submitted Under Tab 2 in Ariba	Duly filled PQR and supporting documents		
	Duly filled PQR format	Editable Excel Format	E-Tender System
	Backup documents for Technical PQR	Signed and Scanned documents	E-Tender System
To be submitted in Ariba	Duly Filled Vendor Registration Form (for unregistered vendor) and supporting documents. Registered vendor to submit letter indicating **Vendor Code** in Tata Power and **factory/supply address** to be used.		
	Duly filled Vendor Registration Form (if vendor is not registered with Tata Power)	Signed and Scanned documents	E-Tender System
	Backup document for Vendor Registration Form (if vendor is not registered with Tata Power)	Signed and Scanned documents	E-Tender System

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To be submitted in Ariba	Technical Submission and Supporting Documents		
	Duly filled Technical Submission Format	Editable Excel Format	E-Tender System
	Technical Submission as required for Technical Specifications	Signed and Scanned documents	E-Tender System
	Duly filled Technical Submission- Type test verification sheet Format	Editable Excel Format	E-Tender System
	Backup documents for Type Test verification	Signed and Scanned documents/ reports	E-Tender System
	Query / Clarification / Deviation (QCD) Format for Deviation if any	Editable Excel Format	E-Tender System
	Duly filled Unpriced Bid Format	Signed and scanned copy of document	E-Tender System
To be submitted in Ariba	Commercial Submission and supporting document		
	Letter of Undertaking (FOR VENDORS NOT REGISTERED WITH TATA POWER)	Scanned Copy of letter of undertaking duly filled, stamped and signed	E-Tender System
	E-auction Undertaking form	Scanned Copy of letter of undertaking duly filled, stamped and signed	E-Tender System
Bid Submission Envelope 3 (Third Part)	Duly filled Priced Bid Format	Duly signed and stamped scanned copy of document. To be entered in E-Tender System	E-Tender System

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1.4 Deviation from Tender

Normally, the deviations to tender terms are not admissible and the bids with deviation are liable for rejection. Hence, the bidders are advised to refrain from taking any deviations on this Tender. Still in case of any deviations, all such deviations shall be set out by the Bidders, clause by clause in the Query / Clarification / Deviation (QCD) Format. Deviations have to be mandatorily submitted in editable Excel sheet Technical and Commercial deviation have to be submitted separately.

Technical or Commercial Deviation should be mentioned in Deviation Format only. Deviation in any other document or Format will not be considered.

1.5 Right of Acceptance/Rejection

1.5.1 Bids are liable for rejection in absence of following: -

1.5.2 Mandatory Documents as listed in 1.3 above

1.5.3 Price Bid as per the Price Schedule mentioned in Tender Document

1.5.4 Receipt of Bid and Response to queries within the due date and time

Tata Power reserves the right to accept/reject any or all the bids without assigning any reason thereof.

1.6 Qualification Criteria

Qualification Requirement expectation and document are detailed in documents in Section C

1.7 Pre-Bid Queries

Pre-Bid Queries if any has to be sent through message in E-Tender System. Pre-Bid Query has to be sent only in the Query / Clarification / Deviation (QCD) Format. Technical Pre-Bid Query and Commercial Pre-Bid Query have to be submitted in Separate Editable Excel File in Prescribed Format. Pre-Bid Queries sent in any other format or send through any other communication channel will not be accepted and answered. Pre-Bid Query have to be sent in the stipulated timeline as defined in the Tender Document. No Pre-Bid Query will be accepted after the due time and date as specified as "Last Date of receipt of pre-bid queries, if any"

1.8 Marketing Integrity

We have a fair and competitive marketplace. The rules for bidders are outlined in the General Condition of Contracts and other parts of Tender Documents. Bidders must agree to these rules prior to participating. In addition to other remedies available, Tata Power reserves the right to exclude a bidder from participating in future markets due to the bidder's violation of any of the rules or obligations contained in the General Condition of Contracts or other part of the Tender Documents. A bidder who violates the marketplace rules or engages in behavior that disrupts the fair execution of the marketplace, may result in restriction of a bidder from further participation in the marketplace for a length of time, depending upon the seriousness of the violation. Examples of violations include, but are not limited to:

- Failure to honor prices submitted to the marketplace
- Breach of terms as published in TENDER
- Submit irrelevant documents or frequently cases of missing documents as part of compliance to Qualifying, Technical or Commercial Requirements causing unnecessary delay in Tender Evaluation

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1.9 Supplier Confidentiality

All information contained in this tender is confidential and shall not be disclosed, published or advertised in any manner without written authorization from Tata Power. This includes all bidding information submitted to Tata Power. All tender documents remain the property of Tata Power and all suppliers are required to return these documents to Tata Power upon request. Suppliers who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

2. Evaluation Criteria

- The bids will be evaluated technically on the compliance to tender terms and conditions.
- The bids will be evaluated commercially on the overall all-inclusive lowest cost for the complete tender BOQ / each line item as calculated in Schedule of Items. Tata Power, however, reserves right to split the order line item wise and/or quantity wise among more than one Bidder. Hence all bidders are advised to quote their most competitive rates against each line item.
- Bidder must mandatorily quote against each item of Schedule of Items. Failing to do so, Tata Power may reject the bids.

NOTE: In case of a new bidder not registered with Tata Power, factory inspection and evaluation shall be carried out to ascertain bidder's manufacturing capability and quality procedures. However, Tata Power reserves the right to carry out factory inspection and evaluation for any bidder prior to technical qualification. In case a bidder is found as Disqualified in the factory evaluation, their bid shall not be evaluated any further and shall be summarily rejected. The decision of Tata Power shall be final and binding on the bidder in this regard.

2.1 Price Variation Clause and Cap:

The prices shall remain firm during the entire contract period and no price variation is applicable.

3. Submission of Bid Documents

3.1 Bid Submission

Bidders are requested to submit their offer in line with this Tender document. Bids shall be submitted in 3 (three) parts:

FIRST PART: "EMD – BANK GUARANTEE" of Value detailed in 1.1 valid for 180 days from the due date of bid submission in the form of Bank Guarantee favoring 'The Tata Power Company Limited'. The EMD must be strictly in the format as mentioned in Tender Document, failing which it shall not be accepted by Tata Power and the bid as submitted shall be liable for rejection.

Note: **BG of 180 days validity and further claim period of 180 days is needed. In case the same cannot be issued by your bank then BG valid for 365 days can be provided**.

Note: At times bidders have sought Tata Power bank details which is needed by them to make BG. Hence the same is reproduced below. These details are only provided to facilitate making of BG if needed

Tata Power's Bank Details for submitting EMD BG:
Bank Name & Address – ICICI Bank, 163 HT Marg,
Backbay Reclamation, Churchgate, Mumbai 400 020.

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A/c no. - 000451000293
IFSC Code – ICIC0000393

The hard copy of EMD in a sealed envelope should be sent on address mentioned in Tender document.

First Part must be submitted in Sealed Envelope.

SECOND PART: "TECHNICAL / UN-PRICED COMMERCIAL BID" shall contain the following documents:

a) Documentary evidence in support of Technical, Commercial qualifying criteria
b) Technical literature/GTP/Type test report/Details of Qualified Manpower Available/ Testing Facility available etc. *(complete in all respect as desired and detailed in Technical Specification and Technical Requirement Section)*
c) Duly filled Technical and Commercial Deviation Sheets
d) Duly filled formats like Authorization affidavit form
e) *Unpriced Commercial Bid*

The technical / un-priced commercial bid shall be properly indexed and is to be submitted in Soft Copy though E-Tender system of Tata Power. Hard Copy of Technical Bids need not be submitted.

Second Part must be submitted through E-Tender System Only.

THIRD PART: "PRICE BID" shall contain only the price details and strictly in Price Bid format along with explicit break up of basic prices and applicable GST. Basic price should include packaging forwarding, freight, transit insurance and any other cost envisaged by the bidder.

Third part must be submitted through E-Tender System Only.

FOR BIDS INVITED THROUGH E-TENDER SYSTEM (TECHNICAL AND UN-PRICED COMMERCIAL BID):

In response to advertisement Bidder has to provide details of person authorized to Bid on behalf of the Bidder. An e-mail will be generated by E-Tender System and the authorized person can download the Tender Documents from the system.

Bidders have to mandatorily submit SECOND and THIRD PART (Technical and Price Bid) only through E-Tender system of Tata Power. Bids submitted through any other form (hard copy) / route shall not be admissible.

FOR BIDS INVITED IN SEALED ENVEOPE PROCESS (FIRST PART):

First Part of the bid shall be sealed in envelope which shall be clearly marked as below:

EMD BID –
"Please mention Tender Reference No"

Please mention our Tender Reference No on the Tender and drop the same in our Tender Box located at The Tata Power Company Limited (Tata Power), Corporate Contracts, Smart Center of Procurement Excellence, 2nd Floor, Sahar Receiving Station, Near Hotel Leela, Sahar Airport Road, Andheri (E), Mumbai 400 059.

The bid shall be addressed to:

Head - Procurement
The Tata Power Company Limited (Tata Power),

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Smart Center of Procurement Excellence, 2nd Floor, Sahar Receiving Station,
Near Hotel Leela, Sahar Airport Road, Andheri (E), Mumbai 400 059.

The envelope shall also bear the Name and Address of the Bidder along with our Tender No. and subject.

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and Tata Power, shall be written in the English Language. Any printed literature furnished by the Bidder may be written in another Language, provided that this literature is accompanied by an English translation, in which case, for purposes of interpretation of the Bid, the English translation shall govern.

Bids submitted by Email/Telex/Telegram /Fax will be rejected. No request from any Bidder to Tata Power to collect the proposals from Courier/Airlines/Cargo Agents etc. shall be entertained.

SIGNING OF BID DOCUMENTS:

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

The Bid being submitted must be signed by a person holding a Power of Attorney authorizing him to do so, certified copies of which shall be enclosed.

The Bid submitted on behalf of companies registered with the Indian Companies Act, for the time being in force, shall be signed by persons duly authorized to submit the Bid on behalf of the Company and shall be accompanied by certified true copies of the resolutions, extracts of Articles of Association, special or general Power of Attorney etc. to show clearly the title, authority and designation of persons signing the Bid on behalf of the Company. Satisfactory evidence of authority of the person signing on behalf of the Bidder shall be furnished with the bid.

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

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

3.2 Contact Information

Communication Details: Detailed in 1.1

3.3 Bid Prices

Bidders shall quote for the entire Scope of Supply/ work with a breakup of prices for individual items and Taxes & duties. The bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total price with taxes, duties & freight up to destination at various sites of Tata Power. The all-inclusive prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during the execution of the supply work, breakup of price constituents.

The quantity breakup shown else-where other than Price Schedule is tentative. The bidder shall ascertain himself regarding material required for completeness of the entire work. Any items not indicated in the price schedule, but which are required to complete the job as per the Technical Specifications/ Scope of Work/ SLA mentioned in the tender, shall be deemed to be included in prices quoted.

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3.4 Bid Currencies

Prices shall be quoted in Indian Rupees Only. It also may be noted that the denomination of Purchase Order / Outline Agreement / Rate Contract and associated Payment to Successful Bidder shall also be in Indian Rupees Only. In case Bidder intends to import any equipment, part etc and supply to Tata Power then all liability and costs related to import will rest with the Bidder. All statutory compliances, payments, expenditure etc. related to importing of equipment will be responsibility of the bidder.

3.5 Period of Validity of Bids

Bids shall remain valid for **180 days** from the due date of submission of the bid.
Price submitted as part of E-auction / Negotiation shall remain valid for **90 days** from date of E-auction / Negotiation.
Notwithstanding clause above, Tata Power may solicit the Bidder's consent to an extension of the Period of Bid Validity. The request and responses thereto shall be made in writing.

3.6 Alternative Bids

Bidders shall submit Bids, which comply with the Bidding documents. Alternative bids will not be considered. The attention of Bidders is drawn to the provisions regarding the rejection of Bids in the terms and conditions, which are not substantially responsive to the requirements of the bidding documents.

3.7 Modifications and Withdrawal of Bids

The bidder is not allowed to modify or withdraw its bid after the Bid's submission. The EMD as submitted along with the bid shall be liable for forfeiture in such event.

3.8 Earnest Money Deposit (EMD)

The bidder shall furnish, as part of its bid, an EMD amounting as specified in the tender. The EMD is required to protect the Tata Power against the risk of bidder's conduct which would warrant forfeiture.
The EMD shall be in following form:

- Bank Guarantee valid for 180 days after due date of submission with an additional claim period of 180 days from the date of expiry of BG.

The EMD shall be forfeited in case of:

a) The bidder withdraws its bid during the period of specified bid validity.

Or

b) In case of a successful bidder, if the Bidder, within 15 days, does not
i) accept the purchase order, or
ii) furnish the required Contract Performance Bank Guarantee (CPBG)

Original Bank Guarantee submitted as EMD shall be returned only after completion of award process for unsuccessful bidders and issue of Contract Performance Bank Guarantee (CPBG) for successful bidder.

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4. Bid Opening & Evaluation process

4.1 Process to be confidential

Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process. Any effort by a Bidder to influence Tata Powers processing of Bids or award decisions may result in the rejection of the Bidder's Bid.

4.2 Technical Bid Opening

Bids will be opened at Corporate Office of Tata Power as per our standard Process. The bids shall be opened internally by Tata Power. Technical bid must not contain any cost information whatsoever.

First the envelope marked “EMD” will be opened. Bids without EMD of required amount/ validity in prescribed format, shall be rejected.

Next, the technical bid of the bidders who have furnished the requisite EMD will be opened in E-Tender system.

4.3 Preliminary Examination of Bids/Responsiveness

Tata Power will examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Bids are generally in order. Tata Power may ask for submission of original documents in order to verify the documents submitted in support of qualification criteria.

Prior to the detailed evaluation, Tata Power will determine the substantial responsiveness of each Bid to the Bidding Documents including production capability and acceptable quality of the Goods offered. A substantially responsive Bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviation.

Bid determined as not substantially responsive will be rejected by the Tata Power and/or the Tata Power and may not subsequently be made responsive by the Bidder by correction of the non-conformity.

4.4 Techno Commercial Clarifications

Bidders need to ensure that the bids submitted by them are complete in all respects. To assist in the examination, evaluation and comparison of Bids, Tata Power may, at its discretion, ask the Bidder for a clarification on its Bid for any deviations with respect to the Tata Power specifications and attempt will be made to bring all bids on a common footing. All responses to requests for clarification shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted owing to any clarifications sought by Tata Power.

4.5 Price Bid Opening

Price Bid of only Technically and / or Safety Qualitied Bidders shall be considered and open internally by TPC. Bidders will get mail intimation from Tata Power E-Tender system (Ariba) when their Price Bids are opened.

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The EMD of the bidder withdrawing or substantially altering his offer at any stage after the technical bid opening will be forfeited at the sole discretion of Tata Power without any further correspondence in this regard.

Arithmetical errors will be rectified on the following basis: If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price per item will be corrected. If there is a discrepancy between the Total Amount and the sum of the total price per item, the sum of the total price per item shall prevail and the Total Amount will be corrected.

4.6 Reverse Auction and Price Matching Option

Tata Power reserves the right to conduct the reverse auction AND / OR Manual Negotiations for the products/ services being asked for in the tender. Only Technical Qualified Bids will be allowed to participate in e-auction. Date and time of e-auction will be intimated through E-Tender system to Authorized Person of Interested Bidder.

For case where more than one bidder has to be awarded (including Rate Contract / Outline Agreement) Price Matching Option will be exercised. Volume of job allocated to original competitive bidder will be more than bidder who is chosen through Price Matching Option. Tata Power decision regarding work sharing shall be final and no explanation OR clarification shall be given regarding the same.

Tata Power reserves the right to go for Reverse Auction (RA) for price negotiation and discover the most competitive price on ARIBA portal, Tata Power's official e-tendering platform. This will be decided after techno-commercial evaluation of the bids. Bidders need to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case Tata Power decides to go for RA.

Only those bidders who are techno-commercially qualified shall be eligible to participate further in RA process. However, the original H1 bidder (whose price bid is the highest post techno-commercial evaluation) shall not be allowed to participate in further RA process provided minimum three techno-commercially qualified bids are available.

5.0 Award Decision

Tata Power will award the contract to the successful bidder whose bid has been determined to be the lowest-evaluated responsive bid as per the Evaluation Criterion mentioned at Clause 2.0. The Cost for the said calculation shall be taken as the all-inclusive cost quoted by bidder in Priced Bid Format subject to any corrections required in line with Clause 4.3 above. The decision to place purchase order/Outline Agreement/ Rate Contact solely depends on Tata Power on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that Tata Power may deem relevant.

Tata Power reserves all the rights to award the contract to one or more bidders so as to meet the delivery requirement or nullify the award decision without assigning any reason thereof.

In case any supplier is found unsatisfactory during the delivery process, the award will be cancelled, and Tata Power reserves the right to award other suppliers who are found fit.

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5.1 Rate Contract / Outline Agreement

Rate Contract / Outline Agreement does not guarantee any assured business volume in Rupees or Quantity. Quantities are only indicative and specified for the purpose of readiness as per the request from Purchaser. Supplies shall be only against Firm Purchase Orders placed as per the agreed terms and conditions of Rate Contract / Outline Agreement. Purchaser shall be entitled at its discretion to place firm order for such supplies on "As and When Required Basis" without minimum take-off guarantee.

Rate Contract / Outline Agreement will have list of Items with Unit Rate and applicable Taxes and Duties. There will be a cap on value for which order which can be placed against the Rate Contract / Outline Agreement. Actual quantity ordered for each line item may differ significantly from the tentative quantity indicated in the Tender Document. One / few / all items of Rate Contract / Outline Agreement can be ordered till the Cap Value is reached.

6.0 Order of Preference/Contradiction:

In case of contradiction in any part of various documents in tender, following shall prevail in order of preference:

1. Outline Agreement/Purchase Order (with Commercial conditions)
2. Special Terms and conditions (if applicable)
3. General Terms and conditions
4. Technical Specifications

In case there is a discrepancy in the BOQ mentioned in tender (to the extent modified through subsequent Corrigendum, if any) and the bid submitted by any bidder, the description as mentioned in the tender (to the extent modified through subsequent Corrigendum, if any) shall prevail.

7.0 Ethics

Tata Power is an ethical organization and as a policy Tata Power lays emphasis on ethical practices across its entire domain. Bidder should ensure that they should abide by all the ethical norms and in no form either directly or indirectly be involved in unethical practice.

Tata Power work practices are governed by the Tata Code of Conduct. Bidder is requested to refer Tata Code of Conduct Clause in General Terms and Conditions.

8.0 General Condition of Contract and Special Condition of Contracts

Any condition not mentioned above shall be applicable as per General Terms and Conditions and Special Condition of Contracts attached along with this tender.

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Section B: Format of Technical & Commercial Pre bid Queries

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FORMAT B.1
Format for Technical Pre-Bid Queries
Tender No
Package Name
Bidder :

Note : The said format to be used only for Technical Pre-Bid Query. Any Commercial Query has to be strictly in Format B2 Format for Commercial Pre-Bid Query and sent seperately
Format to be used for query regarding Technical Pre-Qualifcation Requirement, Safety Pre-Qualifcation Requirement, Technical Set of Documnt
Pre-Bid Query has to be sent in editable Excel file fomat only
Pre-Bid Query has to be sent through e-mail in Tata Power E-Tender System

Sr. No.	Detailed Reference to Tata Power Technical Document. Please specify Document No / Clause No / Page No	Description as per Bid Document	Remarks - Query / Clarification	Tata Power Response
1	2	3	4	5

FORMAT B.2
Format for Commercial Pre-Bid Queries
Tender No
Package Name
Bidder :

Note : The said format to be used only for Commercial Pre-Bid Query. Any Technical Query has to be strictly in Format B1 Format for Technicall Pre-Bid Query and sent seperately
Format to be used for query regarding Tender Notice, Commercial Pre-Qualifcation Requirement, Terms and Conditions, Other Formats / templates
Pre-Bid Query has to be sent in editable Excel file fomat only
Pre-Bid Query has to be sent through e-mail in Tata Power E-Tender System

Sr. No.	Detailed Reference to Tata Power Tender Document. Please specify Document No / Clause No / Page No	Description as per Bid Document	Remarks - Query / Clarification	Tata Power Response
1	2	3	4	5

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Section C.1: Pre-Qualification requirement

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Bidder Shall Qualify in Part A			
Bidders Prequalifying Requirements for 220 kV EHV Cable (Part A-Supply)			
Sr No	**Parameter**	**Tata Power Requirement**	**Documents to be submitted by vendor to ascertain meeting of Pre-Qualification Requirement**
1	**2**	**3**	**4**
1	Infrastructure	Bidder shall be OEM of 220 kV and above voltage class, single core XLPE cables with manufacturing facility / assembly in India, Or, Bidder shall be an EPC Contractor in a JV with OEM of 220 KV and above voltage class with manufacturing facility/assembly in India.	Self-undertaking to be submitted in this regard. Tata Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter. JV agreement copy to be submitted.
2	Supply & Experience	Bidder/OEM partner shall have manufactured and supplied 100 K.Ms. of 110 kV and above voltage grade XLPE Cables in last 5 years as on original bid submission date. Out of above 100 K.Ms. length, minimum 20 K.Ms. cable length supplied shall be of 220 kV class in last 5 years as on original bid submission date. The XLPE cables of 110 kV and higher voltage class supplied by the Bidder should have been in satisfactory commercial operation for a minimum of 25 K.Ms. length, for minimum period of last 2 years as on the original bid submission date. Out of the above 25 K.Ms., minimum 1.5 K.Ms. of 220 kV class cable shall be in service for last two year as on original bid submission date. Indian Subsidiaries / JV of global companies (Parent) registered & having plant in India can be considered provided the Parent supports the bidder to meet the PQR. In such cases, documentary evidences shall be furnished for proving the Parent - Subsidiary / JV relationship and a Backup guarantee of five years for successful operation of the cable shall be furnished by the Parent. In case the bidder has a previous association with any of Tata Power Group companies for similar products and services, the performance feedback of the bidder by the Tata Power Group companies shall only be considered for evaluation purpose, irrespective of performance certificates issued by any third organization.	Supply List / Performance Certificates from the utilities / clients Relevant documentary evidences & a Backup guarantee.
3	Type Test	The bidder/OEM partner shall have conducted PreQualification tests on the cable offered as per IEC 62067. The bidder shall submit Type test reports obtained from third party NABL/ International Accredited Lab as per IEC 62067 for 220kV or higher voltage grade XLPE cable and accessories. The type tests should have been conducted on the equipment / material of the same design. The type tests should have been conducted within 5 years prior to the date of bid opening. Time period for type test may be extended by another 5 years as a special case, if there is no change in design / material of construction (MOC). In case the type test reports furnished are not for the quoted cable but for the cable with different voltage class and/or different conductor size, then type test shall be carried out for the offered cable from NABL / International Accredited Lab without any cost implication to the owner and the Type Test reports shall be submitted before despatch of the Cable System.	Type Test Report. Undertaking that there is no change in design / material of construction (MOC) if Type Test Report older than 5 years but less than 10 years prior to date of bid opening has to be considered (if applicable) Undertaking that type test shall be carried out for the offered equipment / material from NABL / International Accredited Lab without any cost implication to the owner and the Type Test reports shall be submitted before despatch of the equipment / material, in case type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, (if applicable)

Bidder Shall Qualify Part A & Part B			
Bidders Prequalifying Requirements for 220 kV EHV Cable (Part B-EPC)			
Sr No	**Parameter**	**Tata Power Requirement**	**Documents to be submitted by vendor to ascertain meeting of Pre-Qualification Requirement**
1	**2**	**3**	**4**
1	Execution Capability	**1.0** Bidder should have executed minimum 3 nos of EHV cable system projects or work orders (110 kV & Above) in Tier 1 Cities (Category "X") (viz. Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad, Ahmedabad & Pune) with following scope:- a) Supply of EHV cable system from OEM. b) Liasoning for obtaining statutory approvals required for EHV cable laying. c) Civil works for cable trench, joint bays. d) Laying, Jointing / Termination of cable system. e) Backfilling and reinstatement of cable trench and commissioning of cable system. **2.0** Bidder should have commissioned not less than 10.00 K.Ms. in last 5 Yrs as any Single Order. In case the bidder has a previous association with any of Tata Power Group companies for similar products and services, the performance feedback of the bidder by the Tata Power Group companies shall only be considered for evaluation purpose, irrespective of performance certificates issued by any third organization.	List of Projects executed and certificates from utilities / clients.
2	Projects in Service	Out of the 3 projects or work orders executed by the bidder, at least one project executed by the bidder shall be in service satisfactorily for minimum of three years as on date of bid submission.	Performance Certificates from the utilities / clients
3	Commercial Capability	Average Annual turnover of the bidder for last three years shall not be less than INR 225 Crores.	Profit and Loss Statements, Balance Sheet, Cash Flow Statements for the Three (3) preceding financial years duly audited and approved by Authorized Audit Firm / CA. In case of JV, bidder to submit statement from Chartered Accountant (CA) certifying:- (a) Equity stake of the partners in the Joint Venture and (b) Sum of Each Partners turnover multiplied by their respective equity stake in JV for last 3 years should exceed the Tata Power requirement (c) JV to have positive Networth for preceding year. Incase JV does not have positive Networth then all partners to have positive Networth for preceding year. Backup guarantee document to be submitted by JV Partners to support the JV till execution of the project till completion of execution and completion of Latent Defect Liability Period.
4	Supply	Bidder or its OEM partner shall meet the qualifying requirement as mentioned in **Part A**.	Bidders confirmation.
5	Warranty	Bidder shall provide 5 years warranty for the supplied and installed Cable System. In case Bidder is an EPC Contractor, the warranty and gurantee on cable system shall be provided by the OEM. The OEM shall stand guarantee on the project and shall furnish authorization cum undertaking (As per format given in tender)	Bidders confirmation. Authorization cum Undertaking by OEM.
6	Other	One OEM shall submit only 01 bid (either directly or in partnetship with an EPC contrator).	
	Note	**The Prequalification Criteria published along with the tender "In Section C.1 Pre-Qualification requirement" is the total & complete pre-qualification requirement for the tender and shall prevail over any other/additional pre-qualification requirement mentioned elsewhere in the tender.**	

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Section C.2: Safety Bid document

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Appendix 6: CSM F6 - Safety Competency Assessment Form (Template)

Name of the Vendor/Bidder:
Name of the Sub Vendor (If job is given to Sub Vendor):
Description of the Job:
Request for Quotation (RFQ) No.:

Vendor/Bidder to mandatorily provide the below safety competency related information:

1. Proposed Manpower Deployment Schedule : -

Type of manpower	Qualification	Experience	Month 1	Month 2	Month 3	…….
Project /*AMC Manager(R7)*						
Site In Charge						
Safety Manager						
Safety Officer						
Supervisors						
Technicians						
High Skilled workmen						
Skilled workmen						
Semiskilled workmen						
Lineman						
Helpers						
Drivers						
Unskilled						
Others(R7)						

Instruction to Bidders:

i. Indicate the overall site manpower deployment schedule as above
ii. Indicate direct or subcontracted employees by using color code given below:
Direct Bidder Employee – Green
Partly Direct / partly Subcontracted – Yellow
4.3.5 **Subcontracted – Red** *If subcontractor detail is not available at stage of Bid evaluation, then this can be agreed with Order manager or Engineer in charge before deployment Ensure that all sub-contractors follow the Tata Power Safety Procedure and agreed CSM F9 Site Safety Management Plan*.**R7**

iii. Against each category, indicate minimum educational qualification and work experience

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iv. Add rows to include other specialized manpower, if any.
v. Extend columns to cover the entire duration of the proposed contract.
vi. If the operation is in shifts, then indicate shift in charge and / or safety officers required for each shift operation.

2. List of Tools, Tackles, Machines and Equipment: -

Bidder/ Vendor to provide the list of tools, tackles, equipment **to be used during the job / project execution**. Bidder/Vendor to ensure that all the lifting tools and tackles, pressure vessels are duly certified by the competent person authorised by the Chief Inspector of Factories of the respective state prior to start of the job

Sr. No	Description of Tools / Tackles	Capacity / Rating	Quantity	Make	Year of manufacture	Remarks
1						
2						
3						
4						
5						
……						

3. Safety Records:

Bidder to provide the details of fatalities and lost workday cases (LWDC), occurred in last three years (data to be provided for the last completed FY and preceding 2 years).

Description	Safety Data for current and Last 3 Years			
	Current Year	Year 1 (Last FY)	Year 2	Year 3
		20__ - _	20__ - _	20__ - _
Fatalities (Nos.)				
Lost Workday Cases (Nos.)				

In case of no fatalities, LWDC during any year, the form may be filled stating NIL against the respective year. Bidders are encouraged to also submit the RCA / incident investigation reports and the learning's implemented out of the above reported incidents

4. Job Safety Plan/ Method Statement:

Bidder to provide / enclose a detailed Site/Job Safety Plan along with a Method statement detailing the execution philosophy (how the bidder intends to execute the Job/Project), identifying all key activities which are required to be performed by the contractor at Site.

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Bidder to also list down all high-risk activities and provide the Hazard Identification and Risk Assessment (HIRA) for all such high-risk activities involved in the site work.

(Use Method Statement template attached as Appendix 9)

5. PPE Requirement -R7

Division/DISCOM Requirement	Bidders Response
The Bidder/Vendor shall ensure that all PPE of Approved standards as per CSM F8 – PPE Requirements shall be always available and shall be used by his employees with no exception whatsoever. Bidders to also ensure Standard PPE matrix of Tata Power to be followed for all activities.	
10% Buffer stock of PPEs to be provided by bidders at each circle to meet any contingency	
Bidder will ensure that sample PPEs to be submitted/approved by Safety Department along with EIC at the time of submission of Safety bids for evaluation In case bidder manpower found using substandard or any PPEs which are not approved by the Tata Power-Division /DISCOM representative, then Tata Power-Division /DISCOM will provide the same to manpower deployed at the cost of bidders.	

6. ***Vehicle Deployment*:** Bidders to provide details of all vehicles deployed during execution of work-(R7)

S. No.	Vehicle No.	Vehicle Type	Location	EV/CNG/Diesel/Petrol	Year	Whether CNG endorsed on RC

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7. ***Crane Deployment***-(R7)**:** Bidders to provide details of crane to be deployed during the execution of work as and when required. Bidders to provide approved new gen crane ACE Model SX150, ACE FX150 and Escorts Model TRX 1550.

Sl No	Crane No	Location	Year

8. ***Training Records***-(R7)**:** Bidders to provide training records of employees deployed for the execution of work during last one year. These training includes OHS (Occupational Health and Safety) Training, Training on SOP/Work Procedures and Medical Emergency trainings imparted at their own facility, cost, and expenses. Bidders to provide the following details:

Tata Power-Division /DISCOM **Requirement**	**Bidders Response**
Training records of employees at their own facility, cost, and expenses for last one year	
Training facility available with Bidders	
Future road map for enhancing the competency of workforce	

9. ***Rewards and Recognition***-(R7)**:** Bidders to provide the details of process deployed in their organization for sharing and resolution of safety concerns raised by their employees. Also, bidders to provide the details of Rewards and Recognition process in their organization for safety to encourage the morale of their workforce.

10. **Management System Certification: -**

Sr.No	**Certification**	**Yes / No**	**If Yes, Year of Certification**	**If No, Target date for Certification**
1	ISO 9001			
2	ISO 14001			
3	ISO 45001			
4	Any other (Specify….)			
Note: Please attach certificates to support above. In case not accredited for above but applied for, application letters may be attached.				

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Section D.1: Scope of Work/Technical Specification

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Technical Specification

Replacement of existing Oil filled cables of 110kV Carnac Grant road with 220kV 1600 sqmm XLPE Copper conductor Lead sheath cable

TE00532

Specification Title: Specification for 220kV 1C 1600 Sqmm Copper conductor Lead sheath Cable system

Specification No: TE00532/SP/0002/FY25

TATA POWER

The Tata Power Company Limited

Engineering T&D, Antop Hill Station, Samadhan Road,

Antop Hill, Mumbai 400 037..

Registered Office: Bombay House 24 Homi Mody Street Mumbai 400 001

Revision	Date	Description	Approvals		
			Prepared By	Checked By	Approved By
A	09-06-2024	Issued For Review & Comment	HSK	MVD	SKV
					270624

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CHECK LIST FOR DOCUMENTS TO BE SUBMITTED ALONG WITH THE BID

SN	Document Name	Submitted by Bidder (Please ☑ in the Box)			
1.	Signed copy of bid document as a token of acceptance	YES		NO	
2.	Duly filled in schedules, listed in section 'C'. i.e. Schedule C1 to C9	YES		NO	
3.	Qualifying Requirement in Format E1	YES		NO	
4.	Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality Plan (FQP) as applicable	YES		NO	
5.	General Arrangement Drawings for equipment offered	YES		NO	
6.	Filled up Data Sheets in Format B1	YES		NO	
7.	Type Test Reports as applicable.	YES		NO	

A1 INTENT OF SPECIFICATION

The Tata Power Company Limited (Tata Power) hereinafter called the "OWNER" or "PURCHASER", proposes to undertake the replacement of Oil filled cables of 110kV Carnac Grant road by 220kV Single Core 1600 sqmm XLPE Copper Conductor Lead Sheath Armoured with Outer HDPE Cable along with its associated accessories respectively to improve reliability and to cater to the need of Mumbai consumers.

The specific requirement covers the procurement of 220kV Cable system. The bidder must supply the equipment being procured under this specific requirement.

A2 PROJECT INFORMATION

1.0	Owner	The Tata Power Company Limited Transmission projects Dharavi Receiving Station, Near Shalimar Industrial Estate Dharavi,Mumbai-400019, Maharashtra Delivery Address: TATA Power Carnac Receiving Station for Carnac Grant road cable Maharashtra Attention: Mr. V V Patil (Mob no: 9223348691)
2.0	Consultant	NA
3.0	Location of the plant	TATA Power Carnac Receiving Station
4.0	Nearest Rail head	Site is connected by rail network
5.0	Transport	Access roads are available for movement of materials to site.
6.0	Plant Elevation	Not more than 60 meters above sea
7.0	a) Maximum ambient air temperature	50 Deg. C
	b) Minimum ambient air temperature	10 Deg. C
	c) Daily average maximum	40 Deg. C
7.0	Climatic conditions	Atmosphere is generally hot, humid and is conducive to pollution, rust and fungus growth. It is laden with salt sprays, chemical fumes, steam and dust. Relative humidity is over 95% during 4 months in a year when about 3000 mm (total) rainfall takes place. The equipment offered shall be suitable for satisfactory operation under these conditions and polluted atmosphere.

A3 SCOPE OF WORK

3.1. The brief scope consists of

1) Design & Engineering of 220kV, Single Core, 1600 sqmm, XLPE, Armoured, Copper Conductor, Lead Sheath with Outer HDPE cable along with its associated accessories
2) Manufacturing, Type test & Factory acceptance test
3) Transportation to site, laying, services for installation and commissioning of for 110 kV Carnac Grant road line (Refer Annexure 9 for Detailed BOQ).
4) Obtaining statutory approvals required for commissioning of project.

3.2. The scope also includes Design, Testing, Supply, laying, Installation & Commissioning of 96 core Armored Fiber optic cable (FOP) with associated joints and terminations

a. Scope of work of bidder as far as FO-cable is considered will include but not limited to.
   i. Supply, Laying of FO Armored-cable in HDPE duct from Communication fiber termination panel
   ii. Supply of fiber termination boxes, Underground joint boxes, Fiber termination racks.
   iii. Services for midspan FO-cable jointing, creation of accessible joint hand holes at appropriate locations
   iv. Creation and submission of documentation related to fiber routes, Fiber test reports and joint locations
   v. Submission of kmz fiber route with mapped Joint locations in kmz
   vi. Service for termination of fiber cables at end stations

3.3. Real time monitoring of the proposed circuit lines through Distributed Temperature Sensing (DTS). 12 core Fiber cable, suitable for DTS sensing (SM or MM), along with all jointing and termination accessories is to be laid through 40mm HDPE ducts. DTS system shall have independent master, operator workstation, GPS receiver and also integrate with existing

i) Server (Max View systems) and
ii) SCADA systems on IEC 104. DTS shall have prewired panel for interrogator / controller of minimum 50kms sensing with minimum 2 channels (min. 25kms on each channel). Supply of above systems, FO sensor cable laying, termination, testing and integrated testing with existing systems is in vendor's scope.

3.4. Route survey, finalizing the optimized route, finalizing the joint bay positions thereby finalizing cable drum lengths for every section, preparation of drawings shall be in scope of OEM. In order to optimize and reduce cable wastage, it is proposed that the vendor finalizes manufacturing drum length for every section. Tata Power will release the payment to the vendor based on actual cable lengths in service.

3.5. Civil works for excavation, trenching, laying of EHV cables, Jointing, Terminations, Testing and Commissioning of EHV cable system.

3.6. Obtaining permissions from Statutory Authorities for laying of cables, Civil works for excavation, trenching, laying of EHV cables, Jointing, Terminations, Testing and Commissioning of EHV cable system. Backfilling, reinstatement of the cable route. Reconciliation of the payments done to statutory and obtaining final No Dues Certificate from the Statutory Authorities. All statutory payments will be arranged by Tata Power. However, getting refund of the deposits on completion of the project will be in the scope of the Vendor.

3.7. Submission of kmz Power Cable route with mapped Joint locations in kmz.

3.8. Packing, shipment, delivery FOR Mumbai, of equipment. The insurance cover (in case of CIF delivery) to be provided shall specifically include fire, theft, malicious damages, transit, civil riots, damage during installation etc. The insurance cover shall be for replacement costs.

3.9. Submission of drawings and obtaining plan and drawing approvals and charging approval permission from Electrical inspector shall be in scope of bidder.

3.10. 220 kV Parel Grant Road and 220 kV Carnac grant Road cable (replacement of aged oil filled cable project) is proposed to be laid in common cable route of 4.5 km from Kalachowki location to BEST Grant Road RSS (Refer Annexure 8 for Common Route in pink colour). This Common Trench works (4.5KM) will be carried out by Tata Power and same shall be excluded from this Project Scope. Bidder shall strictly adhere to the project Schedule given along with Tender. The Cable laying activity in the common stretch shall be planned simultaneously along with the Parel grant road cable laying activity. Bidder has to consider this while preparation of the project schedule.

3.11. The Bidders are advised to visit sites (at their own expense), prior to the submission of the bid and make surveys / assessment of existing scheme as deemed necessary for proposal submission. The site visit will be facilitated by Tata Power officials. Any additional equipment/ system required for successful implementation of proposed scheme shall be supplied & commissioned.

A4 TERMINAL POINTS

110kV GIS Termination at TATA Power Carnac GIS and 110kV GIS Termination at 110kV BEST Grant road GIS.(GIS interfacing drawings of BEST grant road GIS will be shared if available however if not available Bidder has to take dimensions at site after availing outage, Bidder has to design termination accordingly).

A5 EXCLUSIONS

Micro tunneling works for Railway Crossing is excluded from scope of work.
However, laying of EHV cables through the tunnel & associated civil works is in the scope of the bidder.

A6 CODES AND STANDARDS

Annexure 3A- Standard specifications for 220 kV EHV cable system
Annexure 3B- Standard specifications for 110 kV EHV cable system
Annexure 4a- Standard Specification for concrete and allied works
Annexure 4b- Standard Specification for Earthwork in excavation and filling including Dewatering
Annexure 4c- Specification for EHV Cable laying services
Annexure 7- FQP for EHV Cables Installation

A7 BIDDER'S QUALIFICATION REQUIREMENTS

Refer attached Annexure 1: Pre-Qualification requirement for 220kV EHV Cable.

A8 PROJECT SCHEDULE / MILESTONES

Bidder shall submit with the bid, a detailed Project Schedule covering the following based on the milestones tabulated below:

a. Start of 'Engineering'
b. Completion of 'Engineering'
c. Commencement of 'Manufacturing'/Manufacturing process
d. Commencement of Supply
e. Commencement of Supervision of erection, testing and commissioning

Milestone	Target
Pre bid meeting	1st week from RFQ
Bid Submission	2nd week from RFQ
Drawing submission	1st week from PO
Inspection of equipment	8th week from PO
Delivery of equipment	10th week from PO
Completion of installation	12th week from PO
PG test	12th week from PO
Handover to Tata Power after commissioning	12th week from PO

A9 SUBMISSIONS BY BIDDERS

9.1 Bidder shall submit the following information along with the Technical Bid.

- Dully filled in schedules, listed in section 'C'.
- Filled up Data Sheets as per section 'B' (in attached Excel format – Excel soft file to be sent with Technical Bid) & in PDF with company stamp & authorized signature
- The supply list of equipment offered with customer name, year of supply, performance certificates etc.
- Catalogue/ literature of all equipment for information.
- Technical specification with your company stamp & authorized signature

9.2 Bidder shall submit following information after award of contract:

- Detailed Data Sheet and GA of all equipment for approval
- Catalogue/ literature of all equipment for information.
- MQP for equipment offered
- O&M Manual & Recommended Commissioning checklist for equipment offered
- Test certificate/ Witness test reports/ Type test reports as applicable

A10 DETAILED TECHNICAL SPECIFICATIONS

Annexure 3A- Standard specifications for 220 kV EHV cable system
Annexure 3B- Standard specifications for 110 kV EHV cable system
Annexure 4a- Standard Specification for concrete and allied works
Annexure 4b- Standard Specification for Earthwork in excavation and filling including Dewatering
Annexure 4c- Specification for EHV Cable laying services

A11 LAYOUT REQUIREMNETS

NIL

A12 QUALITY REQUIREMENTS

Refer attached Annexure 5: Standard Quality Plan for EHV cables.

Refer attached Annexure 6: Standard Quality Plan for EHV cable termination kit

Refer attached Annexure 7: Standard Field Quality Plan for EHV cables.

A13 PERFORMANCE REQUIREMENTS

A13.1 TEST PROCEDURE

Refer attached Annexure 5: Standard Quality Plan for EHV cables.

A13.2 PERFORMANCE GUARRANTEE PARAMETERS AND LD CLAUSES FOR NON PERFRORMANCE

Refer attached
Annexure 3A- Standard specifications for 220 kV EHV cable system
Annexure 3B- Standard specifications for 110 kV EHV cable system

A14 MAINTAINANCE REQUIREMENTS

Replacement of any defective component shall be simple and free from any obstruction.

A15 TOOLS AND TACKLES FOR ERECTION AND COMMISSIONING

NA

A16 SPARES

NA

< Clearance of Engineering Disciplines (as under) shall be taken on office copy for records. The concurrence signatures shall not be printed on document being sent outside of Project Engineering>

Rev No	Date	Originator	Reviewed By	Cleared By		Approved By (HOD)
				HOD	Signature	
				Mechanical		
				Civil		
				Piping & Layout		
				C & I		
				Automation		
				Electrical		

B1 – DATA SHEETS

Refer **Annexure 2A** – Technical Requirement for 220 kV 1600 Sqmm XLPE Cable

Refer **Annexure 2B** – Technical Requirement for 110 kV 1600 Sqmm XLPE Cable

B2 –STANDARD SPECIFICATIONS

Refer attached Annexure 3A: Standard specifications for 220 kV EHV cable system

Refer attached Annexure 3B: Standard specifications for 110 kV EHV cable system

Refer Annexure 4a - Standard Specification for concrete and allied works

Refer Annexure 4b - Standard Specification for Earthwork in excavation and filling including Dewatering

Refer Annexure 4c - Specification for EHV Cable laying services

C1 - SCHEDULE OF QUANTITIES AND PRICES

SUPPLY:

Sr. No	Description	Qty. Set / Nos.	Unit Price (Rs.)	Item Price (Rs.)

Please refer Annexure 9 for BOQ

SERVICES:

Sr. No	Description	Qty. Set / Nos.	Unit Price (Rs.)	Item Price (Rs.)

Please refer Annexure 9 for BOQ

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C2- PROJECT TIME SCHEDULE

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Note: The bidder shall indicate schedule of milestones and also attach/furnish a detailed bar chart identifying customer inputs.

C3- SCHEDULE OF DEVIATIONS FROM TECHNICAL SPECIFICATIONS

All deviations from this specification, shall be set out by the Bidders, indicating clause no and page in this schedule. Unless ***specifically*** mentioned in this schedule, the tender shall be deemed to conform to the purchaser's specifications:

Sr. No.	Clause No.	Details of deviation With justifications
---	---	---

We confirm that there are no deviations apart from those detailed above.

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C4- SCHEDULE OF DEVIATIONS FROM GENERAL & SPECIAL CONDITIONS OF CONTRACT

All deviations from this specification, shall be set out by the Bidders, indicating clause no and page in this schedule. Unless ***specifically*** mentioned in this schedule, the tender shall be deemed to conform to the purchaser's specifications:

Sr. No.	Clause No.	Details of deviation With justifications
--------	----------	----------

We confirm that there are no deviations apart from those detailed above.

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C5- SCHEDULE OF DRAWINGS & DOCUMENT SUBMISSION

As part of the proposal, the BIDDER shall furnish the schedule of drawing/document Submission

Sr. No.	Title of Drawing/Document	Target Date of submission	For Information/Review/Approval	Remarks
1.0				
1.1				
1.2				
2.0				
2.1				
2.2				
3.0				
3.1				
3.2				
4.0				
4.1				
4.2				
5.0				
5.1				
5.2				

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C6- SCHEDULE OF MANDATORY SPARES

As part of the proposal, the BIDDER shall indicate below the list of recommended spares for three years of trouble free operation of the equipment/system offered by him.

Sr. No.	Equipment tag no.	Description of spare	Material of construction	Part no	Quantity recommended per unit of equipment	Unit price	Total price	Delivery period from date of LOI	Remarks

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C7 - SCHEDULE OF SPECIAL ERECTION/MAINTENANCE TOOLS & TACKLES

As part of the proposal, the BIDDER shall indicate below, the list of erection/maintenance tools & tackles offered by him.

Sr. No.	Description of spare	Quantity recommended per unit of equipment	Unit price	Total price	Delivery period from date of LOI	Remarks

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C8 - SCHEDULE OF PLACES OF MANUFACTURE, TESTS AND INSPECTION

For major equipment / systems, the Bidder shall indicate the name of the Manufacturer / SUB CONTRACTOR and place of test and inspection.

ITEM OF EQUIPMENT	Manufacturer / SUBCONTRACTOR	PLACE OF TESTING & INSPECTION

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C9- SCHEDULE OF RECOMMENDED SPARES

As part of the proposal, the BIDDER shall indicate below the list of recommended spares for three years of trouble free operation of the equipment/system offered by him.

Sr. No.	Equipment tag no.	Description of spare	Material of construction	Part no	Quantity recommended per unit of equipment	Unit price	Total price	Delivery period from date of LOI	Remarks

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D- DRAWINGS AND DOCUMENTS

D1 TENDER PURPOSE

D2 AFTER AWARD OF CONTRACT

E. - ANNEXURES

Annexure 1A	Format C1 - Pre-Qualification requirement for 220kV EHV Cable
Annexure 2A	Format E2 - Technical Requirement for 220 kV EHV cable
Annexure 2B	Format E2 - Technical Requirement for 110 kV EHV cable
Annexure 3A	Standard specifications for 220 kV EHV cable system
Annexure 3B	Standard specifications for 110 kV EHV cable system
Annexure 4b	Standard Specification for concrete and allied works
Annexure 4b	Standard Specification for Earthwork in excavation and filling including Dewatering
Annexure 4c	Specification for EHV Cable laying services
Annexure 5	Standard Quality Plan for EHV cables
Annexure 6	Standard Quality Plan for EHV Termination kit
Annexure 7	Standard Field Quality Plan for EHV cables
Annexure 8	220kV Carnac Grant road cable route
Annexure 9	Bill of Quantity
Annexure 10a	Drawing for 220kV Cable Cleats
Annexure 10b	Drawings for 220kV RCC Slab
Annexure 10c	Drawing for 220kV Cable trench
Annexure 11	General Requirements for Quality Assurance & Inspection
Annexure 12	Specification for DTS

Bidder Shall Qualify in Part A			
Bidders Prequalifying Requirements for 220 kV EHV Cable (Part A-Supply)			
Sr No	**Parameter**	**Tata Power Requirement**	**Documents to be submitted by vendor to ascertain meeting of Pre-Qualification Requirement**
1	**2**	**3**	**4**
1	Infrastructure	Bidder shall be OEM of 220 kV and above voltage class, single core XLPE cables with manufacturing facility / assembly in India, Or, Bidder shall be an EPC Contractor in a JV with OEM of 220 KV and above voltage class with manufacturing facility/assembly in India.	Self-undertaking to be submitted in this regard. Tata Power reserves the right to inspect the said manufacturing facility as a proof of compliance to this parameter. JV agreement copy to be submitted.
2	Supply & Experience	Bidder/OEM partner shall have manufactured and supplied 100 K.Ms. of 110 kV and above voltage grade XLPE Cables in last 5 years as on original bid submission date. Out of above 100 K.Ms. length, minimum 20 K.Ms. cable length supplied shall be of 220 kV class in last 5 years as on original bid submission date. The XLPE cables of 110 kV and higher voltage class supplied by the Bidder should have been in satisfactory commercial operation for a minimum of 25 K.Ms. length, for minimum period of last 2 years as on the original bid submission date. Out of the above 25 K.Ms., minimum 1.5 K.Ms. of 220 kV class cable shall be in service for last two year as on original bid submission date. Indian Subsidiaries / JV of global companies (Parent) registered & having plant in India can be considered provided the Parent supports the bidder to meet the PQR. In such cases, documentary evidences shall be furnished for proving the Parent - Subsidiary / JV relationship and a Backup guarantee of five years for successful operation of the cable shall be furnished by the Parent. In case the bidder has a previous association with any of Tata Power Group companies for similar products and services, the performance feedback of the bidder by the Tata Power Group companies shall only be considered for evaluation purpose, irrespective of performance certificates issued by any third organization.	Supply List / Performance Certificates from the utilities / clients Relevant documentary evidences & a Backup guarantee.
3	Type Test	The bidder/OEM partner shall have conducted PreQualification tests on the cable offered as per IEC 62067. The bidder shall submit Type test reports obtained from third party NABL/ International Accredited Lab as per IEC 62067 for 220kV or higher voltage grade XLPE cable and accessories. The type tests should have been conducted on the equipment / material of the same design. The type tests should have been conducted within 5 years prior to the date of bid opening. Time period for type test may be extended by another 5 years as a special case, if there is no change in design / material of construction (MOC). In case the type test reports furnished are not for the quoted cable but for the cable with different voltage class and/or different conductor size, then type test shall be carried out for the offered cable from NABL / International Accredited Lab without any cost implication to the owner and the Type Test reports shall be submitted before despatch of the Cable System.	Type Test Report. Undertaking that there is no change in design / material of construction (MOC) if Type Test Report older than 5 years but less than 10 years prior to date of bid opening has to be considered (if applicable) Undertaking that type test shall be carried out for the offered equipment / material from NABL / International Accredited Lab without any cost implication to the owner and the Type Test reports shall be submitted before despatch of the equipment / material, in case type test reports furnished are not for the quoted equipment / material but for the equipment / material with higher voltage class and/or different capacity, (if applicable)

Bidder Shall Qualify Part A & Part B			
Bidders Prequalifying Requirements for 220 kV EHV Cable (Part B-EPC)			
Sr No	**Parameter**	**Tata Power Requirement**	**Documents to be submitted by vendor to ascertain meeting of Pre-Qualification Requirement**
1	**2**	**3**	**4**
1	Execution Capability	**1.0** Bidder should have executed minimum 3 nos of EHV cable system projects or work orders (110 kV & Above) in Tier 1 Cities (Category "X") (viz. Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad, Ahmedabad & Pune) with following scope:- a) Supply of EHV cable system from OEM. b) Liasoning for obtaining statutory approvals required for EHV cable laying. c) Civil works for cable trench, joint bays. d) Laying, Jointing / Termination of cable system. e) Backfilling and reinstatement of cable trench and commissioning of cable system. **2.0** Bidder should have commissioned not less than 10.00 K.Ms. in last 5 Yrs as any Single Order. In case the bidder has a previous association with any of Tata Power Group companies for similar products and services, the performance feedback of the bidder by the Tata Power Group companies shall only be considered for evaluation purpose, irrespective of performance certificates issued by any third organization.	List of Projects executed and certificates from utilities / clients.
2	Projects in Service	Out of the 3 projects or work orders executed by the bidder, at least one project executed by the bidder shall be in service satisfactorily for minimum of three years as on date of bid submission.	Performance Certificates from the utilities / clients
3	Commercial Capability	Average Annual turnover of the bidder for last three years shall not be less than INR 225 Crores.	Profit and Loss Statements, Balance Sheet, Cash Flow Statements for the Three (3) preceding financial years duly audited and approved by Authorized Audit Firm / CA. In case of JV, bidder to submit statement from Chartered Accountant (CA) certifying:- (a) Equity stake of the partners in the Joint Venture and (b) Sum of Each Partners turnover multiplied by their respective equity stake in JV for last 3 years should exceed the Tata Power requirement (c) JV to have positive Networth for preceding year. Incase JV does not have positive Networth then all partners to have positive Networth for preceding year. Backup guarantee document to be submitted by JV Partners to support the JV till execution of the project till completion of execution and completion of Latent Defect Liability Period.
4	Supply	Bidder or its OEM partner shall meet the qualifying requirement as mentioned in **Part A**.	Bidders confirmation.
5	Warranty	Bidder shall provide 5 years warranty for the supplied and installed Cable System. In case Bidder is an EPC Contractor, the warranty and gurantee on cable system shall be provided by the OEM. The OEM shall stand guarantee on the project and shall furnish authorization cum undertaking (As per format given in tender)	Bidders confirmation. Authorization cum Undertaking by OEM.
6	Other	One OEM shall submit only 01 bid (either directly or in partnetship with an EPC contrator).	
	Note	**The Prequalification Criteria published along with the tender "In Section C.1 Pre-Qualification requirement" is the total & complete pre-qualification requirement for the tender and shall prevail over any other/additional pre-qualification requirement mentioned elsewhere in the tender.**	

FORMAT E2

TECHNICAL REQUIREMENT AND SUBMISSION FORMAT - 220 kV 1C 1600 Sqmm EHV Cable

S No	Item Description	Unit	Tata Power Requirement	By Bidder
1	Name of manufacturer		By Bidder	
2	Country of manufacture		By Bidder	
3	Type of cable		Copper Conductor XLPE Insulated Lead Sheath Armoured cable	
4	Standards applicable		IEC 62067, IEC 60502 & tender specifications	
5	Rated voltage between phases:			
i)	Nominal	kV	220	
ii)	Maximum	kV	245	
6	Suitable for earthed or unearthed system		Suitable for Earthed system	
7	Permissible voltage and frequency variation for satisfactory operation			
i)	Voltage	kV	+/- 10%	
ii)	Frequency	Hz	+/- 5%	
8	Number of cores	No	1	
9	Conductor :			
i)	Material :		Annealed plain copper to IEC 60228	
ii)	Nominal cross sectional area	sq mm	1600	
iii)	Number & diameter of wires	No / mm	Suitably selected to meet class 2	
			requirement of IEC 60228	
iv)	Special features, e.g. plain, tinned, dyed down, screened, shaped, etc		Segmental (Milliken)	
v)	Water Tightness of Conductor		Water Blocked Conductor (Non	
			conducting water swellable tapes)	
vi)	Maximum dielectric stress at conductor	kV/cm	By Bidder	
10	Conductor screen			
i)	Material		Extruded semi-conducting layer	
ii)	Nominal thickness	mm	Min 1.0	
11	Insulation			
i)	Composition of insulation		Ultra Superclean (Borealis)	
			XLPE to IEC 60840	
ii)	Minimum radial thickness of insulation between conductor and screen	mm	22	
iii)	Special features, e.g. gas cured, steam cured, dry cured, etc		Dry Cured	
12	Maximum dielectric stress at the core screen	kV / cm	By Bidder	
13	Insulation screen			
i)	Material		Extruded semi-conducting layer	
ii)	Nominal thickness	mm	Min 1.0	
14	Loss angle at normal frequency and rated voltage		By Bidder	
15	Details of Water Barrier		Semiconducting water swellable tape as longitudinal water barrier and extruded lead sheath as radial water barrier	
i)	Minimum thickness	mm	0.3	
16	Concentric Wire Screen		Copper wire screen applied helically. This metallic screen alone shall be designed for shot circuit rating of 40 kA for 1 sec	
i)	Nominal dia of copper wire	mm	2.2	
ii)	Nominal thickness	mm	0.1	
iii)	Minimum Number of copper wires	mm	75	
17	Binder tape		open helix of Copper tape	
i)	Thickness	mm	0.1	
18	Water Swellable Tape		semiconducting water swellable tapewound helically	
18.1	Thickness	mm	0.3	
19	Metal sheath			
i)	Material composition		Lead alloy	
ii)	Extruded or wrapped		Extruded	
iii)	Minimum radial thickness of metal sheath	mm	3.6	
iv)	Max working stress	kV/cm	By Bidder	
v)	0.01 % proof stress			
20	Nominal diameter over metal sheath	mm	By Bidder	
21	Nominal radial clearance allowed under metal sheath	mm	By Bidder	
22	Bedding for reinforcement			
i)	Material		Extruded PVC type ST2 to IEC 60840	
ii)	Minimum thickness	mm	2	
23	Reinforcement Material		Stainless Steel Tape	
24	Protective outer serving			
i)	Type & composition		Extruded, Black HDPE Type St7 to IEC 60840	
ii)	Minimum thickness	mm	4.07	
25	Nominal overall diameter of completed cable	mm	By Bidder	
26	Nominal weight per metre of completed cable	kg/m	By Bidder	
26a	Embossing on the cable should be			
	TATA POWER (MANUFACTURER'S NAME) (MANUFACTURING YEAR) 127/220 kV CABLE SIZE mm2 XLPE (DRUMNUMBER) (SEQUENTIAL METER MARKING NUMBER)			
27	Minimum radius of bend round which cable can be laid			
i)	Direct	mm	20 times the overall dia of cable	
ii)	In ducts	mm	20 times the overall dia of cable	
28	Nominal internal diameter of pipes or ducts required	mm	By Bidder	
29	Maximum DC resistance of conductor per km at 20 deg C	Ohm	By Bidder	
30	Maximum AC resistance of conductor per km at 90 deg C	Ohm	By Bidder	
31	Equivalent star reactance per km of 3 phase circuit at power frequency (50Hz)	Ohm	By Bidder	
32	Maximum and minimum electrostatic capacitances per core per km of cable	u F	By Bidder	
33	Maximum charging current per conductor per km of cable at nominal voltage	A/km/ph	By Bidder	
34	Maximum power factor of charging KVA of cable when laid direct in the ground, at normal voltage and frequency at conductor temperature of 15 deg C, 30 deg C, 45 deg C, 65 deg C, 80 deg C, 85 deg C and 90 deg C		By Bidder	
35	Maximum dielectric loss of cable per km of 3 phase circuit, laid direct in ground, at normal voltage, frequency and maximum conductor Temperature	W/m	By Bidder	
36	Maximum power factor of charging kVA of cable at normal frequency at a conductor temperature of 20 deg C and at 0.5, 1.0, 1.5 and 2.0 times nominal voltage	--	By Bidder	
37	Maximum change in power factor between nominal and twice Nominalvoltage at 15 deg C	--	By Bidder	
38 a)	Sheath loss (including reinforcement) of cable per km of 3 phase circuit at normal voltage and frequency at maximum continuous current rating	W/m	By Bidder	
b)	Sheath voltage at Maximum Continuous Current	V/m	By Bidder	
c)	Sheath voltage during external 3 phase symmetrical fault value of 50 K amps for one second	kV/m		

i)	Laid direct in ground 1 metre below the ground level	V	By Bidder	
ii)	Drawn into ducts	V	By Bidder	
39	Impedance per km of 3 phase circuit at normal power frequency And maximum conductor temperature:	ohm/km	By Bidder	
40 a	Maximum drum length of cable	M	The Cable Drum length should be as per drum schedule given by Tata Power User departmen	
b)	Normal drum length of cable for each size offered	M	As per the site requirement	
41	Approximate shipping weight and size of drum	kg M	By Bidder	
	Special Arrangement for cable Drum		Pallete attangement for lifting with forklift	
42	Current Ratings			
42.1	Continuous current rating of XLPE insulated single circuit in air at an ambient temperature of 45 deg C and Maximum conductor temperatures of 65 deg C, 70 deg C, 75 deg C, 80 deg C, 85 deg C, 90 deg C	A		
	Circuit Formation			
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
42.2	Continuous current rating of XLPE insulated single circuit in ground At soil temperature of 40 deg C and soil thermal resistivity of 120 deg C cm/watt and depth of burial of 1metre,75 deg C, 80 deg C, 85 deg C, 90 deg C	A		
	Circuit Formation			
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
43	Overload capacity and duration			
i)	Conductor temperature after overload	deg C	By Bidder	
ii)	For XLPE cables from initial temperature of 90 deg C to 130 deg C	A / hr	By Bidder	
44	Recommended operating temperatures			
i)	Continuous	deg C	90	
ii)	Emergency (2hrs)	deg C	130	
iii)	After short circuit	deg C	250	
45	Short circuit capacity for 1second, for conductor temperature rising from42(i),42(ii) to 42(iii)	kA RMS	By Bidder	
46	Short circuit capacities with a conductor temperature of 90 deg c at the commencement			
a)	0.5 sec DURATION	kA	By Bidder	
b)	1 sec DURATION	kA	By Bidder	
c)	2 sec DURATION	kA	By Bidder	
d)	3 sec DURATION	kA	By Bidder	
47	Rated sheath current for the short circuit capacities indicated in item 44 above		Short Circuit rating of copper screen alone Considering43(i) 43 (ii)	
a)	0.5 sec DURATION	kA	By Bidder	
b)	1 sec DURATION	kA	By Bidder	
c)	2 sec DURATION	kA	By Bidder	
d)	3 sec DURATION	kA	By Bidder	
48 a	Temperature at outer surface of the lead sheath corresponding to maximum conductor temp.of 90 deg C	deg C	By Bidder	
b)	Temperature of the over sheath corresponding to maximum conductor temp rise of 90 deg C	deg C	By Bidder	
c)	Temperature of the over sheath corresponding to maximum conductor temp of 250 deg C	deg C	By Bidder	
49	Maximum continuous current carrying capacity per circuit when laid in ground, 1.0 M/ 1.3 M to top of cable. (Ground temperature 40 deg C, soil thermal resistivity 120 deg C CM/W, maximum conductor temperature 90 deg C		By Bidder	
a)	Only one 3-phase circuit loaded A	Amps		
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
b i)	Two 3-phase circuit per trench, in horizontal formation and 450 mm centres,			
	both loaded			
i)	Flat	A	By Bidder	
ii)	Open Trefoil	A	By Bidder	
iii)	Close Trefoil		By Bidder	
50	Maximum continuous current carrying capacity per circuit when drawn into pipes (conditions as in item 48 above)			
a)	Only one 3-phase circuit loaded	A	By Bidder	
b)	Two 3-phase circuits at 450 mm centres	A	By Bidder	
51	Continuous current carrying capacity which will permit a further 10% overload for two hours without exceeding a maximum conductor temperature of 90 deg C. (Laid as in item 48 above)	A		
a)	Only one 3-phase circuit loaded			
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
b)	Two 3-phase circuits at 450 mm centres			
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
52	Continuous current carrying capacity which will permit a further 10% overload for two hours as in item 50 above, but with cables drawn into pipes			
a)	Only one 3-phase circuit loaded	A	By Bidder	
b)	Two 3-phase circuits at 450 mm centres			
i)	Flat	A	By Bidder	
ii)	Open Trefoil	A	By Bidder	
iii)	Close Trefoil	A	By Bidder	
53 a	Number of joints requiring direct sheath Earthing	No	As per site requirement	
b)	Number of joints requiring sheath Earthing through non-linear resistor	No		
54	Detailed calculation of sheath voltages for all normal and abnormal conditions enclosed with bid	Yes / No	Yes	
55	Drawings/Information/Documents and details enclosed	Yes / No	Yes	
56	Phase to Ground characteristic Impedance at 50-200 Hz	Ohm	By Bidder	
57	For 1-core cables			
a)	Method of laying (Open or close Trefoil or Horizontal)		By Bidder	
b)	Whether sheaths are to be bonded and earthed at one end or both ends		By Bidder	
58	Basic impulse insulation level (1.2 + 30%, / 50 + 20% u Sec Wave)	kV Peak	By Bidder	
59	Power Frequency (50 Hz) withstand voltage for 30 Minutes	kV RMS	By Bidder	

60	Minimum total creepage distance for Sealing ends	mm	By Bidder	
61	Minimum Protected creepage distance for Sealing ends	mm	By Bidder	
62	Support Insulators for insulating Sealing ends from Earth provided	Yes / No	By Bidder	
63	Maximum continuous operating pressure for SF6 for GIS sealing end	Kg/sq.cm	By Bidder	
64	Test reports for special tests enclosed with bid	Yes / No	Yes	
		Above		
65	Link boxes suitable for installation	ground/Be	Above ground	
66	Tests to be carried out at site on cables & accessories after installation		Yes as per IEC 60840	
67	Inductance of single core cable	mH/km pe	By Bidder	
68	Capacitive charging current at rated voltage and 50 Hz	A/km per	By Bidder	
69	Capacitance of Cable	μF/km per phase	By Bidder	
70	Dielectric loss at 50 Hz	W/km per	By Bidder	
71	Maximum allowable pulling force for the cable.	kN	By Bidder	
72	Details of measures for prevention of ingress of moisture (radial &		By Bidder	
	longitudinal) in the cable			

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Date	Name
	Designation

	GTP for SB CABLE			
S No	**Item Description**	**Unit**	**Tata Power Requirement**	**By Bidder**
1	Name of the manufacturer			
2	Reference standard		IS 7098-2/2011	
3	Conductor			
a	Material		Annealed Plain Copper conforming to IS 8130	
b	Cross sectional area		300 Sqmm Nominal	
c	Flexibility class		Class 2, Stranded Compacted circular	
d	Max DC Res at 20 deg		By bidder	
4	Seperator over conductor		Semi-conducting tape	
5	Insulation			
a	Material		XLPE conforming to IS 7098-2	
b	Thickness	mm	Nominal 3.5	
6	Outer sheath			
a	Material		Extruded Black PVC ST2 conforming to IS 5831	
b	Thickness	mm	Nominal 2.2	
c	Conducting layer over outer sheath		Graphite Coating	
7	Approx. Diameter of Cable	mm	By bidder	
8	Test Voltage		25 kV DC for 1 min	
9	Marking on the Cable		By bidder (Along with Name of TATA Power Co Ltd)	

Signature

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Designation

GTP for Coaxial Cable

S No	Item Description	Unit	Tata Power Requirement	By Bidder
1	Name of the manufacturer			
2	Reference standard		IS 7098-2/2011	
3	**Inner Conductor**			
a	Material		Annealed Plain Copper conforming to IS 8130	
b	Cross sectional area		300 Sqmm Nominal	
c	Flexibility class		Class 2, Stranded Compacted circular	
d	Max DC Res at 20 deg		By bidder	
4	Seperator over conductor		Semi-conducting tape	
5	**Inner Insulation**			
a	Material		XLPE conforming to IS 7098-2	
b	Thickness	mm	Nominal 4.6	
c	Seperator tape		Semiconducting tape	
6	**Outer conductor**			
a	Material		Double layer of annealed plain copper wires with semiconducting seperator between the layers	
b	Nom area of conductor		300	
c	Nom dia/no of wires		Suitably selected to have total area of 300 Sqmm	
d	Seperator tape		Semiconducting tape	
7	**outer insulation**			
a	Material		XLPE to IS 7098-2	
b	Insulation		Nominal 3.5	
6	**Outer sheath**			
a	Material		Extruded Black PVC ST2 conforming to IS 5831	
b	Thickness	mm	Nominal 2.6	
c	Conducting layer over outer sheath		Graphite Coating	
7	Approx. Diameter of Cable	mm	By bidder	
8	Test Voltage		25 kV DC for 1 min	
9	Marking on the Cable		By bidder (Along with Name of TATA Power Co Ltd)	

Signature

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Designation

GTP for EC CABLE

S No	Item Description	Unit	Tata Power Requirement	By Bidder
1	Name of the manufacturer			
2	Reference standard		IS 7098-2/2011	
3	Conductor			
a	Material		Annealed Plain Copper conforming to IS 8130	
b	Cross sectional area		300 Sqmm Nominal	
c	Flexibility class		Class 2, Stranded Compacted circular	
d	Max DC Res at 20 deg		By bidder	
4	Seperator over conductor		Semi-conducting tape	
5	Insulation			
a	Material		XLPE conforming to IS 7098-2	
b	Thickness	mm	Nominal 3.5	
6	Outer sheath			
a	Material		Extruded Black PVC ST2 conforming to IS 5831	
b	Thickness	mm	Nominal 2.2	
c	Conducting layer over outer sheath		Graphite Coating	
7	Approx. Diameter of Cable	mm	By bidder	
8	Test Voltage		25 kV DC for 1 min	
9	Marking on the Cable		By bidder (Along with Name of TATA Power Co Ltd)	

Signature

Seal of the Company

Designation

FORMAT E2

Technical Requirement and Submission Format - 110 kV 1C 1600 Sqmm EHV Cable system for Carnac Grant Road

S No	Item Description	Unit	Tata Power Requirement	By Bidder
1	Name of manufacturer		By Bidder	
2	Country of manufacture		By Bidder	
3	Type of cable		Copper Conductor XLPE Insulated Lead Sheath Armoured cable	
4	Standards applicable		IEC 60502 & tender specifications	
5	Rated voltage between phases:			
	Nominal	kV	110	
	Maximum	kV	123	
6	Suitable for earthed or unearthed system		Suitable for Earthed system	
7	Permissible voltage and frequency variation for satisfactory operation			
i)	Voltage	kV	+/- 10%	
ii)	Frequency	Hz	+/- 5%	
8	Number of cores	No	1	
9	Conductor :			
i)	Material :		Annealed plain copper to IEC 60228	
ii)	Nominal cross sectional area	sq mm	1600	
iii)	Number & diameter of wires	No / mm	Suitably selected to meet class 2 requirement of IEC 60228	
iv)	Special features, e.g. plain, tinned, dyed down, screened, shaped, etc		Segmental (Milliken)	
v)	Water Tightness of Conductor		Water Blocked Conductor (Non conducting water swellable tapes)	
vi)	Maximum dielectric stress at conductor	kV/mm	7 KV/mm	
10	Conductor screen			
i)	Material		Extruded semi-conducting layer	
ii)	Nominal /Minimum thickness	mm	Min 1.0	
11	Insulation			
i)	Composition of insulation		Superclean (Borealis/DOW), XLPE	
ii)	Minimum radial thickness of insulation between conductor and screen	mm	18	
12	Maximum dielectric stress at the core screen	kV / mm	By Bidder	
13	Insulation screen			
i)	Material		Extruded semi-conducting layer	
ii)	Nominal /Minimum thickness	mm	Min 1.0	
14	Loss angle at normal frequency and rated voltage		By Bidder	
15	Details of Water Barrier		Semiconducting water swellable tape as longitudinal water barrier and extruded lead sheath as radial water barrier	
15.1	Minimum thickness of Water Swellable Tape	mm	0.3	
16	Concentric Wire Screen		Copper wire screen applied helically. This metallic screen alone shall be designed for shot circuit rating of 40 kA for 1 sec	
16.1	Nominal dia of copper wire	mm	2.2	
16.2	Nominal thickness	mm	0.1	
16.3	Minimum Number of copper wires	mm	75	
17	Binder tape		open helix of Copper tape	
17.1	Thickness	mm	0.1	
18	Water Swellable Tape		semiconducting water swellable tape wound helically	
18.1	Thickness	mm	0.3	
19	Metal sheath			
i)	Material composition		Lead alloy	
ii)	Extruded or wrapped		Extruded	
iii)	Minimum radial thickness of metal sheath	mm	3.1	
iv)	Max working stress	kV/cm	By Bidder	
v)	0.01 % proof stress		By Bidder	
20	Nominal diameter over metal sheath	mm	By Bidder	
21	Nominal radial clearance allowed under metal sheath	mm	By Bidder	
22	Bedding for reinforcement			
i)	Material		Extruded PVC type ST2 to IEC 60840	
ii)	Minimum thickness	mm	2	
23	Reinforcement			
	Material		Double Non-magnetic stainless steel Tape	
24	Protective outer serving			
i)	Type & composition		Extruded, Black HDPE Type ST7 to IEC 60840	
ii)	Minimum thickness	mm	3.81	
25	Nominal overall diameter of completed cable	mm	By Bidder	
26	Nominal weight per metre of completed cable	kg/m	By Bidder	
26a	Embossing on the cable should be			
	TATA POWER (MANUFACTURER'S NAME) (MANUFACTURING YEAR) 64/110 kV CABLE SIZE mm2 XLPE (DRUMNUMBER) (SEQUENTIAL METER MARKING NUMBER)			
27	Minimum radius of bend round which cable can be laid			
i)	Direct	mm	20 times the overall dia of cable	
ii)	In ducts	mm	20 times the overall dia of cable	
28	Nominal internal diameter of pipes or ducts required	mm	By Bidder	
29	Maximum DC resistance of conductor per km at 20 deg C	Ohm	By Bidder	
30	Maximum AC resistance of conductor per km at 90 deg C	Ohm	By Bidder	
31	Equivalent star reactance per km of 3 phase circuit at power frequency (50 Hz)	Ohm	By Bidder	
32	Maximum and minimum electrostatic capacitances per core per km of cable	u F	By Bidder	
33	Maximum charging current per conductor per km of cable at nominal voltage	A/km/ph	By Bidder	
34	Maximum power factor of charging KVA of cable when laid direct in the ground, at normal voltage and frequency at conductor temperature of 15 deg C, 30 deg C, 45 deg C, 65 deg C, 80 deg C, 85 deg C and 90 deg C		By Bidder	
35	Maximum dielectric loss of cable per km of 3 phase circuit, laid direct in ground, at normal voltage, frequency and maximum conductor Temperature	W/m	By Bidder	
36	Maximum power factor of charging kVA of cable at normal frequency at a conductor temperature of 20 deg C and at 0.5, 1.0, 1.5 and 2.0 times nominal voltage		By Bidder	

37	Maximum change in power factor between nominal and twice Nominal voltage at 15 deg C		By Bidder	
38 a	Sheath loss (including reinforcement) of cable per km of 3 phase circuit at normal voltage and frequency at maximum continuous current rating	W/m	By Bidder	
b)	Sheath voltage at Maximum Continuous Current	V/m	By Bidder	
c)	Sheath voltage during external 3 phase symmetrical fault value of 50 K amps for one second	kV/m	By Bidder	
i)	Laid direct in ground 1 metre below the ground level	V	By Bidder	
ii)	Drawn into ducts	V	By Bidder	
39	Impedance per km of 3 phase circuit at normal power frequency And maximum conductor temperature:	ohm/km	By Bidder	
40 a	Maximum/Minimum drum length of cable	M	The Cable Drum length should be as per drum schedule given by Tata Power User departmen	
b)	Normal drum length of cable for each size offered	M	550 meters	
41	Approximate shipping weight and size of drum	kg M	By Bidder	
	Special Arrangement for cable Drum		Pallete attangement for lifting with forklift	
42	Current Ratings			
42.1	Continuous current rating of XLPE insulated single circuit in air at an ambient temperature of 45 deg C and Maximum conductor temperatures of 65 deg C, 70 deg C, 75 deg C, 80 deg C, 85 deg C, 90 deg C	A	By Bidder	
	Circuit Formation			
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
42.2	Continuous current rating of XLPE insulated single circuit in ground At soil temperature of 40 deg C and soil thermal resistivity of 120 deg C cm/watt and depth of burial of 1metre,75 deg C, 80 deg C, 85 deg C, 90 deg C	A		
	Circuit Formation			
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
43	Overload capacity and duration			
i)	Conductor temperature after overload	deg C	By Bidder	
ii)	For XLPE cables from initial temperature of 90 deg C to 130 deg C	A / hr	By Bidder	
44	Recommended operating temperatures			
i)	Continuous	deg C	90	
ii)	Emergency (2hrs)	deg C	130	
iii)	After short circuit	deg C	250	
45	Short circuit capacity for 1second, for conductor temperature rising from42(i),42(ii) to 42(iii)	kA RMS	By Bidder	
46	Short circuit capacities with a conductor temperature of 90 deg c at the commencement			
a)	0.5 sec DURATION	kA	By Bidder	
b)	1 sec DURATION	kA	By Bidder	
c)	2 sec DURATION	kA	By Bidder	
d)	3 sec DURATION	kA	By Bidder	
47	Rated sheath current for the short circuit capacities indicated in item 44 above		Short Circuit rating of copper screen Considering 43(i) 43 (ii)	
a)	0.5 sec DURATION	kA	By Bidder	
b)	1 sec DURATION	kA	By Bidder	
c)	2 sec DURATION	kA	By Bidder	
d)	3 sec DURATION	kA	By Bidder	
48 a	Temperature at outer surface of the lead sheath corresponding to maximum conductor temp.of 90 deg C	deg C	By Bidder	
b)	Temperature of the over sheath corresponding to maximum conductor temp rise of 90 deg C	deg C	By Bidder	
c)	Temperature of the over sheath corresponding to maximum conductor temp of 250 deg C	deg C	By Bidder	
49	Maximum continuous current carrying capacity per circuit when laid two circuits in ground, 1.0 M/ 1.3 M to top of cable. (Ground temperature 40 deg C, soil thermal resistivity 120 deg C CM/W, maximum conductor temperature 90 deg C		By Bidder	
a)	Only one 3-phase circuit loaded A	Amps		
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
b)	Two 3-phase circuit per trench, in horizontal formation and 450 mm centres, both loaded	Amps		
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
50	Maximum continuous current carrying capacity per circuit when drawn into pipes (conditions as in item 49(b) above)	Amps		
a)	Only one 3-phase circuit loaded		By Bidder	
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
b)	Two 3-phase circuits at 450 mm centres		By Bidder	
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
51	Continuous current carrying capacity which will permit further 10% overload for two hours without exceeding maximum conductor temperature of 90 deg C. (Laid as in item 49 above)	A		
a)	Only one 3-phase circuit loaded			
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
b)	Two 3-phase circuits at 450 mm centres			
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	

52	Continuous current carrying capacity which will permit a further 10% overload for two hours as in item 50 above, but with cables drawn into pipes			
a)	Only one 3-phase circuit loaded	A	By Bidder	
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
b)	Two 3-phase circuits at 450 mm centres			
i)	Flat		By Bidder	
ii)	Open Trefoil		By Bidder	
iii)	Close Trefoil		By Bidder	
53	Detailed calculation of sheath voltages for all normal and abnormal conditions enclosed with bid	Yes / No	Yes	
54	Drawings/Information/Documents and details enclosed	Yes / No	Yes	
55	Phase to Ground characteristic Impedance at 50-200 Hz	Ohm	By Bidder	
56	Basic impulse insulation level (1.2 + 30%, / 50 + 20% u Sec Wave)	kV Peak	By Bidder	
57	Power Frequency (50 Hz) withstand voltage for 30 Minutes	kV RMS	By Bidder	
58	Minimum total creepage distance for Sealing ends	mm	By Bidder	
59	Minimum Protected creepage distance for Sealing ends	mm	By Bidder	
60	Support Insulators for insulating Sealing ends from Earth provided	Yes / No	By Bidder	
61	Maximum continuous operating pressure for SF6 for GIS sealing end	Kg/sq.cm	By Bidder	
62	Test reports for special tests enclosed with bid	Yes / No	Yes	
63	Link boxes suitable for installation	Above ground/Below ground	Above ground	
64	Inductance of single core cable	mH/km per phase	By Bidder	
65	Capacitive charging current at rated voltage and 50 Hz	A/km per phase	By Bidder	
66	Capacitance of Cable	µF/km per phase	By Bidder	
67	Dielectric loss at 50 Hz	W/km per phase	By Bidder	
68	Maximum allowable pulling force for the cable.	kN	By Bidder	
69	Details of measures for prevention of ingress of moisture (radial & longitudinal) in the cable		By Bidder	
70	Desired Closed trefoil current rating for conditions mentioned in standard specification	Amps	By Bidder	

Signature

Seal of the Company

Designation

THE TATA POWER COMPANY LIMITED

STANDARD

TECHNICAL SPECIFICATION

FOR

110 kV EHV CABLE SYSTEM

(DOCUMENT NO - ENGG/STD-SPEC/ STD-SPECS/73A)

Tata Power

Engineering (T&D)

Rev. No	Date	Revision History	Prepared By	Checked By	Approved By (HOD)
A	15.05.2020		PSA	SVD/RKS	AM
B	24.03.2022	Learnings from Previous Project added	RS / PSA	PBT/AAB	AM
C	03.01.2024	Learnings from Previous Project & Safety requirements added	HSK/RS	MVD	SKV 100124

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1. INTRODUCTION

The specification covers 110 kV single core, copper conductor, XLPE insulated, lead sheathed, armoured, HDPE sheathed cable and associated straight through / Cross bonding joint kits, cable terminations for the cable, Link Box, Cleats, and Earthing Cable etc.

2. BIDDER'S QUALIFICATION REQUIREMENTS

Refer Annexure C1– PQR for 110 kV EHV cable.

3. SYSTEM DESCRIPTION AND SCOPE

3.1 The scope includes supply of 110 kV single core, copper conductor, XLPE insulated, lead sheathed, armoured, HDPE sheathed cable and associated Straight through / Cross bonding joint kits, cable terminations for the cable, Link Box, Cleats, Earthing Cable, etc

4. CODES AND STANDARDS

4.1 CODES

4.1.1 The design, manufacture and performance of the cables shall comply with all currently applicable statutes, regulations and safety codes in the locality where they will be installed. Nothing in this specification shall be construed to relieve the BIDDER of his responsibility in this regard.

4.1.2 The equipment's shall comply, in all respects, with the requirements of the latest editions of the codes and standards.

4.1.3 Other National Standards are acceptable if they are established to be equal or superior to the listed standards. In all such cases, however, copies shall be attached to the Bid. The Bids not complying with this requirement are liable for rejection.

4.1.4 In the event of any conflict between the codes and standards referred to elsewhere in this specification and the requirements of this section, the requirements of this section will govern.

4.1.5 Please note that in case of a contradiction the information given in specific requirements overrule the information given in the schedule of guaranteed particulars.

4.2 STANDARDS

4.2.1 International Electro technical Commission Standards are:

a) IEC Publication No.60228: Stranded circular or shaped conductor of copper or aluminium.

b) IEC Publication No.60840: Test for Power Cables with extruded insulation for rated voltage above 30 kV.
c) IEC Publication No.60287: Calculation of continuous current rating for cables.
d) IEC Publication No.60853-2: Cyclic and emergency rating of cables.
e) IEC Publication No.62271-209: Dry type cable terminations.

IS 7098 Part 3 Indian Standard Cross-Linked Polyethylene Insulated Thermoplastic Sheathed Cable Specification.

4.2.2 The BIDDER shall attach, to his bid, copies of all standards to which the equipment quoted confirms. The BID not complying with this requirement will be rejected. In the event that the standards referred are not in the English language, the BIDDER shall submit translations as indicated in 1.3 above.

The testing procedures and requirements shall conform to the latest edition of the following national and international standards, but not limited to:

a) IEC publication 60540
b) IEC publication 60228
c) IEC publication 60229
d) British Standard Specification 6622/BS 801 for metal sheath composition
e) IEC publication 60840
f) IEC publication 60230
g) IEC publication 60287
h) IEC publication 60811
i) IEC publication 60885

The IEC standards shall prevail whenever the same tests are specified in other standards.

5. DESIGN REQUIREMENTS

5.1 Specific Requirements

5.1.1 The cables shall be single core with stranded annealed copper conductors (water tight), segmented, shielded, cross link Polyethylene XLPE (insulation compound ultra-super clean of Borealis/DOW make) insulated, core shielded, with water barrier protection (both radial and longitudinal), concentric plain copper wires applied helically with gaps followed with open helix of plain copper binder and thereafter semiconducting water swellable tape, lead alloy sheathed, armoured tape with non-magnetic material and shall be provided with an overall HDPE over sheath coated with graphite.

5.1.2 The conductor shield, insulation and insulation shield shall be extruded in a single process (triple extrusion) or any other equivalent process using dry curing technology to ensure homogeneity and absence of micro voids.

5.1.3 These cables shall be manufactured by 'Dry curing' process.

5.1.4 The BIDDER shall indicate any specific construction features, which will be provided to ensure specific water tightness of cable, both transversely and longitudinally.

5.1.5 The MANUFACTURER shall confirm the final permissible conductor temperature after overload and consequently ensure that there is no loss of life of the cable insulation.

5.1.6 The EHV cables shall be designed for continuous operation at a maximum line to line system voltage. The maximum dielectric stress at the conductor surface, assumed smooth shall not exceed 7 kV/mm.

5.1.6.1 Maximum insulation power factor of the cables at 90 deg. C shall not exceed 1.8%.

5.1.6.2 The impulse withstand peak voltage of the cables shall be as per relevant IEC standard.

5.1.6.3 The cables and accessories shall be capable of withstanding dynamic and thermal stresses due to a symmetrical short circuit current.

5.1.7 The maximum conductor temperature shall not exceed 90 deg.C during continuous operation at full rated current at rated voltage followed by 10% overload for two hours. The temperature after a short circuit for one second, shall not exceed 250 deg.C, with initial conductor temperature of 90 deg.C.

5.1.8 Emergency Loading

The BIDDER shall indicate the maximum percentage overload current that the cable can carry and its duration when operating initially at a conductor temperature of 90 deg.C and the permissible final conductor temperature after overload. The total period during the lifetime of the cable when it shall be subjected to emergency loading without any deterioration to its insulation shall also be indicated.

5.2 **Design Features**

5.2.1 Cable Construction

5.2.1.1 Conductor

Plain, annealed, high conductivity copper wires with compacted circular conductor for size up to 800 Sqmm and Milliken conductor for size 1000 Sqmm and above. The conductor shall be made watertight by providing Non conducting water swellable tape yarns followed

by semiconducting water swellable tape(s) over the conductor. The pulling eye shall be designed for 10 T Pulling capacity. There should not be any protrusion of conductor, relative movement / weak bonding between conductor and its insulation. In case of any such anomaly, cable will be considered for rejection.

5.2.1.2 Conductor Shield

Extruded layers of semi-conducting compound. Minimum thickness of extruded conductor screen shall be 1.0 mm. A semi-conducting tape may be applied over the conductor before extrusion of the conductor screen.

5.2.1.3 Insulation

Cross linked polyethylene (XLPE) manufactured by chemical cross-linking process with suitable amounts of antioxidants, harmless to operating personnel, added to further improve ageing properties at elevated temperatures.

5.2.1.4 Insulation Shield

Extruded layers of semi-conducting compound. Minimum thickness of insulation screen shall be 1.0 mm.

5.2.1.5 Moisture barrier

Moisture impervious layer of suitable material (or semi-conducting swell able tape) for longitudinal and radial water tightness shall be provided which shall be helically applied with suitable overlap.

5.2.1.6 Concentric Copper wire screen

Plain copper wires shall be applied helically with gap. Copper wire screen alone shall be designed for 40 kA for 1 sec

5.2.1.7 Binder tape

Open helix of copper tape binder shall be applied helically with suitable overlap

5.2.1.8 Longitudinal water Barrier

Semi conducting water swellable tape shall be applied helically with suitable overlap

5.2.1.9 Metal Sheath

Lead alloy sheath of type kb-PbTe 0.04 as per DIN 17640 or type 1/2 C as per BS801 and the following compositions. Any other composition of lead alloy may be considered if the same is in accordance with other acceptable international standards.

Kb-PbTe 0.04

a) Tellurium - > 0.035 percentage by weight.
b) Copper - 0.03 to 0.05 percentage by weight.
c) Lead - Remaining percentage by weight materials.
d) Other metals - < 0.005 percentage by weight.
Including Sb, Sn, etc.

1/2C

a) Tin - 0.175 to 0.225 percentage by weight.
b) Cadmium - 0.06 to 0.09 percentage by weight.
c) Lead - Remaining percentage by weight.

5.2.1.10 Bedding

Layer of extruded PVC/crape paper.

5.2.1.11 Armour

Double Non-magnetic stainless-steel tapes designed to provide adequate mechanical protection during installation and in-service conditions. Thickness shall be 0.8 mm nominal.

5.2.1.12 Bedding

A suitable binder tape or bedding shall be applied over armour tapes and under the over sheath.

5.2.1.13 Over sheath

Extruded Black HDPE jacket over the armour. The jacket shall protect the cable sheath and armour from electrolysis caused by stray currents from galvanic action, corrosion and microbiological attack. Suitable additives harmless to operating personnel/ environment shall be included in the HDPE jacket to prevent attack by rodents and termites.

5.2.1.14 Coating

A hard baked one layer of graphite shall be applied over the over sheath as outer electrode for testing the sheath.

5.3 **Cable Accessories**

The bidder should design, manufacture, test and supply accessories for the EHV cable to complete the cable system manufactured by him and guarantee for the complete cable system.
However, if the manufacturer of EHV cable is not manufacturing the cable accessories, then he can supply the accessories from the following EHV cable accessories manufacturer. In this case also, the complete responsibility and guarantee for design, manufacture, testing and comp ability for the cable system will be of the EHV cable manufacturer and supplier:

a) M/s Nexans, Germany
b) M/s NKT, Germany
c) M/s Raychem, India.
d) M/s BRUGG
e) Link Boxes – M/s Peace Power, M/s. Raychem India

5.3.1 Cross Bonding / Straight Joints for EHV cable circuits –

The BIDDER shall quote for the required quantity of cross bonding / straight joints (metal enclosed) along with accessories which shall be complete with premoulded stress relief cones and all other necessary accessories. The cable accessories will be supplied vacuum packed. The accessories shall comply to the latest IEC standards.

5.3.2 110 kV Sealing Ends for suitable size, 1 Core XLPE cable

5.3.2.1 **Outdoor and GIS Sealing End**

Outdoor sealing ends shall be fluid type and GIS sealing end shall be dry type. The outdoor and GIS sealing ends shall withstand the power frequency, impulse and cable testing voltage after installation as specified in IEC standards.

The Cable & accessories shall withstand all thermal and mechanical stresses under steady state and transient operating conditions.

5.4 **Link Boxes**

5.4.1 Link Boxes along the run of the EHV cable

a) Link boxes for grounding of the sheaths of single core cables along the run of the cables shall be made of stainless steel, outdoor, weather proof type, with hinged door with gaskets, painted with tar-epoxy paint and anti-rust protection suitable for completely underground installation and for operation when immersed in water. Hence the design with a Lid which can be lifted vertically is preferred. BIDDER to submit the detailed drawing of these boxes along with the Bid. These Link Boxes shall be easily accessible from road surface in case of installation in joint pit. The gaskets of lid of the box shall be of 'O' ring seals to ensure complete protection against water ingress. The link boxes will be filled with Tarplast Compound as an additional protection against any moisture entry.

b) These Link Boxes shall be suitable for terminating the cable sheaths on either side of joint bays based on cable route for bonding at the box as well as for earthing at recommended locations.

c) All accessories such as copper terminals, cable lugs, connecting links, disconnecting links, washers, gaskets, mounting arrangements, etc. shall be provided to make the system complete.

d) The link box shall be designed to be completely waterproof and capable of immersion in water having protection class IP 64 or higher.

e) The cable leads from sheath to link box, capable of withstanding 10 kV DC, shall also be in BIDDER's scope of supply. (The BIDDER shall quote for the type of cable leads for the cross-bonding system as per the following design:

i. Concentric bonding leads corresponding to three (3) nos. co-axial cable entries to the cross-bonding box. Non-linear resistor type surge diverters of metal oxide type, wherever required, shall be provided in the link box by the BIDDER.)

ii. The BIDDER may quote for link boxes of suitable design in which the surge voltage limiters (SVLs) do not need to be disconnected when a routine 10 kV DC test on the cable over sheath is performed.

5.4.2 Link boxes at the circuit ends for EHV cables

The lead sheath shall be grounded through suitable disconnecting links at the base of sealing ends. The BIDDER shall clearly indicate whether the links are to be grounded directly or through SVLs (non-linear resistors). The links shall be housed in a weatherproof, outdoor, galvanized sheet steel box or cast iron or aluminium alloy box with mounting brackets and provided with 'O' ring gasketed door. The cable leads from the sheath to the link box, capable of withstanding 10 kV DC shall form a part of the scope of supply of the BIDDER.

5.4 The cable and accessories shall withstand all thermal and mechanical stresses under steady state and transient operating conditions.

5.5 Cable Drums

Cables shall be supplied on returnable drums. All the empty drums shall be taken back to OEM factory. All ferrous and other metal parts of drum shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit or storage. The direction for rolling of drums and for laying of Cable should be indicated. Fire Resistant polyethylene as packing material followed by GI sheet (minimum 0.5 mm thick) covering to be provided for protection

The length of cable on each drum shall be determined by the manufacturer considering the transport limitations from manufacturer's works to the site and the route survey indicating the location of joints, cross bonding considerations, etc. as per the final survey carried out by the successful Bidder and the PURCHASER. BIDDER shall indicate in the offer, the maximum length for each size of cable, which can be furnished on one drum. However, before manufacture of the cables, the successful BIDDER shall obtain PURCHASER'S approval for the drum length. The cable ends on the drum must be sealed during transport, storage and installation to prevent ingress of water in the cable.

The sizes and weights of drums shall also be restricted to reasonable amounts to facilitate transport from Stores to site as also installation.

Any adjustment required in the drum lengths (± 5%) to suit the cable route lengths of the EHV cables shall be made without an extra cost to match overall order length.

5.6 Electrolysis & Corrosion

The cable serving shall be designed such that the cable sheath and armouring are protected from electrolysis caused by stray currents, from galvanic action and from corrosion and microbiological attack. The design of accessories shall be such that the outer metallic coverings of cable joints, sealing ends and control points can be insulated from earth along the entire route so that cathode protection, if needed can be applied and also periodic testing of the insulation resistance of the serving can be done. A set of links shall be provided at each end of the cables to connect the cable sheath and armour to the respective station grounds. The sealing ends shall be suitably insulated from their supporting structures, to permit insulation tests on the cable over sheath.

6. LAYOUT REQUIREMENTS

NIL.

7. SAFETY REQUIREMENT

Bidder to note that cable pulling eye shall be designed for 10 T pulling capacity

8. OPERATIONAL AND MAINTENACE REQUIRMENT

8.1 OPERATIONAL REQUIRMENT

NIL

8.2 MAINTENACE REQUIRMENT

NIL

9. TECHNICAL PARAMETERS OF EQUIPMENT INCLUDING DATA SHEET

1. APPROXIMATE LENGTH OF CABLE	: As given in Price Bid
2. TYPE OF INSULATION	: XLPE
3. NOMINAL SYSTEM VOLTAGE, PHASES AND FREQUENCY	:110 kV
4. MAXIMUM SYSTEM VOLTAGE (FOR CONTINUOUS OPERATION)	: 123 kV
5. SYSTEM NEUTRAL EARTHING AT EACH END OF CABLE	: Effectively earthed
6. a) FAULT LEVEL OF SYSTEM (SYMMETRICAL) (kA RMS FOR 1 SEC.)	: 40
b) DYNAMIC WITHSTAND CAPABILITY (kA)	: 100
7. NO. OF CORES	: 1
8. CONDUCTOR	
8.1 MATERIAL	: Annealed Copper
8.2 SIZE (MINIMUM)	: As per GTP
8.3 SHAPE	: Compacted circular (for up to 800 Sqmm Size) Segmental Milliken (for 1000 Sqmm and above size)
8.4 WATER TIGHTNESS OF CONDUCTOR	: Non conducting water swellable tape yarns followed by semiconducting water swellable tape(s) over the conductor

9. CONDUCTOR SCREEN
9.1MATERIAL : Extruded layers of Semiconducting Compound
9.2 THICKNESS (MINIMUM) : 1.0 mm

10 INSULATION : SUPER CLEAN BORIALES / DOW
10.1 MATERIAL : Cross linked Polyethylene (XLPE)
10.2 THICKNESS MINIMUM : 18 mm

11 INSULATION SCREEN

A. Nonmetallic part (extruded)
11.1 MATERIAL : Extruded layers of Semiconducting Compound
11.2 THICKNESS (MINIMUM) :1.0 mm
B. Nonmetallic part (taped) longitudinal water barrier over insulation screen (Swellable type)
a) MATERIAL : Semiconducting swellable tape
b) THICKNESS : MIN 0.3 MM
C. METALLIC SCREEN
MATERIAL : Annealed copper wires (open helix) followed by copper tape as binder
NOMINAL DIA. OF COPPER WIRE : 2.2 mm

MINIMUM THICKNESS OF COPPER TAPE : 0.1 mm (min)

NUMBER OF COPPER WIRES : 75 (min)

SHORT CIRCUIT RATING OF METALLIC SCREEN ALONE : 40 KA FOR 1 SEC

D. SWELLABLE TYPE WATER BLOCKING SEMICONDUCTING TAPE
MATERIAL : Semiconducting swellable tape
THICKNESS : MIN 0.3 MM

12 METAL SHEATH
12.1 MATERIAL : Lead Alloy (Type 1/2C or E)
12.2 THICKNESS (Minimum) : 3.1 MM

13. INNER SHEATH (BEDDING)
13.1 MATERIAL : PVC ST 2 TYPE
13.2 THICKNESS : 2 mm (min)

14. ARMOUR
14.1 MATERIAL : Double Non-magnetic stainless steel tapes followed by suitable binder

14.2 Thickness (Nominal)	:0.8 mm
15. OUTER SHEATH	: Extruded Black HDPE ST 7 Type
15.1 THICKNESS	: 3.81 mm (min)
15.2 Coating	: layer of graphite coating
15.3 Embossing on Outer sheath	: TATA POWER (MANUFACTURER'S NAME) (MANUFACTURING YEAR) 64/110 kV CABLE SIZE mm2 XLPE (DRUMNUMBER) (SEQUENTIAL METER MARKING NUMBER) Sequential marking shall be after every 1mtr and all things shall be embossed.

16. BASIC IMPULSE INSULATION LEVEL (1.2 + 30%/50 + 20% u Sec WAVE)	: 550 kVP
17. POWER FREQUENCY WITHSTAND FOR RMS 30 MINUTES	: 160 kV
18. POWER FREQUENCY WITHSTAND VOLTAGE AFTER IMPULSE TEST FOR 15 MINUTES	: 160 kV
19. MAXIMUM LEVEL OF PARTIAL DISCHARGE AT 1.5U SHALL NOT EXCEED	: 5 pc
20. D C WITHSTAND VOLTAGE OF HDPE SERVING FOR ONE MINUTE	: 10 kV
21. SPECIAL TESTS AS PER RELEVENT IEC REQUIRED TO BE CARRIED OUT	: YES
22. LINK BOXES SUITABLE FOR INSTALLATION	: BELOW GROUND

B. JOINTS

1. ESTIMATED NO. OF INSULATED STRAIGHT THROUGH JOINTS	: As given in Price Bid
2. NORMAL DESIGN VOLTAGE	: 110 kV
3. MAXIMUM DESIGN VOLTAGE	: 123 kV
4. MATERIAL OF JOINT CASING	: Copper, PE coated
5. MODE OF SHEATH EARTHING	: By Bidder

6. BASIC IMPULSE LEVEL
(1.2+30%, 50+20% μ Sec WAVE) : 550 kVP

7. POWER FREQUENCY WITHSTAND
FOR 30 MINUTES : same as for cable

C.SEALING ENDS

1. NO. OF GIS TYPE SEALING ENDS
(VENDOR to also quote for polymer type sealing ends) : As per Section A

2. NO. OF OUTDOOR SEALING ENDS : As per Section A

3. NO. OF TRANSFO END SEALING ENDS : As per Section A

4. RATED VOLTAGE : 110 kV

5. ONE MINUTE POWER FREQUENCY
WITHSTAND VOLTAGE : Same as for cable

6. IMPULSE WITHSTAND VOLTAGE
1.2/50 u Sec WAVE : 550 kVP
7. MINIMUM TOTAL CREEPAGE DISTANCE
FOR OUTDOR TYPE SEALING ENDS : 31 mm/kV

8. SUPPORT INSULATORS FOR
INSULATING SEALING ENDS FROM EARTH : Required

9. MAXIMUM CONTINUOUS OPERATING PRESSURE
FOR SF6 (BARS) : 6.0 bars gauge

10. LOCATION OF SEALING ENDS GIS TYPE : Indoor

D. INSTALLATION

1. TYPE OF LAYING * : Direct Burial

2. AVERAGE DEPTH OF BURIAL : 1.5 M

3. CONFIGURATION : Closed trefoil

4. GROUND TEMPERATURE :35 deg C

5. THERMAL RESISTIVITY :1.2

6. CONTINUOUS CURRENT RATING OF LAID CABLES AND ACCESSORIES AS PER SITE CONDITIONS : As per GTP

Notes:

*All details mentioned above as 'By Bidder' shall be subject to Purchaser's approval.

Data sheet:

Pl refer Annexure E2 for Technical Requirement of 110 kV EHV cable

10. QUALITY REQUIREMENTS

Standard Quality Plan for EHV Cable Ref No. TPQAIT- QAXX-00-EX-SQP-005-Rev0 dated 12.12.2014 and for EHV Termination kits Ref No TPQAIT- QAXX-00-EX-SQP-028-Rev0 dated 11.03.2015 is attached.

11. INSPECTION, TESTING AND PERFORMANCE REQUIREMENTS ALONG WITH WARRANTY

11.1 TESTING OF CABLE SYSTEM

11.1.1 TEST REQUIREMENTS OF EHV XLPE INSULATED CABLES & ACCESSORIES

Bidder shall submit Manufacturing Quality & Inspection Plan along with the bid for approval from the purchaser. All test results shall be provided for review and acceptance by the PURCHASER. The cables and accessories shall be tested in accordance with the latest edition of the applicable standards. The tests to be carried out at the MANUFACTURER'S works shall include those given below. Type tests or special tests when called for in the specifications and all routine tests shall be performed in the presence of PURCHASER'S representative. The PURCHASER shall reserve the right to waive performance of type tests by BIDDER provided type test certificates of similar cables and accessories of voltage level and conductor size same as those in this specification, or higher are submitted by the BIDDER.

The BIDDER shall also indicate any special tests at works/site recommended by him to ensure satisfactory operation of the cables.

Cost of cable consumed for testing shall be on bidders account & the actual delivery quantity of the cable should not deviate from the ordered quantity.

11.1.2 CATEGORIES OF TESTS

The tests shall be generally grouped under the following categories out of which a), b) and c) shall be conducted in the MANUFACTURER's works/recognized laboratory:
a) Routine tests
b) Sample/Special tests on cable
c) Type tests on cable and accessories
d) Acceptance Tests
e) Site tests after installation details to be given by vendor

The tests to be carried out at the BIDDER's works shall include those indicated below. Type tests or special tests, whenever specified, and all the routine tests shall be performed in the presence of PURCHASER's representative. Bidder to furnish type test reports along with the bid documents. The type tests carried out earlier shall be considered valid if the same are carried out not be later than 5 years from the bid submission date. In case the bidders have not carried out the type tests mentioned below within last five years, then the bidders will have to carry out the type tests at their own cost in presence of PURCHASER's representatives. Alternatively, bidders to take clear deviation giving reasons for the same. Approval of such deviations will be at the discretion of the PURCHASER.

11.1.3 ROUTINE TESTS

The routine tests shall be carried out on every drum of completed cable to ensure compliance of the cable with the requirement of the relevant national or international specification.

Routine Tests on cables will be carried out as per the approved Standard Quality Plan.

11.1.3.1 TYPE TESTS ON CABLE

The bidder shall furnish type test reports carried out not be later than 5 years from the bid submission date. In case the bidders have not carried out the type tests mentioned in SQP within last five years, then the bidders will have to carry out the type tests at their own cost in presence of PURCHASER's representatives.
Type Test on cables will then be carried out as per the approved Standard Quality Plan.

11.1.4 TYPE TESTS ON CABLE ACCESSORIES

Bidder shall submit the Type test reports for review and acceptance of the Purchaser to demonstrate satisfactory operation in service.

The bidder shall furnish type test reports carried out not be later than 5 years from the bid submission date. In case the bidders have not carried out the type tests mentioned in

SQP within last five years, then the bidders will have to carry out the type tests at their own cost in presence of PURCHASER's representatives.
Type Tests on cable accessories will then be carried out as per the approved Standard Quality Plan.

The type tests shall be grouped into two categories:
a) Electrical tests
b) Non-electrical tests

11.1.4.1 ELECTRICAL TESTS

The tests shall be conducted successively on two test assemblies containing 10-15 metres of cable previously subjected to a bending test, one assembly being of cable only and the second being an assembly of cable together with accessories designed for use with the cable.
The tests shall be carried out in the following sequence:
a) Bending test.
b) Partial discharge test.
c) Dielectric loss angle (DLA) measurement as a function of the voltage.
d) Capacitance measurement.
e) DLA measurement as a function of the temperature.
f) Loading cycle test plus partial discharge test and DLA measurement.
g) Thermal Stability test
In order to demonstrate thermal stability of the system, a test will be carried out on the same installation as follows:
With the test voltage of 1.5 times working voltage maintained between each conductor and sheath copper screen, a loading current, adjusted according to the ambient temperature to give the designed maximum conductor temperature of 90 deg C plus 5 deg C, will be circulated. This current shall be maintained with the other test conditions unaltered until steady temperatures, with a total variation not exceeding 2 deg C, have been maintained for six hours. Temperature readings shall be taken every hour during this test. Hot power factors shall be measured at the test voltage at the end of the six-hour period.
h) Impulse withstand test followed by power frequency voltage test.
i) DLA measurement as a function of temperature.
h) Impulse Test to Break-down
For information only, a sample of cable shall be subjected to an impulse break down test at a conductor temperature of 90 deg C. The impulse voltage shall be increased in steps of about 15 kV peak, 10 negatives followed by 10 positive impulses being applied at each level, until break down occurs. The general test arrangements shall be at the discretion of the MANUFACTURER who shall not be required to inT&D any accessories other than the necessary potheads, which may be of any type convenient. If the MANUFACTURER should so desire, this impulse break down test may be carried out on the installation, previously used for the impulse withstand test.
i) DC voltage test

j) High voltage AC test.
k) Cable and accessory examination.

11.1.4.2 NON-ELECTRICAL TESTS

In addition to the non-electrical tests listed under sample test, the tests indicated in relevant IEC shall also be carried out.

11.1.4.3 TESTS ON ACCESSORIES

The following type tests shall be carried out on the accessories:
a) Impulse withstand test.
b) High voltage test for 4 hours.

11.1.5 ACCEPTANCE TESTS:

The acceptance tests for cable and accessories shall be carried out as per the approved Standard Quality Plan.

11.1.6 SITE TESTS ON SYSTEM AFTER INSTALLATION

The following tests shall be conducted to ensure that no damage has occurred during transport, cable laying and assembly of the accessories:

a) Conductor resistance measurement on each core of completed circuit.
Subsequent to completion of installation of all the lengths, the total conductor resistance of each core of the entire circuit shall be measured.

b) Insulation resistance of each core of each drum length, after laying and before jointing. Subsequent to completion of installation of all the lengths, a total insulation resistance test of each core of the entire circuit shall be carried out.

c) Voltage test of 10 kV DC applied for 1 minute between the metal sheath of the cable and earth to check quality of anti-corrosion protection on completion of cable laying of each drum length before jointing. In addition, the serving insulation resistance shall be measured and checked with the value obtained in the factory routine test. Subsequent to completion of installation of all the lengths, duly jointed and anticorrosive protection applied with all cross bonding equipments installed, the sheath of the entire circuit shall be tested at 10 kV DC for 1 minute.

12. MANDATORY SPARES

Bidder shall include list of spares with quantities as recommended by him required for three years trouble free operation of equipments.

13. DATA SUBMISSION BY BIDDER

13.1 ALONGWITH BID

Bidder shall submit following Data sheets / information along with the Technical Bid.

13.1.1 Data Confirming Bidders Qualification Requirement Ref S No. 2.1 in Format C1 excel sheet
13.1.2 Guaranteed Technical Parameters (GTP) (in attached Excel format E2– Excel soft file to be sent with Technical Bid) & in PDF
13.1.3 Quality Assurance Plan
13.1.4 General Arrangement Drawing
13.1.5 Schedule of Technical Deviations
13.1.6 Project Schedule / Manufacturing & Delivery schedule
13.1.7 Valid Type Test Reports (Should not be older than 5 years of same design)

13.2 AFTER AWARD OF CONTRACT

13.2.1 General arrangement Drawings
13.2.2 Guaranteed Technical Parameters
13.2.3 Manufacturing Quality Plan (QAP)
13.2.4 Field Quality Plan (FQP)
13.2.5 Test Plans
13.2.6 Schedule of Recommended Spares

14. ANNEXURES

14.1.1 Standard Quality Plan for EHV Cable Ref No. TPQAIT- QAXX-00-EX-SQP-005-Rev0 dated 12.12.2014
14.1.2 Standard Quality plan for EHV Termination kits Ref No TPQAIT- QAXX-00-EX-SQP-028-Rev0 dated 11.03.2015

THE TATA POWER COMPANY LIMITED

STANDARD

TECHNICAL SPECIFICATION

FOR

"220 kV EHV CABLE SYSTEM"

(DOCUMENT NO - ENGG/ELECTRICAL/STD-SPEC/97/20)

Tata Power

Engineering (T&D)

Rev. No	**Date**	**Revision History**	**Prepared By**	**Checked By**	**Approved By**
B	**07.07.2023**	**Cable drum details added**	**PSA**	**MVD**	**SKV** 100723
A	**24.03.2022**	**Learnings from Previous Project added**	**RS / PSA**	**PBT / AAB**	**AM**

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13. Data Submission by Bidder

    13.1 With the Bid (including list of key drawings with dates/period which are part of commercial compliance)

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1. Introduction

The specification is issued for design, engineering, manufacturing, Factory acceptance test, transportation to site, installation (including civil works) and commissioning of 220 kV, 1C, copper conductor, XLPE insulated, lead sheathed, armoured, HDPE sheathed cable and associated accessories along with Fibre Optic cable.

2. Pre-Qualifying Requirements including TTR

Bidder shall meet the qualification requirements as mentioned in attached Format C1 – Annexure 1:

3. System Description and Scope

As per section A

4. Codes & Standards.

4.1 CODES

4.1.1 The design, manufacture and performance of the cables shall comply with all currently applicable statutes, regulations and safety codes in the locality where they will be installed. Nothing in this specification shall be construed to relieve the BIDDER of his responsibility in this regard.

4.1.2 The equipment's shall comply, in all respects, with the requirements of the latest editions of the codes and standards.

4.1.3 Other National Standards are acceptable if they are established to be equal or superior to the listed standards. In all such cases, however, copies shall be attached to the Bid. The Bids not complying with this requirement are liable for rejection.

4.1.4 In the event of any conflict between the codes and standards referred to elsewhere in this specification and the requirements of this section, the requirements of this section will govern.

4.1.5 Please note that in case of a contradiction the information given in specific requirements overrule the information given in the schedule of guaranteed particulars.

4.2 STANDARDS

4.2.1 International Electro technical Commission Standards are:

a) IEC Publication No.60228: Stranded circular or shaped conductor of copper or aluminium.
b) IEC Publication No.60840: Test for Power Cables with extruded insulation for rated voltage above 30 kV.
c) IEC Publication No.60287: Calculation of continuous current rating for cables.
d) IEC Publication No.60853-2: Cyclic and emergency rating of cables.
e) IEC Publication No.62271-209: Dry type cable terminations

4.2.2 The BIDDER shall attach, to his bid, copies of all standards to which the equipment quoted confirms. The BID not complying with this requirement will be rejected. In the event that the standards referred are not in the English language, the BIDDER shall submit translations as indicated in 1.3 above.

The testing procedures and requirements shall conform to the latest edition of the following national and international standards, but not limited to:

a) IEC publication 60540
b) IEC publication 60228
c) IEC publication 60229
d) British Standard Specification 6622/BS 801 for metal sheath composition
e) IEC publication 60840
f) IEC publication 60230
g) IEC publication 60287
h) IEC publication 60811
i) IEC publication 60885
j) IEC publication 62067

The IEC standards shall prevail whenever the same tests are specified in other standards.

5. Design Requirements

5.1 Specific Requirements

5.1.1 The cables shall be 220 kV, single core, cable with stranded annealed copper water tight conductors, segmented, shielded, cross link Polyethylene XLPE (insulation compound ultra-super clean of Borealis) insulated, core shielded, with water barrier protection (both radial and longitudinal), concentric plain copper wires applied helically with gaps followed with open helix of plain copper binder and thereafter semiconducting water

swellable tape, lead alloy sheathed, armoured tape with non-magnetic material and shall be provided with an overall HDPE over sheath coated with graphite.

5.1.2 The conductor shield, insulation and insulation shield shall be extruded in a single process (triple extrusion) or any other equivalent process using dry curing technology to ensure homogeneity and absence of micro voids.

5.1.3 These cables shall be manufactured by 'Dry curing' process.

5.1.4 The BIDDER shall indicate any specific construction features, which will be provided to ensure specific water tightness of cable, both transversely and longitudinally.

5.1.5 The MANUFACTURER shall confirm the final permissible conductor temperature after overload and consequently ensure that there is no loss of life of the cable insulation.

5.1.6 The 220 kV cables shall be designed for continuous operation at a maximum line to line system voltage of 245 kV. The maximum dielectric stress at the conductor surface, assumed smooth shall not exceed 7 kV/mm.

5.1.7 Maximum insulation power factor of the cables at 90 deg. C shall not exceed 1.8% for 220 kV.

5.1.8 The impulse withstand peak voltage of the cables shall not be less than 1050 kV (peak) for the 220 kV cables.

5.1.9 The cables and accessories shall be capable of withstanding dynamic and thermal stresses due to a symmetrical short circuit current of 40 kilo Amperes (RMS) for a period of 1 sec. and dynamic withstand of 100 kA (peak).

5.1.10 The minimum thickness of insulation of the cable shall not be less than 22 mm.

5.1.11 The minimum thickness of the lead alloy sheath and HDPE over sheath shall be as follows:

a. Lead alloy sheath 3.6 mm
b. HDPE over sheath 4.07 mm

5.1.12 Temperature Rise: The maximum conductor temperature shall not exceed 90 deg.C during continuous operation at full rated current at 220 kV followed by 10% overload for two hours. The temperature after a short circuit for one second, shall not exceed 250 deg.C, with initial conductor temperature of 90 deg.C.

5.1.13 Emergency Loading

The BIDDER shall indicate the maximum percentage overload current that the cable can carry and its duration when operating initially at a conductor temperature of 90 deg.C and the permissible final conductor temperature after overload. The total period during the lifetime of the cable when it shall be subjected to emergency loading without any deterioration to its insulation shall also be indicated.

5.2 Design Features

5.2.1 Cable Construction

5.2.1.1 Conductor

Plain, annealed, high conductivity copper wires, stranded segmented compacted Milliken conductor as specified in General Technical Particulars. The pulling eye should have same strength as the permissible conductor strength. The conductor shall be watertight conductor. There should not be any protrusion of conductor, relative movement / weak bonding between conductor and its insulation. In case of any such anomaly, cable will be considered for rejection.

5.2.1.2 Conductor Shield

Extruded layers of semi-conducting compound. Minimum thickness of extruded conductor screen shall be 1 mm. A semi-conducting tape may be applied over the conductor before extrusion of the conductor screen.

5.2.1.3 Insulation

Cross linked polyethylene (XLPE) manufactured by chemical cross-linking process with suitable amounts of antioxidants, harmless to operating personnel, added to further improve ageing properties at elevated temperatures. The minimum thickness for 220 kV Cable shall be 22 mm in accordance with IEC 62067.

5.2.1.4 Insulation Shield

Extruded layers of semi-conducting compound. Minimum thickness of insulation screen shall be 1 mm.

5.2.1.5 Moisture barrier

Moisture impervious layer of suitable material (or semi-conducting swell able tape) for longitudinal and radial water tightness shall be provided which shall be helically applied with suitable overlap.

5.2.1.6 Concentric Copper wire screen

Plain copper wires shall be applied helically with gap. Nominal area shall be 285 Sq mm. The copper wire screen shall be designed for 40 KA for 1sec.

5.2.1.7 Binder tape

Open helix of copper tape binder shall be applied helically with suitable overlap

5.2.1.8 Longitudinal water Barrier

Semi conducting water swellable tape shall be applied helically with suitable overlap

5.2.1.9 Metal Sheath

Lead alloy sheath of type kb-PbTe 0.04 as per DIN 17640 or type 1/2 C as per BS801 and the following compositions. Any other composition of lead alloy may be considered if the same is in accordance with other acceptable international standards.

Kb-PbTe 0.04

a) Tellurium - > 0.035 percentage by weight.
b) Copper - 0.03 to 0.05 percentage by weight.
c) Lead - Remaining percentage by weight materials.
d) Other metals - < 0.005 percentage by weight.
Including Sb, Sn, etc.

1/2C

a) Tin - 0.175 to 0.225 percentage by weight.
b) Cadmium - 0.06 to 0.09 percentage by weight.
c) Lead - Remaining percentage by weight.

5.2.1.10 Bedding

Layer of extruded PVC/crape paper.

5.2.1.11 Armour

Double Non-magnetic stainless steel tapes designed to provide adequate mechanical protection during installation and in service conditions. Thickness shall be 0.8 mm minimum.

5.2.1.12 Bedding

A suitable binder tape or bedding shall be applied over armour tapes and under the over sheath.

5.2.1.13 Over sheath

Extruded Black HDPE jacket over the armour. The jacket shall protect the cable sheath and armour from electrolysis caused by stray currents from galvanic action, corrosion and microbiological attack. Suitable additives harmless to operating personnel/ environment shall be included in the HDPE jacket to prevent attack by rodents and termites.

5.2.1.14 Coating

A hard baked one layer of graphite shall be applied over the over sheath as outer electrode for testing the sheath.

5.3 Cable Accessories

The bidder should design, manufacture, test and supply accessories for the EHV cable to complete the cable system manufactured by him and guarantee for the complete cable system.
However, if the manufacturer of EHV cable is not manufacturing the cable accessories, then he can supply the accessories from TATA Power approved EHV cable accessories manufacturer. In this case also, the complete responsibility and guarantee for design, manufacture, testing and comp ability for the cable system will be of the EHV cable manufacturer and supplier:

a) M/s Nexans, Germany
b) M/s NKT, Germany
c) M/s BRUGG
d) M/s Raychem, India.

5.3.1 Cross Bonding / Straight Joints for EHV cable circuits

BIDDER shall quote for the required quantity of cross bonding / straight joints (metal enclosed) along with accessories which shall be complete with premoulded stress relief cones and all other necessary accessories. The cable accessories will be supplied vacuum packed. The accessories shall comply to the latest IEC standard. The joints shall be with copper casing and outer Coffin Box filled with compound.

5.3.2 220 kV Sealing Ends

Outdoor & GIS Sealing Ends

Outdoor sealing ends shall be fluid type. The outdoor sealing ends shall be with Polymer insulators. GIS sealing end shall be dry type. The sealing ends shall withstand the power frequency, impulse and cable testing voltage after installation as specified.

The above sealing ends shall be in the scope of supply of the BIDDER. However, the BIDDER shall indicate clearly and explicitly in his offer the scope of supply of the GIS vendor. The successful BIDDER shall co-ordinate with the GIS vendor, through the PURCHASER, the terminal arrangements, flanges, gaskets other interfacing equipment etc. The Bidder shall be overall responsible to achieve interface with the GIS cable chamber.

The Cable & accessories shall withstand all thermal and mechanical stresses under steady state and transient operating conditions.

5.4 Cross Bonding of 220 kV Cable Sheath

For all projects, the vendor shall calculate the voltage rise and proposed remedial measures so that the sheath standing voltage to earth for rated cable current shall not be in excess of 65 V rms and sheath voltage, during an external three phase, symmetrical through fault as specified, should not be in excess of 800V. Cable supplier shall submit detailed calculations with the bid for the type of cross bonding being offered. As the existing system is to be modified and extended for this project, the cross bonding and earthing system to be designed accordingly.

5.5 Link Boxes

5.5.1 Link Boxes along the run of the 220 kV cable

a. Link boxes for grounding of the sheaths of single core cables along the run of the cables shall be made of cast iron/aluminium alloy/stainless steel, outdoor, weather proof type, with hinged door with gaskets, painted with tar-epoxy paint and anti-rust protection suitable for completely underground installation and for operation when immersed in water. Hence the design with a Lid which can be lifted vertically is preferred. BIDDER to submit the detailed drawing of these boxes along with the Bid. These Link Boxes shall be easily accessible from road surface in case of installation in joint pit. The gaskets of lid of the box shall be of 'O' ring seals to ensure complete protection against water ingress. The link boxes will be filled with Tarplast Compound as an additional protection against any moisture entry.

b. These Link Boxes shall be suitable for terminating the cable sheaths on either side of joint bays based on cable route for bonding at the box as well as for earthing at recommended locations.

c. All accessories such as copper terminals, cable lugs, connecting links, disconnecting links, washers, gaskets, mounting arrangements, etc. shall be provided to make the system complete.

d. The link box shall be designed to be completely water proof and capable of immersion in water having protection class IP 64 or higher.

e. The cable leads from sheath to link box, capable of withstanding 10 kV DC, shall also be in BIDDER's scope of supply. (The BIDDER shall quote for the type of cable leads for the cross bonding system as per the following design :

i. Concentric bonding leads corresponding to three (3) nos. co-axial cable entries to the cross bonding box. Non-linear resistor type surge diverters of metal oxide type, where ever required, shall be provided in the link box by the BIDDER.)

ii. The BIDDER may quote for link boxes of suitable design in which the surge voltage limiters (SVLs) do not need to be disconnected when a routine 10 kV DC test on the cable over sheath is performed.

5.5.2 Link boxes at the circuit ends for 220 kV cables

The lead sheath shall be grounded through suitable disconnecting links at the base of sealing ends. The BIDDER shall clearly indicate whether the links are to be grounded directly or through SVLs (non-linear resistors). The links shall be housed in a weather proof, outdoor, galvanized sheet steel box or cast iron or aluminium alloy box with mounting brackets and provided with 'O' ring gasketed door. The cable leads from the sheath to the link box, capable of withstanding 10 kV DC shall form a part of the scope of supply of the BIDDER.

5.4 The cable and accessories shall withstand all thermal and mechanical stresses under steady state and transient operating conditions.

5.6 Cable Drums

Cables shall be supplied in non-returnable drums. All ferrous and other metal parts of drum shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit or storage. The direction for rolling of drums and for laying of Cable should be indicated. Fire Resistant Polyethylene as the packing material followed by GI Sheet (minimum 0.5 mm thick) covering for protection to be provided.
The length of cable on each drum shall be determined by the manufacturer considering the transport limitations from manufacturer's works to the site and the route survey indicating the location of joints, cross bonding considerations, etc. as per the final survey carried out by the successful Bidder and the PURCHASER. BIDDER shall indicate in the offer, the maximum length for each size of cable, which can be furnished on one drum. However, before manufacture of the cables, the successful BIDDER shall obtain PURCHASER'S approval for the drum length. The cable ends on the drum must be sealed during transport, storage and installation to prevent ingress of water in the cable.

The sizes and weights of drums shall also be restricted to reasonable amounts to facilitate transport from Stores to site as also installation.
Any adjustment required in the drum lengths to suit the cable route lengths of the 220 kV cables shall be made without extra cost. The bidder should have his own storage plot and dispose off the drums after cable laying.

5.6.1 Storage of cable drums:

1. Store cable drums indoors on a hard, dry, and flat surface to avoid deterioration due to rapid ageing from weather, extreme seasonal effects, dampening and affecting from insects the drums must always be stored with their flanges vertical. The cable ends should remain sealed to prevent the ingress of moisture
2. The storage site shall be well drained, levelled and should preferably have concrete surface/hard surface with fire breakers to prevent external fire threatening the stores.
3. Fire protection material to be mandatorily kept in store for any eventuality e.g., Fire Extinguisher, Sand buckets, etc
4. The accessories should be maintained in closed storage with air conditioning facility specially when storage of cable jointing accessories have to be kept over a year or as per OEM recommended storage requirement.
5. In case of outdoor storage of cable drums near/ adjacent to farm or other place having more probability of fire hazard, local area of cable storage can be curtained/ guarded with shield of asbestos or any other flame proof material
6. Drum stoppers (MS material) shall be suitable for taking the entire load of cable drum
7. A visual inspection of the drums is to be carried out at intervals of minimum three months to check their general condition
8. Before laying of the cable, condition of cable drum to be ascertained by OEM representative.
9. Suitable arrangement on the cable drum should be made available for lifting of cable drum using forklift.

5.7 Electrolysis & Corrosion

The cable serving shall be designed such that the cable sheath and armoring are protected from electrolysis caused by stray currents, from galvanic action and from corrosion and microbiological attack. The design of accessories shall be such that the outer metallic coverings of cable joints, sealing ends and control points can be insulated from earth along the entire route so that cathode protection, if needed can be applied and also periodic testing of the insulation resistance of the serving can be done. A set of links shall be provided at each end of the cables to connect the cable sheath and armour to the

respective station grounds. The sealing ends shall be suitably insulated from their supporting structures, to permit insulation tests on the cable over sheath.

5.8 Grounding System

The BIDDER shall indicate his recommendations regarding the type of grounding systems for the lead sheath/armour. The scope of supply shall include any ground rod or ground conductor/earthing cable as recommended. The grounding material shall be copper. Special provision including supply of required material viz. shorting bars, varistors etc. for GIS envelope carrying cable sealing ends shall be made, to avoid Transient Ground Potential Rise (TGPR) Phenomenon.

6. Layout Requirements for the equipment

The laying requirements are covered in Section A attached with this tender.

7. Safety Requirements

Bidder / Contractor to comply to all the Safety requirements as per the Contractor Safety Manual

8. Operational Requirements

Bidder / Contractor should adhere to the operational requirements as instructed by the Engineer – in – charge during execution of the project.

9. Technical Parameters of Equipment including data sheet and make list for bought out items.

Bidder shall submit the data sheet attached with the bid document for owner's review and approval.

10. Quality Requirements (including SQP and FQP)

TATA Power Standard Quality Plan ref no. TPQAIT-QAXX-00-EX-SQP-090 Rev 0 dated 30.03.2015 is attached as reference. Bidder shall submit quality plan for owner's review and approval which shall meet the reference document

11. Inspection, Testing and Performance Requirements along with Warranty

The material shall be inspected and tested as per the approved Manufacturing Quality Plan.

Vendor will have to carry out all type tests as mentioned in Standard Quality Plan. All test results shall be provided for review and acceptance by PURCHASER.

Cost of cable consumed for testing shall be on bidders account & the actual delivery quantity of the cable should not deviate from the ordered quantity.

The Cable Drum length should be as per drum schedule given by Tata Power User department.

12. Mandatory Spares

Bidder shall specify mandatory spares if any in his offer.

13. Data Submission by Bidder

13.1 With the Bid:

- Dully filled in schedules, listed in section 'C'.
- Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP)
- General Arrangement Drawings and documents for equipment offered
- Guaranteed Technical Particulars (Data Sheet) in Format E2
- Type Test Reports
- Documents conforming validation of qualifying requirements as detailed in S No. 2 above and format C1.

13.2 After award of contract

- General Arrangement Drawings and documents for equipment offered
- Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP)
- Type Test Reports
- Inspection Schedule
- Manufacturing Schedule
- After placement of award, the Contractor shall submit, Master Drawing List (MDL), all documents and fully dimensioned drawing including all the components in WRENCH software to the Owner for approval. TATA Power will provide training to the contractor's representative for facilitating him drawing submission in WRENCH. After getting approval from the Owner and successful completion of all the type tests, the Contractor shall proceed for manufacturing after seeking specific approval from the owner.

Annexure - 4a

THE TATA POWER COMPANY LIMITED

STANDARD

TECHNICAL SPECIFICATION

FOR

Concrete and allied works

(DOCUMENT NO - ENGG/ CIVIL/STD-SPEC/1711/20)

Tata Power

Project Engineering

0	**21/08/2017**	**-**	**AR**	**SAT**	**SC**
Rev. No	**Date**	**Revision History**	**Prepared By**	**Checked By**	**Approved By (HOD)**

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10. Inspection, Testing and Performance Requirements along with Warranty

11. Mandatory Spares

12. Data Submission By Bidder

    12.1 With the Bid

    12.2 After award of contract

1. Introduction
As per main specification

2. Pre-Qualifying Requirements and Approved Vendor List
Not Applicable

3. System Description and Scope
This Specification covers the general requirements for concrete using on-site production facilities including requirements in regard to the quality, handling, storage of ingredients, proportioning, batching, mixing, transporting, placing, curing, protecting, repairing, finishing and testing of concrete; formwork; requirements in regard to the quality, storage, bending and fixing of reinforcement; grouting as well as mode of measurement and payment for completed works.

It shall be very clearly understood that the specifications given herein are brief and do not cover minute details. However, all works shall have to be carried out in accordance with the relevant standards and codes of practices or in their absence in accordance with the best accepted current engineering practices or as directed by ENGINEER from time to time. The decision of ENGINEER as regards the specification to be adopted and their interpretation and the mode of execution of work shall be final and binding on EPC-CONTRACTOR and no claim whatsoever will be entertained on this account.

4. Codes & Standards.
The following specifications, standards and codes, including all official amendments/revisions and other specifications & codes referred to therein, should be considered a part of this specification. In all cases the latest issue/edition/revision shall apply. In case of discrepancy between this specification and those referred to herein below or other specifications forming a part of this bid document, this specification shall govern.

APPLICABLE CODES

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to.

Material

IS: 455	Specification for Portland slag cement.
IS: 1489-(Parts 1 & 2)	Specification for Portland-Pozzolana cement
IS: 8112	Specification for 43 grade ordinary portland cement
IS: 383	Specification for coarse and fine aggregates from natural sources for concrete
IS:432-(Parts 1 & 2)	Specification for mild steel and medium tensile steel bars and hard-drawn steel wires for concrete reinforcement
IS: 1566 - (Part II)	Specification for hard-drawn steel wire fabric for concrete reinforcement.
IS: 1786	Specification for high strength deformed steel bars and wires for concrete reinforcement.
IS: 2062	Specification for Hot rolled low, medium and high tensile structural steel
IS: 9103	Specification for admixtures for concrete
IS: 2645	Specification for integral cement waterproofing compounds.
IS: 4900	Specification for plywood for concrete shuttering work
IS: 3812	Pulverized Fuel Ash

Material Testing

IS: 4031-(Parts 1 to 15)	Methods of physical tests for hydraulic cement
IS: 4032	Method of chemical analysis of hydraulic cement
IS: 650	Specification for standard sand for testing of cement
IS: 2430	Methods for sampling of aggregates for concrete
IS: 2386-(Parts1 to 8)	Methods of test for aggregates for concrete
IS: 3025	Methods of sampling and test (physical and chemical) water used in industry.
IS: 6925	Methods of test for determination of water soluble chlorides in concrete admixtures.

Material Storage

IS: 4082	Recommendations on stacking and storing of construction materials at site.

Concrete Mix Design

IS: 4926	Ready mixed concrete – Code of practice
IS: 10262	Recommended guidelines for concrete mix design
SP: 23-(S&T)	Handbook on Concrete Mixes

Concrete Testing

IS: 1199	Method of sampling and analysis of concrete
IS: 516	Method of test for strength of concrete.
IS: 9013	Method of making, curing and determining compressive strength of accelerated cured concrete test specimens.
IS: 8142	Method of test for determining setting time of concrete by penetration resistance.
IS: 9284	Method of test for abrasion resistance of concrete.
IS: 2770	Methods of testing bond in reinforced concrete.

Equipment

IS: 1791	Specification for batch type concrete mixers.
IS: 4925	Specification for concrete batching and mixing plant.
IS: 5892	Specification for concrete transit mixer and agitator.
IS: 2722	Specifications for portable swing weigh batchers for concrete (single and double bucket type).
IS: 2750	Specifications for steel scaffoldings.

Code of Practice

IS: 456	Code of practice for plain and reinforced concrete
IS: 3370-(Parts 1 to 4)	Code of practice for concrete structures for storage of liquids.
IS: 2502	Code of practice for bending and fixing of bars for concrete reinforcement.
IS: 5525	Recommendation for detailing of reinforcement in reinforced concrete works.
IS: 2751	Code of practice for welding of mild steel plain and deformed bars used for reinforced concrete construction.
IS: 3558	Code of practice for use of immersion vibrators for consolidating concrete.
IS: 4326	Code of practice for earthquake resistant design and construction of buildings.
IS: 4014-(Parts 1 & 2)	Code of practice for steel tubular scaffolding
IS: 7861	Code of practice for extreme weather concreting.
Part -1	Recommended practice for hot weather concreting
Part-2	Recommended practice for cold weather concreting

Construction Safety

IS: 3696-(Parts 1 & 2)	Safety code for scaffolds and ladders.
IS: 7969	Safety code for handling and storage of building materials.
IS: 8989	Safety code for erection of concrete framed structures.

Measurement (Not Applicable for EPC Contract)

IS: 1200 (Part 1 to 12)	Method of measurement of building and engineering works.

5. Design Requirements

DRAWINGS

The EPC Contractor will furnish drawings wherever required by ENGINEER for their approval/ information. The EPC CONTRACTOR shall follow strictly such drawings.

6. Layout Requirements for the equipment
As per detailed drawing

7. Operational Requirements
Not Applicable

8. Technical Parameters of Equipment including DATA SHEET

Technical Parameters

8.1 GENERAL

8.1.1 ENGINEER shall have the right at all times to inspect all operations including the sources of materials, procurement, layout and storage of materials, the concrete batching and mixing equipment, and the quality control system. Such an inspection shall be arranged and ENGINEER's approval obtained, prior to starting of concrete work. This shall, however, not relieve CONTRACTOR of any of his responsibilities. All materials which do not conform to this specification shall be rejected.

8.1.2 Materials should be selected so that they can satisfy the design requirements of strength, serviceability, safety, durability and finish with due regards to the functional requirements and the environmental conditions to which the structure will be subjected. Materials complying with codes/standards shall generally be used. Other materials may be used after approval of the ENGINEER and after establishing their performance suitability based on previous data, experience or tests.

8.1.3 The supervision of work by the Owner will not obviate the Contractor from using any bad materials and / or bad workmanship or errors. Any sub-standard materials and / or workmanship, and error pointed out by the Owner at any stage during period of the contract and during the defects

Liability period shall be replaced / rectified by the Contractor at his cost.

All the Execution work shall be carried out as per Tata Power Approved Quality plans (FQP, Procedures etc.) and Tata power representative is entitled to do surveillance check at any point of time irrespective of any class of check defined in the approved Quality plans.

8.2 MATERIALS

8.2.1 CEMENT

8.2.1.1 Unless otherwise called for by ENGINEER/OWNER, cement shall be ordinary portland cement conforming to IS: 8112 or Portland Pozzolana Cement conforming to IS 1489.

8.2.1.2 Where Portland Pozzolana or slag cements are used, it shall be ensured that consistency of quality is maintained, there will be no adverse interactions between the materials and the finish specified is not marred.

8.2.1.3 Only one type of cement shall be used in any one mix. The source of supply, type or brand of cement within the same structure or portion thereof shall not be changed without approval from ENGINEER.

8.2.1.4 Cement which is not used within 90 days from its date of manufacture shall be tested at a laboratory approved by ENGINEER and until the results of such tests are found satisfactory, it shall not be used in any work.

8.2.2 AGGREGATES

8.2.2.1 Aggregates shall consist of naturally occurring stones (crushed or uncrushed), gravel and sand. They shall be chemically inert, strong, hard,

clean, durable against weathering, of limited porosity, free from dust/silt/organic impurities/deleterious materials and conform to IS: 383. Aggregates such as slag, crushed over burnt bricks, bloated clay ash, sintered fly ash and tiles shall not be used.

8.2.2.2 Aggregates for special purposes shall be as specified in Section A.

8.2.2.3 Aggregates shall be washed and screened before use where necessary or if directed by the ENGINEER.

8.2.2.4 Aggregates containing reactive materials shall be used only after tests conclusively prove that there will be no adverse affect on strength, durability and finish, including long term effects, on the concrete.

8.2.2.5 The fineness modulus of sand shall neither be less than 2.2 nor more than 3.2.

8.2.2.6 The maximum size of coarse aggregate shall be as stated on the drawings, but in no case greater than 1/4 of the minimum thickness of the member.

8.2.2.7 Plums 160 mm and above of a reasonable size may be used where directed. Plums shall not constitute more than 33% by volume of the concrete.

8.2.3 WATER

8.2.3.1 Water used for both mixing and curing shall conform to IS: 456. Potable waters are generally satisfactory. Water containing any excess of acid, alkali, sugar or salt shall not be used.

8.2.4 REINFORCEMENT

8.2.4.1 Reinforcement bars shall conform to IS: 432 or IS: 1786 and welded wire fabric to IS: 1566 as shown or specified on the drawing.

8.2.4.2 All reinforcement shall be clean, free from pitting, oil, grease, paint, loose mill scales, rust, dirt, dust, or any other substance that will destroy or reduce bond.

8.2.4.3 If permitted by ENGINEER, welding of reinforcement shall be done in accordance with IS: 2751 or IS: 9417 as applicable.

8.2.5 ADMIXTURES

8.2.5.1 Accelerating, retarding, water-reducing and air entraining admixtures shall conform to IS: 9103 and integral water proofing admixture to IS: 2645.

8.2.5.2 Admixtures may be used in concrete as per manufacturer's instructions only with the approval of ENGINEER based upon evidence that with the passage of time neither the compressive strength nor its durability is reduced. An admixture's suitability and effectiveness shall be verified by trial mixes with the other materials used in the works. If two or more admixtures are to be used simultaneously in the same concrete mix, their interaction shall be checked and trial mixes done to ensure their compatibility. There should also be no increase in risk of corrosion of the reinforcement or other embedments.

8.2.5.3 Calcium chloride shall not be used for accelerating set of the cement for any concrete containing reinforcement or embedded steel parts.

8.3 SAMPLES AND TESTS

8.3.1 All materials used for the works shall be tested before use.

8.3.2 Contractor to furnish the test certificate for all materials through testing at a Owner approved laboratory at no extra cost to the Owner. Transportation of material samples to the laboratory shall have to be done by CONTRACTOR at no extra cost. This is in addition to the original MTC provided by supplier.

8.3.3 Sampling and testing shall be as per IS: 2386 under the supervision of ENGINEER. The cost of all tests, sampling, etc. shall be borne by CONTRACTOR.

8.3.4 Water to be used shall be tested to comply with requirements of IS: 456.

8.3.5 CONTRACTOR shall furnish manufacturer's test certificates and technical literature for the admixture proposed to used. If directed, the admixture shall be got tested at an approved laboratory at no extra cost.

8.4 STORING OF MATERIALS

8.4.1 All material shall be stored in a manner so as to prevent its deterioration and contamination which would preclude its use in the works. Requirements of IS: 4082 shall be complied with.

8.4.2 CONTRACTOR will have to make his own arrangements for the storage of adequate quantity of cement even if cement is supplied by OWNER. If such cement is not stored properly and has deteriorated, the material shall be rejected. Cost of such rejected cement, where cement is supplied by OWNER, shall be recovered at issue rate or open market rate which ever is higher. Cement bags shall be stored in dry weatherproof shed with a raised floor, well away from the outer walls and insulated from the floor to avoid moisture from ground. Not more than 15 bags shall be stacked in

any tier. Storage arrangement shall be approved by ENGINEER. Storage under tarpaulins shall not be permitted. Each consignment of cement shall be stored separately and consumed in its order of receipt.

8.4.3 Each size of coarse and fine aggregates shall be stacked separately and shall be protected from leaves and contamination with foreign material. The stacks shall be on hard, clean, free draining bases, draining away from the concrete mixing area.

8.4.4 CONTRACTOR shall make his own arrangements for storing water at site in tanks to prevent contamination.

8.4.5 The reinforcement shall be stacked on top of timber sleepers to avoid contact with ground/ water. Each type and size shall be stacked separately.

8.5 **CONCRETE**

8.5.1 GENERAL

8.5.1.1 Concrete grade shall be as designated on drawings. Concrete in the works shall be “DESIGN MIX CONCRETE” OR “NOMINAL MIX CONCRETE”. All concrete works of grade M5, M7.5 and M10 shall be NOMINAL MIX CONCRETE whereas all other grades, M 20 and above, shall be DESIGN MIX CONCRETE.

8.5.2 DESIGN MIX CONCRETE

8.5.2.1 Mix Design & Testing

8.5.2.1.1 For Design Mix Concrete, the mix shall be designed according to IS: 10262 and SP: 23 to provide the grade of concrete having the required workability and characteristic strength not less than appropriate values given in IS:456. The design mix shall in addition be such that it is cohesive and does not segregate and should result in a dense and durable concrete and also capable of giving the finish as specified. For liquid retaining structures, the mix shall also result in water tight concrete. The EPC CONTRACTOR shall exercise great care while designing the concrete mix and executing the works to achieve the desired result.

8.5.2.1.2 Unless otherwise specifically mentioned the minimum cementitious content (as per IS 456 and IS10262) for Design Mix Concrete shall be as follows:

M15: 250 kg
M20: 310 kg
M25: 320 kg
M30: 350 kg
M35: 370 kg
M40: 400 kg

Fly ash content for OPC shall be restricted to a maximum of 25% for OPC. However for PPC and Slag Cement no fly ash content will be permitted.

The minimum cementitious content stipulated shall be adopted irrespective of whether the CONTRACTOR achieves the desired strength with less quantity of cement. The CONTRACTOR's quoted rates for concrete shall provide for the above eventuality and nothing extra shall become payable to the CONTRACTOR in this account. Even in the case where the quantity of cement required is higher than that specified above

to achieve desired strength based on an approved mix design, nothing extra shall become payable to the CONTRACTOR.

8.5.2.1.3 It shall be CONTRACTOR's sole responsibility to carry out the mix designs at his own cost. He shall furnish to ENGINEER at least 30 days before concreting operations, a statement of proportions proposed to be used for the various concrete mixes and the strength results obtained. The strength requirements of the concrete mixes ascertained on 150 mm cubes as per IS: 516 shall comply with the requirements of IS: 456.

8.5.2.1.4 Range of slumps which shall generally be used for various types of construction unless otherwise instructed by the ENGINEER shall be as per clause 7.1 of IS 456.

8.5.2.2 Batching & Mixing of Concrete

8.5.2.2.1 Proportions of aggregates and cements, as decided by the concrete mix design, shall be by weight. These proportions shall be maintained during subsequent concrete batching by means of weigh batchers capable of controlling the weights within one percent of the desired value.

8.5.2.2.2 Amount of water added shall be such as to produce dense concrete of required consistency, specified strength and satisfactory workability and shall be so adjusted to account for moisture content in the aggregates. Water- cement ratio specified for use by ENGINEER shall be maintained. Each time the work stops, the mixer shall be cleaned out, and while recommencing, the first batch shall have 10% additional cement to allow for sticking in the drum.

8.5.2.2.3 Arrangement should be made by CONTRACTOR to have the cubes tested in an approved laboratory or in field at his own expense, with prior consent of ENGINEER. Sampling and testing of strength and workability of concrete shall be as per IS: 1199, IS: 516 and IS: 456.

8.5.3 NOMINAL MIX CONCRETE

8.5.3.1 Mix Design & Testing

8.5.3.1.1 Mix Design and preliminary tests are not necessary for Nominal Mix Concrete. However works tests shall be carried out as per IS: 456. Proportions for Nominal Mix Concrete and w/c ratio may be adopted as per Table 9 of IS: 456. However, it will be CONTRACTOR's sole responsibility to adopt appropriate nominal mix proportions to yield the specified strength.

For adopting nominal mix special permission from owner to be taken by the EPC contractor.

8.5.3.1.2 Batching & Mixing of Concrete

8.5.3.1.2.1 Based on the adopted nominal mixes, aggregates shall be measured by volume. However cement shall be by weight only.

8.6 **FORMWORK**

8.6.1 Formwork shall be all inclusive and shall consist of but not limited to shores, bracings, sides of footings, walls, beams and columns, bottom of slabs, etc. including ties, anchors, hangers, inserts, false work, wedges, etc.

8.6.2 The design and engineering of the formwork as well as its construction shall be the responsibility of EPC -CONTRACTOR. However, if so desired by ENGINEER the drawings and calculations for the design of the formwork shall be submitted to ENGINEER approval.

8.6.3 Formwork shall be designed to fulfill the following requirements:

a. Sufficiently rigid and tight to prevent loss of grout or mortar from the concrete at all stages and appropriate to the methods of placing and compacting.

b. Made of suitable materials.

c. Capable of providing concrete of the correct shape and surface finish within the specified tolerance limits.

d. Capable of withstanding without deflection the worst combination of self-weight, reinforcement and concrete weight, all loads and dynamic effects arising from construction and compacting activities, wind and weather forces.

e. Capable of easily striking without shock, disturbance or damage to the concrete.

f. Soffit forms capable of imparting a camber if required.

g. Soffit forms and supports capable of being left in position if required.

h. Capable of being cleaned and/or coated if necessary immediately prior to casting the concrete; design temporary openings where necessary for these purposes and to facilitate the preparation of

construction joints.

8.6.4 The formwork may be of timber, plywood, steel, plastic or concrete depending upon the type of finish specified. Sliding forms and slip form may be used with the approval of ENGINEER. Timber for formwork shall be well seasoned, free from sap, shakes, loose knots, worm holes, warps and other surface defects. Joints between formwork and formwork and between formwork and structures shall be sufficiently tight to prevent loss of slurry from concrete, using seals if necessary.

8.6.5 The faces of formwork coming in contact with concrete shall be cleaned and two coats of approved shuttering oil applied before fixing reinforcement. All rubbish, particularly chippings, shavings, sawdust, wire pieces, dust etc. shall be removed from the interior of the forms before the concrete is placed. Where directed, cleaning of forms shall be done by blasting with a jet of compressed air at no extra cost.

8.6.6 Forms intended for reuse shall be treated with care. Forms that have deteriorated shall not be used. Before reuse, all forms shall be thoroughly scraped, cleaned, nails removed, holes suitably plugged, joints repaired and warped lumber replaced to the satisfaction of ENGINEER. CONTRACTOR shall equip himself with enough shuttering to allow for wastage so as to complete the job in time.

8.6.7 Permanent formwork shall be checked for its durability and compatibility with adjoining concrete before it is used in the structure. It shall be properly anchored to the concrete.

8.6.8 Wire ties passing through beams, columns and walls shall not be allowed. In their place bolts passing through sleeves shall be used. Formwork spacers left in situ shall not impair the desired appearance or durability of the structure by causing spalling, rust staining or allowing the passage of moisture.

8.6.9 For liquid retaining structures sleeves shall not be provided for through bolts nor shall through bolts be removed if provided. The bolts, in the latter case, shall be cut at 25 mm depth from the surface and the hole made good by cement mortar of the same proportion as the concrete just after striking the formwork.

8.6.10 Where specified or shown on drawings all corners and angles exposed in the finished structure shall have chamfers or fillets of 20 mm x 20 mm size.

8.6.11 Forms for substructure may be omitted when, in the opinion of ENGINEER, the open excavation is firm enough (in hard non-porous soils) to act as a form. Such excavations shall be slightly larger, as directed by ENGINEER, than that required as per drawing to compensate for irregularities in excavation.

8.6.12 CONTRACTOR shall provide adequate props of adjustable steel pipes carried down to a firm bearing without overloading any of the structures.

8.6.13 The shuttering for beams and slabs shall be so erected that the side shuttering of beams can be removed without disturbing the bottom shuttering. If the shuttering for a column is erected for the full height of the column, one side shall be built up in sections as placing of concrete proceeds or windows left for placing concrete from the side to limit the drop of concrete to 1.0 m or as directed by ENGINEER. CONTRACTOR

shall temporarily and securely fix items to be cast (embedment/inserts) in a manner that will not hinder the striking of forms or permit loss of grout.

8.6.14 Formwork showing excessive distortion, during any stage of construction, shall be removed. Placed concrete affected by faulty formwork, shall be entirely removed and formwork corrected prior to placement of new concrete at CONTRACTOR's cost.

8.6.15 The stripping time for formwork shall be determined based on the following requirements:

a. Development of adequate concrete strength;

b. Permissible deflection at time of striking form work;

c. Curing procedure employed - its efficiency and effectiveness;

d. Subsequent surface treatment to be done;

e. Prevention of thermal cracking at re-entrant angles;

f. Ambient temperatures; and

g. Aggressiveness of the environment (unless immediate adequate steps are taken to prevent damage to the concrete).

8.6.16 Under normal circumstances (generally where temperatures are above 20 Deg. C) forms may be struck after expiry of the time period given in clause 11.3.1 of IS: 456 unless directed otherwise by ENGINEER. For Portland Pozzolana/slag cement the stripping time shall be suitably modified as directed by the ENGINEER. It is the CONTRACTOR's responsibility to ensure that forms are not struck until the concrete has developed sufficient strength to support itself, does not undergo excessive deformation and resist surface damage and any stresses arising during the construction period.

8.7 **REINFORCEMENT WORKMANSHIP**

8.7.1 Reinforcing bars supplied bent or in coils shall be straightened cold without damage and at no extra cost. No bending shall be done when ambient temperature is below 5°C.

8.7.2 All bars shall be accurately bent gradually and according to the sizes and shapes shown on the drawings/ schedules or as directed by ENGINEER.

8.7.3 Re-bending or straightening incorrectly bent bars shall not be done without approval of ENGINEER.

8.7.4 Reinforcement shall be accurately fixed and maintained firmly in the correct position by the use of blocks, spacers, chairs, binding wire, etc. to prevent displacement during placing and compaction of concrete. The tied in place reinforcement shall be approved by ENGINEER prior to concrete placement. Spacers shall be of such materials and designs as will be durable, not lead to corrosion of the reinforcement and not cause spalling of the concrete cover.

8.7.5 Binding wire shall be 16 gauge soft annealed wires. Ends of the binding wire shall be bent away from the concrete surface and in no case encroach into the concrete cover.

8.7.6 Substitution of reinforcement, laps/splices not shown on drawing shall be subject to ENGINEER's approval.

8.8 TOLERANCES

8.8.1 Tolerance for formed and concrete dimensions shall be as per clause 11.1 of IS: 456 unless specified otherwise.

8.8.2 Tolerance specified for horizontal or vertical building lines or footings shall not be construed to permit encroachment beyond the legal boundaries.

8.9 PREPARATION PRIOR TO CONCRETE PLACEMENT

8.9.1 Before concrete is actually placed in position, the inside of the formwork shall be cleaned and shuttering oil applied, inserts and reinforcement shall be correctly positioned and securely held, necessary openings, pockets, etc. provided.

8.9.2 All arrangements-formwork, equipment and proposed procedure, shall be approved by ENGINEER. CONTRACTOR shall maintain separate Pour Card for each pour as per the format enclosed. Contractor shall prepare and submit "concrete pour plan" to ensure 3M's (material, Manpower and Machinery).

8.10 TRANSPORTING, PLACING AND COMPACTING CONCRETE

8.10.1 Concrete shall be transported from the mixing plant to the formwork with minimum time lapse by methods that shall maintain the required workability and will prevent segregation, loss of any ingredients or ingress of foreign matter or water.

8.10.2 In all cases concrete shall be deposited as nearly as practicable directly in its final position. To avoid segregation, concrete shall not be rehandled or caused to flow. For locations where direct placement is not possible and in narrow forms, CONTRACTOR shall provide suitable drops and “Elephant Trunks”. Concrete shall not be dropped form a height of more than 1.5 m as stipulated in clause 13.2 of IS 456.

8.10.3 Concrete shall not be placed in flowing water. Under water, concrete shall be placed in position by tremies or by pipeline from the mixer and shall never be allowed to fall freely through the water.

8.10.4 While placing concrete the CONTRACTOR shall proceed as specified below and also ensure the following:

a. Continuously between construction joints and predetermined abutments.

b. Without disturbance to forms or reinforcement.

c. Without disturbance to pipes, ducts, fixings and the like to be cast in; ensure that such items are securely fixed. Ensure that concrete cannot enter open ends of pipes and conduits, etc.

d. Without dropping in a manner that could cause segregation or shock.

e. In deep pours only when the concrete and formwork is designed for

this purpose and by using suitable chutes or pipes.

f. Do not place if the workability is such that full compaction cannot be achieved.

g. Without disturbing the unsupported sides of excavations; prevent contamination of concrete with earth. Provide sheeting if necessary. In supported excavations, withdraw the linings progressively as concrete is placed.

h. If placed directly onto hardcore or any other porous material, dampen the surface to reduce loss of water from the concrete.

i. Ensure that there is no damage or displacement to sheet membranes.

j. Record the time and location of placing structural concrete.

8.10.5 Concrete shall normally be compacted in its final position within thirty minutes of leaving the mixer. Concrete shall be compacted during placing with approved vibrating equipment without causing segregation until it forms a solid mass free from voids thoroughly worked around reinforcement and embedded fixtures and into all corners of the formwork. Immersion vibrators shall be inserted vertically at points not more than 450 mm apart and withdrawn slowly till air bubbles cease to come to the surface, leaving no voids. When placing concrete in layers advancing horizontally, care shall be taken to ensure adequate vibration, blending and melding of the concrete between successive layers. Vibrators shall not be allowed to come in contact with reinforcement, formwork and finished surfaces after start of initial set. Over-vibration shall be avoided.

8.10.6 Concrete may be conveyed and placed by mechanically operated equipment after getting the complete procedure approved by ENGINEER. The slump shall be held to the minimum necessary for conveying concrete by this method. When concrete is to be pumped, the concrete mix shall be specially designed to suit pumping. Care shall be taken to avoid stoppages in work once pumping has started.

8.10.7 Except when placing with slip forms, each placement of concrete in multiple lift work shall be allowed to set for at least 24 hours after the final set of concrete before the start of subsequent placement. Placing shall stop when concrete reaches the top of the opening in walls or bottom surface of slab, in slab and beam construction, and it shall be resumed before concrete takes initial set but not until it has had time to settle as determined by ENGINEER. Concrete shall be protected against damage until final acceptance.

8.11 MASS CONCRETE WORKS

8.11.1 Sequence of pouring for mass concrete works shall be as approved by ENGINEER. CONTRACTOR shall exercise great care to prevent shrinkage cracks and shall monitor the temperature of the placed concrete if directed.

8.12 CURING

8.12.1 Curing and protection shall start immediately after the compaction of the concrete to protect it from:

a. Premature drying out, particularly by solar radiation and wind;

b. Leaching out by rain and flowing water;

c. Rapid cooling during the first few days after placing;

d. High internal thermal gradients;

e. Low temperature or frost;

f. Vibration and impact which may disrupt the concrete and interfere with its bond to the reinforcement.

8.12.2 All concrete, unless directed otherwise by ENGINEER, shall be cured by use of continuous sprays or ponded water or continuously saturated coverings of sacking, canvas, hessian or other absorbent material for the period of complete hydration with a minimum of 7 days. The quality of curing water shall be the same as that used for mixing.

8.12.3 Where a curing membrane is directed to be used by the ENGINEER, the same shall be of a non-wax base and shall not impair the concrete finish in any manner. The curing compound to be used shall be got approved from the ENGINEER before use and shall be applied with spraying equipment capable of a smooth, even textured coat.

8.12.4 Extra precautions shall be exercised in curing concrete during cold and hot weather.

8.13 CONSTRUCTION JOINTS AND KEYS

8.13.1 Construction joints will be as shown on the drawing or as approved by ENGINEER. Concrete shall be placed without interruption until completion of work between construction joints. If stopping of concreting becomes unavoidable anywhere, a properly formed construction joint shall be made with the approval of ENGINEER.

8.13.2 Dowels for concrete work, not likely to be taken up in the near future, shall be coated with cement slurry and encased in lean concrete as indicated on the drawings or as directed by ENGINEER.

8.13.3 Before resuming concreting on a surface which has hardened all laitance and loose stone shall be thoroughly removed by wire brushing/hacking and surface washed with high pressure water jet and treated with thin layer of cement slurry for vertical joints and a 15 mm thick layer of cement sand mortar for horizontal layers, the ratio of cement and sand being the same as in the concrete mix.

8.13.4 When concreting is to be resumed on a surface which has not fully hardened, all laitance shall be removed by wire brushing, the surface wetted, free water removed and a coat of cement slurry applied. On this a layer of concrete not exceeding 150 mm thickness shall be placed and well rammed against the old work. Thereafter work shall proceed in the normal way.

8.14 **FOUNDATION BEDDING**

8.14.1 All earth surfaces upon which or against which concrete is to be placed, shall be well compacted and free from standing water, mud or debris. Soft or spongy area shall be cleaned out and back filled with either soil-cement mixture, lean concrete or clean sand compacted as directed by ENGINEER. The surfaces of absorptive soils shall be moistened.

8.15 **FINISHES**

8.15.1 GENERAL

8.15.1.1 The formwork for concrete works shall be such as to give the finish as specified. The CONTRACTOR shall make good as directed any unavoidable defects consistent with the type of concrete and finish specified; defects due to bad workmanship (e.g. damaged or misaligned forms, defective or poorly compacted concrete) will not be accepted. CONTRACTOR shall construct the formwork using the correct materials and to meet the requirements of the design and to produce finished concrete to required dimensions, plumbs, planes and finishes.

8.15.2 SURFACE FINISH TYPE F1

8.15.2.1 This type of finish shall be for non-exposed concrete surfaces against which back fill or concrete is to be placed. The main requirement is that of dense, well compacted concrete. No treatment is required except repair of defective areas, filling all form tie holes and cleaning up of loose or adhering debris. For surfaces below grade which will receive waterproofing treatment the concrete shall be free of surface irregularities which would interfere with proper and effective application of waterproofing material specified for use.

8.15.3 SURFACE FINISH TYPE F2

8.15.3.1 This type of finish shall be for all concrete work which will be exposed to view upon completion of the job. The appearance shall be that of a smooth dense, well-compacted concrete showing the slight marks of well fitted shuttering joints. The CONTRACTOR shall make good any blemishes.

8.15.4 SURFACE FINISH TYPE F3

8.15.4.1 This type of finish shall be for concrete work which will be exposed to view but to give an appearance of smooth, dense, well-compacted concrete with no shutter marks, stain free and with no discolouration, blemishes, arises, airholes, etc. Only lined or coated plywood with very tight joints shall be used to achieve this finish. The panel size shall be uniform and as large as practicable. Any minor blemishes that might occur shall be made good by CONTRACTOR.

8.15.5 Integral Cement Finish On Concrete Floor

8.15.5.1 In all cases where integral cement finish on a concrete floor has been specified, the top layer of concrete shall be screeded off to proper level and tamped with tamper having conical projections so that the aggregate shall be forced below the surface. The surface shall be finished with a wooden float and a trowel with pressure. The finish shall be continued till the concrete reaches its initial set. No cement or cement mortar finish shall be provided on the surface. Where specified, a floor hardener as approved by the ENGINEER shall be supplied and used as recommended by the manufacturer.

8.16 REPAIR AND REPLACEMENT OF UNSATISFACTORY CONCRETE

8.16.1 Immediately after the shuttering is removed, all the defective areas such as honey-combed surfaces, rough patches, holes left by form bolts, etc. shall be brought to the notice of ENGINEER who may permit patching of the defective areas or reject the concrete work.

8.16.2 All through holes for shuttering shall be filled for full depth and neatly plugged flush with surface.

8.16.3 Rejected concrete shall be removed and replaced by CONTRACTOR at no additional cost to OWNER.

8.16.4 For patching of defective areas all loose materials shall be removed and the surface shall be prepared as directed by the ENGINEER.

8.16.5 Bonding between hardened and fresh concrete shall be done either by placing cement mortar or by applying epoxy. The decision of the ENGINEER as to be the method of repairs to be adopted shall be final and binding on the CONTRACTOR and no extra claim shall be entertained on this account. The surface shall be saturated with water for 24 hous before patching is done with 1:5 cement sand mortar. The use of epoxy for bonding fresh concrete shall be carried out as directed by ENGINEER.

The concrete repair procedure shall be submitted by contractor to Tata power team for approval prior to start of work.

8.17 **VACUUM DEWATERING OF SLABS**

8.17.1 Where specified floor slabs, either on grade or suspended, shall be finished by vacuum dewatering including all operations such as poker vibration, surface vibration, vacuum processing, floating and trowelling as per equipment manufacturer's recommendation. The equipment to be used shall be subject to ENGINEER'S approval.

8.18 **HOT WEATHER REQUIREMENT**

8.18.1 Concreting during hot weather shall be carried out as per IS: 7861 (Part I).

8.18.2 Adequate provisions shall be made to lower concrete temperatures which shall not exceed 40 °C at the time of placement of fresh concrete.

8.18.3 Where directed by ENGINEER, CONTRACTOR shall spray non-wax based curing compound on unformed concrete surface at no extra costs.

8.19 **COLD WEATHER REQUIRMENTS**

8.19.1 Concreting during cold weather shall be carried out as per IS: 7861 (PART 2).

8.19.2 The ambient temperature during placement and upto final set shall not fall below 5°C. Approved anti-freeze/accelerating additive shall be used where directed.

8.19.3 For major and large scale concreting works the temperature of concrete at times of mixing and placing, the thermal conductivity of the formwork and its insulation and stripping period shall be closely monitored.

8.20 **LIQUID RETAINING STRUCTURES**

8.20.1 The CONTRACTOR shall take special care for concrete of liquid retaining structures, underground structures and those other specifically called for to guarantee the finish and water tightness.

8.20.2 The minimum level of surface finish for liquid retaining structures shall be type F2. All such structures shall be hydro-tested.

8.20.3 The CONTRACTOR shall include price of hydro-testing of structure, all arrangements for testing such as temporary bulk heads, pressure gauges, pumps, pipe lines, etc in the quoted rates of concrete works for liquid retaining structures. For all water retaining structures, Hydro swelling bars shall be used at each and every construction joints to ensure its water tightness.

8.20.4 Any temporary arrangements that may have to be made to ensure stability of the structures shall also be considered to have been taken into account while quoting the rates.

8.20.5 Any leakage that may occur during the hydro-test or subsequently during the defects liability period or the period for which the structure is guaranteed shall be effectively stopped either by cement/epoxy pressure grouting, guniting or such other method as may be approved by the ENGINEER. All such rectification shall be done by the CONTRACTOR to the entire satisfaction of the OWNER/ENGINEER at no extra cost to the OWNER.

8.21 **TESTING CONCRETE STRUCTURES FOR LEAKAGE**

8.21.1 Hydro-static test for water tightness shall be in line with the IS 3370. Brief guidelines are described below:

a. In case of structures whose external faces are exposed, such as elevated tanks, the requirements of the test shall be deemed to be satisfied if the external faces show no sign of leakage or sweating and remain completely dry during the period of observation of seven days after allowing a seven day period for absorption after filling with water.

b. In the case of structures whose external faces are submerged and are not accessible for inspection, such as underground tanks, the structures shall be filled with water and after the expiry of seven days after the filling; the level of the surface of the water shall be recorded. The level of water shall be recorded again at subsequent intervals of 24 hrs over period of seven days. Backfilling shall be withheld till the tanks are tested. The total drop in surface level over a period for seven days shall be taken as an indication of the water tightness of the structure. The ENGINEER shall decide on the actual permissible nature of this drop in the surface level, taking into account whether the structures are open or closed and the corresponding effect it has on evaporation losses. Unless specified otherwise, a structure whose top is covered shall be deemed to be water tight if the total drop in the surface level over a period of seven days does not exceed 40 mm.

c. Each compartment/segment of the structure shall be tested individually and then all together.

8.21.2 For structures such as pipes, tunnels, etc. the hydrostatic test shall be carried out by filling with water, after curing as specified, and subjecting to the specified test pressure for specified period. If during this period the loss of water does not exceed the equivalent of the specified rate, the structure shall be considered to have successfully passed the test.

8.21.3 The ENGINEER in-charge shall approve hydro test procedure.

8.22 **OPTIONAL TEST**

8.22.1 If the ENGINEER feels that the materials i.e. cement, sand, coarse aggregates, reinforcement and water are not in accordance with the specifications or if specified concrete strengths are not obtained, he may order tests to be carried out on these materials in laboratory, to be approved by the ENGINEER, as per relevant IS Codes. OWNER shall pay only for the testing of material supplied by the OWNER, otherwise CONTRACTOR shall have to pay for the tests. Transporting of all material to the laboratory shall however be done by the CONTRACTOR at no extra cost to OWNER.

8.22.2 In the event of any work being suspected of faulty material or workmanship requiring its removal or if the works cubes do not give the stipulated strengths, ENGINEER reserves the right to order the CONTRACTOR to take out cores and conduct tests on them or do ultrasonic testing or load testing of structure, etc. All these tests shall be carried out by CONTRACTOR at no extra cost to the OWNER. Alternately ENGINEER also reserves the right to ask the CONTRACTOR to dismantle and re-do such unacceptable work at the cost of CONTRACTOR.

8.22.3 If the structure is certified by ENGINEER as having failed, the cost of the test and subsequent dismantling/reconstruction shall be borne by CONTRACTOR.

8.22.4 The quoted unit rates/prices of concrete shall deemed to provide for all tests mentioned above.

8.23 **INSPECTION**

8.23.1 All materials, workmanship and finished construction shall be subject to continuous inspection and approval of ENGINEER. Materials rejected by ENGINEER shall be expressly removed from site and shall be replaced by

CONTRACTOR immediately at no extra cost to OWNER.

All material inspection, sampling & testing, activity inspection shall be carried out as per Tata power QAI Approved FQP.

8.24 **CLEAN-UP**

8.24.1 Upon the completion of concrete work, all forms, equipment, construction tools, protective coverings and any debris, scraps of wood, etc. resulting from the work shall be removed and the premises left clean.

8.25 **ACCEPTANCE CRITERIA**

8.25.1 Any concrete work shall satisfy the requirements given below individually and collectively for it to be acceptable.

a. Properties of constituent materials;
b. Characteristic compressive strength;
c. Specified mix proportions;
d. Minimum cement content;
e. Maximum free-water/cement ratio;
f. Workability;
g. Temperature of fresh concrete;
h. Density of fully compacted concrete;
i. Cover to embedded steel;
j. Curing;
k. Tolerances in dimensions;
l. Tolerances in levels;
m. Durability;
n. Surface finishes;

o. Special requirements such as:

i. Water tightness

ii. Resistance to aggressive chemicals

iii. Resistance to freezing and thawing

iv. Very high strength

v. Improved fire resistance

vi. Wear resistance

vii. Resistance to early thermal cracking

8.25.2 The ENGINEER's decision as to the acceptability or otherwise of any concrete work shall be final and binding on the CONTRACTOR.

8.25.3 For work not accepted, the ENGINEER may review and decide whether remedial measures are feasible and so as to render the work acceptable. The ENGINEER shall in that case direct the CONTRACTOR to undertake and execute the remedial measures. These shall be expediously and effectively implemented by the CONTRACTOR. Nothing extra shall become payable to the CONTRACTOR by the OWNER for executing remedial measures.

8.26 **MODE OF MEASUREMENT AND PAYMENT (Not Applicable for EPC Contract)**

8.26.1 The unit rate for concrete work under various categories shall be all inclusive and no claims for extra payment on account of such items and leaving holes, embedding inserts, etc. shall be entertained unless separately provided for in the Schedule of Quantities. No extra claim shall also be entertained due to change in the number, position and/or dimensions of holes, slots or openings, sleeves, inserts or on account of

any increased lift, lead of scaffolding etc. All these factors should be taken into consideration while quoting the unit rates. Unless provided for in the schedule of Quantities the rates shall also include fixing inserts in all concrete work, whenever required.

8.26.2 Payments for concrete will be made on the basis of unit rates quoted for the respective items in the Schedule of Quantities. No deduction in the concrete quantity will be made for reinforcements, inserts etc. and opening less than 0.100 of a Sq.m, in areas where concrete is measured in sq.m. and 0.010 cu.m where concrete is measured in cu.metres. Where no such deduction for concrete is made, payment for shuttering work provided for such holes, pockets, etc. will not be made. Similarly the unit rates for concrete work shall be inclusive or exclusive of shuttering as provided for in the Schedule of Quantities.

8.26.3 Payment for beams will be made for the quantity based on the depth being reckoned from the underside of the slabs and length measured as the clear distance between supports. Payment for columns shall be made for the quantity based on height reckoned upto the underside of slabs/beams.

8.26.4 The unit rate for precast concrete members shall include formwork, mouldings, finishing, hoisting and setting in position including setting mortar, provision of lifting arrangement etc. complete. Reinforcement and inserts shall be measured and paid for separately under respective item rates.

8.26.5 Laps, chairs, binding wires, spacer blocks, cover blocks, any other extra reinforcement not shown in approved drawings shall not be measured and paid for. The quoted rate shall be inclusive of the same.

8.26.6 Concrete rate shall be inclusive of formwork, shuttering, shoring, propping, scaffolding, etc. complete. Closure of all the Non Conformity (Raised

during execution work) shall be one of the criteria against the release of full payment. In case of any un resolved Non Conformity, Suitable amount of payment will be hold/ deducted from the respective bills raised against this activity.

9. Quality Requirements (including SQP and FQP)
As per approved SQP and FQP

10. Inspection, Testing and Performance Requirements along with Warranty
As per approved SQP and FQP

11. Mandatory Spares
Not Applicable

12. Data Submission By Bidder

12.1 With the Bid - Not Applicable

12.2 After award of contract - SQP, FQP, Field test report and drawings, pour cards etc

CONCRETE POUR CARD

CLIENT: DATE: POUR NO. :

PROJECT: STRUCTURE:

CONTRACTOR: MAX AGGREGATE SIZE SLUMP: MM/ MM

DRG. NO. : START/COMPLETION TIME:

CONCETE GRADE/QUANTITY: M / M^3 MIXING TIME:

SR. NO.	ITEM		CONTRACTOR'S REP. SIGNATURE	ENGINEER'S SIGNATURE	REMARKS
1.	BEFORE CONCRETING	CENTERLINES CHECKED			
2.		FORMWORK AND STAGING CHECKED			
3.		REINFORCEMENT CHECKED			
4.		COVER TO REINFORCEMENT CHECKED			
5.		VERFIED TEST CERTIFICATE FOR CEMENT /STELL	YES/NO	YES/NO	
6.		ADEQUENCY OF MATERIALS/EQUIPMENT FOR POUR	YES/NO	YES/NO	
7.		EMBEDED PARTS CHECKED (LOCATION & PLUMB) – CIVIL			
		EMBEDED PARTS CHECKED (LOCATION & PLUMB) – MECHANICAL			
		EMBEDED PARTS CHECKED (LOCATION & PLUMB) – ELECTRICAL			
					POUR AUTHORISED SITE ENGINEER
8.	SOFFIT(S) AND POUR TOP (T) LEVELS CHECKED BEFORE (B) AND AFTER (A) FROM REMOVAL (ONLY OF BEAMS OF OVER 10 M SPAN & IMPORTANT STRUCTURES LIKE T.G. ETC.)		S(B) S(A)	T(B) T(A)	
9.	CONSTRUCTION JOINT LOCATION & TIME (IF NOT AS PER DRAWING)				
10.	CEMENT CONSUMPTION IN KGS.				
11.	NUMBER OF CUBES AND IDENTIFICATION MARK				
12.	TEST CUBE RESULTS (7 DAYS/ 28 DAYS)		/ / /		
13.	CONCRETE CONDITION ON FORM REMOVAL		V.GOOD/GOOD/FAIR/POOR		
					SITE-IN-CHARGE

NOTES:

1. EACH ITEM TO BE CHECKED & SIGNED BY THE RESPECTIVE ENGINEERS.
2. ITEMS 8 TO 13 (BOTH INCLUSIVE) TO BE FILLED BY ONLY TCE ENGINEER.
3. EACH POUR TO HAVE SEPARATE CARDS, IN TRIPILCATE ONE EACH FOR CLIENT, TCE & SITE OFFICE. FORM 279
4. UNDER REMARKS INDICATE DEVIATIONS FROM DWGS & SPECIFICATIONS, CONGESTION IN REINFORCEMENT IF ANY, UNUSUAL OCCURENCES, SUCH AS FAILURE OF EQUIPMENT'S, SINKING OF SUPPORTS/PROPS, HEAVY RAINS AFFECTING CONCRETEING, POOR COMPACTION, IMPROPER CURING, OTHER DEFICIENCIES, OBSERVATION ETC.

Annexure - 4b

THE TATA POWER COMPANY LIMITED

STANDARD

TECHNICAL SPECIFICATION

FOR

Earthwork in Excavation and Filling including Dewatering

(DOCUMENT NO - ENGG/ CIVIL/STD-SPEC/1711/20)

Tata Power

Project Engineering

0	21/08/2017	-	AR	SAT	SC
Rev. No	Date	Revision History	Prepared By	Checked By	Approved By (HOD)

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9. Quality Requirements (including SQP and FQP)

10. Inspection, Testing and Performance Requirements along with Warranty

11. Mandatory Spares

12. Data Submission By Bidder

    12.1 With the Bid

    12.2 After award of contract

1. Introduction

This specification covers the general requirements of earth work such as excavation, filling and dewatering.

2. Pre-Qualifying Requirements and Approved Vendor List

Refer bidder qualification.

3. System Description and Scope

This specification covers the general requirements of earth work in excavation in different materials, filling in areas as shown in drawing, filling back around foundations and in plinths, conveyance and disposal of surplus soils and dewatering. All operations covered within the intent and purpose of this specification.

4. Codes & Standards.

All tools and plants, equipment and machineries to be used in this work shall be of standard quality and manufactured by reputed vendors confirming to Indian Standards (IS) codes or equivalent.

APPLICABLE CODES

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to.

1	IS 1200	- Method of measurement of building and - civil engineering works
	(Part 1)	- Part 1 Earthwork
	(Part 27)	- Part 27 Earthwork done by mechanical appliances
2	IS 3764-1992	- Excavation work –code of safety.

5. Design Requirements

DRAWINGS

The EPC Contractor (CONTRACTOR) shall furnish drawings wherever required. Such drawings are required to show areas to be excavated/filled, grade level, sequence of priorities etc. The drawings shall be submitted to ENGINEER (ONWER'S Engineer) for Information/ Approval. The CONTRACTOR shall follow strictly such drawings.

6. Layout Requirements for the equipment
As per detailed drawing

7. Operational Requirements
Not Applicable

8. Technical Parameters of Equipment including DATA SHEET

Technical Parameters:-

8.1 GENERAL

8.1.1 The CONTRACTOR shall furnish all tools, plants, instruments, qualified supervisory personnel, labour, materials any temporary works, consumables, any and everything necessary, whether or not such items are specifically stated herein for completion of the job in accordance with the specification requirements.

8.1.2 The CONTRACTOR shall carry out the survey of the site before excavation and set properly all lines and establish levels for various works such as earthwork in excavation for grading, basement, foundations, plinth filling etc. such survey shall be carried out by taking accurate cross sections of the area perpendicular to established reference /grid lines at 5 M intervals or nearer based on ground profile. These shall be submitted to the ENGINEER for Information/ Approval and thereafter properly recorded.

8.1.3 The excavation shall be done to correct lines and levels. This shall also include, where required, proper shoring to maintain excavations and also the furnishing, erecting and maintaining of substantial barricades around excavated areas and warning lamps at night for ensuring safety.

Detail excavation plan for deep excavation work shall be separately prepared and submitted by contractor to Tata power for approval.

8.1.4 The dumping of excavated material shall be done with regular slope within the lead specified and levelling the same so as to provide natural drainage. Rock/ soil excavated shall be stacked properly. As a rule, all softer material shall be laid along the centre of heaps, the harder and more weather resisting materials forming the casing on the sides and the top. Rock shall be stacked separately.

All excavated material shall be kept away from the excavated area. Hard barricade shall be done around the excavated area.

8.2 CLEARING

8.2.1 The area to be excavated /filled shall be cleared of fences, trees, plants, logs, stumps, bush, vegetation, rubbish, slush, etc and no other objectionable matter. If any roots or stumps of trees are met during excavation, they shall also be removed. The material so removed shall be burnt or disposed properly as per norms of local statutory authority. Wherever earth fill is intended, the area shall be stripped of all loose /soft patches, top soil containing objectionable matter/materials before fill commences.

8.3 PRECIOUS OBJECTS, RELICS, OBJECTS OF ANTIQUITY, ETC.

8.3.1 All gold, silver, oil, minerals, archaeological and other findings of importance, trees cut or other materials of any description and all precious stones, coins, treasures, relics, antiquities and other similar things which may be found in or

upon the site shall be the property of the OWNER (TATA POWER) and the CONTRACTOR shall duly preserve the same to such person or persons as the OWNER may from time to time authorise or appoint to receive the same.

8.4 CLASSIFICATION

8.4.1 All materials to be excavated shall be classified as per IS 1200 Part 1. No distinction shall be made whether the material is dry, moist or wet. The decision of the ENGINEER regarding the classifications shall be final and binding on the CONTRACTOR and not be a subject matter of any appeal or arbitration.

8.4..2 Any earthwork shall be classified under any of the following categories:

The materials to be excavated shall be classified as follows unless otherwise specified :

a) 'Soft / Loose Soil - Generally any soil which yields to the ordinary application of pick and shovel, or to PHAWRA. Rake or other ordinary digging implement; such as vegetable or organic soil, turf, gravel, sand, silt, loam, clay peat, etc.

b) Hard/Dense Soil - Generally any soil which requires the close application of picks, or jumpers or scarifiers to loosen; such as stiff clay, gravel, cobblestone, water bound macadem and soling of roads.

c) Mud - A mixture of soil and water in fluid or weak solid state.

d) Soft/Disintegrated Rock (Not Requiring Blasting) - Rock or boulders which may be quarried or split with crowbars. This will also include laterite and hard conglomerate.

e) Hard Rock (Requiring Blasting) - Any rock or boulder for the excavation of

which blasting is required.

f) Hard Rock (Blasting Prohibited) - Hard rock requiring blasting as described under (e) but where blasting is prohibited for any reason and excavation has to be carried out by chiselling, wedging or any other agreed method.

8.5 EXCAVATION

8.5.1 All excavation work shall be carried out by mechanical equipment unless otherwise directed by owner for manual excavation. The contractor has to take care of the underground utilities during excavation without any extra payment. The methodology of excavation shall be submitted to the ENGINEER for Information / Approval.

8.5.2 Excavation work shall be taken to such widths, lengths, depths and profiles as are shown on the drawings or such other lines and grades. Rough excavation shall be carried out to a depth 150 mm above the final level. Soft pockets shall be removed even below the final level and extra excavation filled up shall be in CONTRACTOR scope, wherever necessary. The final excavation should be carried out just prior to laying mud mat.

8.5.3 The CONTRACTOR may, for facility of work or similar other reasons excavate, and also backfill later, if so approved by the ENGINEER, at his own cost outside the lines shown on the drawings or directed by the ENGINEER. Should any excavation shall fill it up, with lean concrete (M10 grade) up to the required elevation. No extra cost shall be claimed by the CONTRACTOR on this account.

8.5.4 All excavation shall be done to the minimum dimensions as required for safety

and working facility. Prior approval of the ENGINEER shall be obtained by the CONTRACTOR in each individual case, for the method he proposes to adopt for the excavation, including dimensions, side slopes, dewatering, disposal etc. This approval, however, shall not in any way relieve the CONTRACTOR of his responsibility for any consequent loss or damage. The excavation must be carried out in the most expeditious and efficient manner. Side slopes shall be as steep as will stand safely for the actual soil conditions encountered. Every precaution shall be taken to prevent slips. Should slip occur, the slipped material shall be removed and the slope earth will not be paid for if the slips are due to the negligence of the CONTRACTOR.

Excavation in hard rock shall be carried out with controlled blasting & special care. Excavation shall be carried out with such tools, tackles and equipment as described herein before. Blasting or other methods maybe resorted to in the case of hard rock; however not without the specific permission of the ENGINEER. Wherever applicable, Silent concrete / rock breaking technique shall be implemented.

License for blasting and other statutory requirements (labour licence etc.) shall be CONTRACTOR'S responsibility.

It shall be clearly understood that the cost of excavation shall include conveying excavated material to the place for disposal as specified or directed. No extra cost shall be claimed by the CONTRACTOR on this account.

8.6 DEWATERING

8.6.1 All excavations shall be kept free of water. Grading in the vicinity of excavation shall be properly closed to prevent surface water running into excavated areas.

CONTRACTOR shall remove by pumping or other means approved by ENGINEER any water inclusive of rain water and subsoil water accumulated in excavation and keep all excavations dewatered. Sumps made for dewatering must be kept clear of the excavations/trenches required for further work. Method of pumping shall be approved by the ENGINEER. But in any case, the pumping arrangement shall be such that there shall be no movement of subsoil or blowing in due to differential head of water during pumping. Pumping arrangements shall be adequate to ensure no delays in construction.

8.6.2 When there is a continuous inflow of water, contractor should adopt well point dewatering system. No separate payment is payable for the same.

8.7 FILLING AND GRADING

8.7.1 General

Filling material shall be tested for its physical and chemical properties at NABL approved third party testing laboratory prior to its use. Same shall be approved by QAI team.

All fill material will be subjected to the ENGINEER's approval, if any material is rejected by the ENGINEER, the CONTRACTOR shall remove the same forthwith from the site at no extra cost to the owner. Surplus fill material shall be deposited/disposed off as directed by the ENGINEER after the fill work is completed.

No earthfill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with as directed by the ENGINEER. The surplus or rejected excavated earth, shall be disposed as per local statutory norms without any extra cost. CONTRACTOR shall take necessary approvals for dumping of surplus earth.

8.7.2 Selected surplus soils from excavated materials shall be used as fill, preferably within the premises. Fill material shall be free from clods, salts, sulphates, organic or other foreign material. All cods of earth shall be broken or removed.

8.7.3 Filling in pits and around foundations of structures, walls etc.

As soon as the work in foundations has been accepted and measured, the spaces around the foundations, structures, pits trenches etc. shall be cleared of all debris, and filled with earth in layers not exceeding 15 cm, each layer being watered, rammed and properly consolidated, before the succeeding one is laid. Each layer shall be consolidated to the satisfaction of the ENGINEER (95% of proctor density). Earth shall be rammed with approved mechanical compaction machines. Usually no manual compaction shall be allowed unless the ENGINEER is satisfied that in some cases manual compaction by tampers cannot be avoided. The final backfill surface shall be trimmed and levelled to proper profile as indicated in approved construction drawings.

8.7.4 Plinth filling

Plinth filling shall be carried out with approved material as described herein before in layers not exceeding 15 cm, watered and compacted with mechanical compaction machines. The ENGINEER may however permit manual compaction by hand tampers in case he is satisfied that mechanical compaction is not possible. When filling reaches the finished level, the surface shall be flooded with water, unless otherwise directed, for at least 24 hours allowed to dry and then the surface again compacted as specified above to avoid settlements at a later stage. The finished level of the filling shall be trimmed to the level/slope specified.

In plinth filling 95% Proctor density shall be achieved while compaction. In case

wherever soil compaction is practically not possible, sand filling along with flooding shall be adopted without any extra cost.

8.7.5 General Site Grading

8.7.5.1 Site grading shall be carried out as directed in the approved drawings. Filling and compaction shall be carried out as specified in approved drawing and elsewhere unless otherwise indicated below.

8.7.5.2 Minimum compaction in site grading shall be 95% of proctor density .If no compaction is called for, the fill may be deposited to the full height in one operation and levelled. If the fill has to be compacted, it shall be placed in layers not exceeding 225 mm and levelled uniformly and compacted before the next layer is deposited.

8.7.5.3 The CONTRACTOR shall protect the earth fill from being washed away by rain damaged in any other way. Should any slip occur, CONTRATOR shall remove the affected material and make good the slip at his cost.

8.7.5.4 The fill shall be carried out to such dimensions and levels as indicated on the drawings after the stipulated compaction. The fill will be considered as incomplete if the desired compaction has not been obtained.

8.8 LEAD

8.8.1 Lead for deposition/disposal of excavated material, shall be as specified in the respective item of work. For the purpose of measurement of lead, the area to be excavated or filled or area on which excavated material is to be deposited/disposed off shall be divided into suitable blocks and for each of the

blocks, the distance between centrelines shall be taken as the lead which shall be measured by the shortest straight line route on the plan and not the actual route taken by the CONTRACTOR. No extra compensation is admissible on the grounds that the lead including that for borrowed material had to be transported over marshy or 'katcha' land route.

8.9 MEASUREMENT AND PAYMENT (Not applicable for EPC Contract)

8.9.1 All excavations shall be measured net. Dimensions for purpose of payment shall be reckoned on the horizontal area of the excavation at the base (PCC dimensions) for foundations, multiplied by the mean depth from the surface of the ground in accordance with the drawings. Excavation in side slopes will not be paid for. The CONTRACTOR may make such allowance in his rates to provide for excavation in side slopes keeping in mind the nature of the soil and safety or excavation. The quoted rate should be inclusive of reasonable working space, beyond concrete dimensions.

8.9.2 Unless otherwise specified, the unit rates quoted for excavation in different types of material shall also account for disposal as specified or directed.

8.9.3 It shall be clearly understood that the cost of excavation shall include conveying excavated material to the place for disposal as specified or directed.

8.9.4 Rate quoted for excavation shall also provide for dewatering expenses.

8.9.5 Payment for fills inside trenches, plinth etc, will be based on the measurement of plinth/trench filled. Plinth ground level shall be surveyed beforehand for this purpose. This clause is applicable wherever backfilling is separate line item in the BOQ.

8.9.6 Payment for site grading will be based on the surveyed dimensions before filling commences and surveyed dimension after filling and compaction.

9. Quality Requirements (including SQP and FQP)
As per approved SQP and FQP

10. Inspection, Testing and Performance Requirements along with Warranty
As per approved SQP and FQP

11. Mandatory Spares
Not Applicable

12. Data Submission By Bidder

12.1 With the Bid - Not Applicable

12.2 After award of contract - SQP, FQP, Field test report and drawings.

Annexure - 4c

Annexure 4c - Specification for EHV Cable laying services

1.1 EHV Cable Laying

1.1.1 Pre installation Activities

a) Trench as per specification shall be constructed with proper shoring, dewatering arrangement and with sufficient clearances from all sides for the proposed cable system to be installed.

b) In case of critical clearances from other utilities/nalla/insufficient depth, the cable system will be provided with additional metal enclosure protection for future safeguarding against a possible damage.

c) In case of congestion of other utilities, the same will be supported and space underneath will be created to house the cables to be laid.

d) Either side of the trench will be cleared of all objects for ease in laying and preventing anything falling on to the cables being laid and thereby damaging the same.

e) Trench floor and places where the cable is to be installed/ laid shall be kept free of foreign materials such as stones, nails and pieces of concrete, asphalt, brick pieces, glass pieces, sharp-edged objects etc, to avoid damage of cable.

f) Complete de- watering of trench shall be done.

g) Protection tiles shall be present throughout the trench wall and tile joints shall be smoothly finished with cement mortar.

h) It shall be ensured that more than minimum bending radius of the cable (20 X Diameter of the cable) is attained at all curves of trench.

i) Top surface of PCC (Plain cement concrete) layer shall be smooth.

j) It shall be confirmed that adequate shoring/ slopping provided to trench where ever required so that the side walls will not collapse at any portion along the cable route.

k) Cable drum shall be mounted on drum jacks for free rotation.

l) Drum jacks shall be placed on leveled surface for proper balance of cable drum while moving.

m) The cable drum shall be set at the opposite direction to the arrow painted on the drum that indicates the direction of rolling so that the cable requires least pulling force.

n) Drum shall be raised up by jacks of both sides gradually and equally from both sides.

o) Cable drum battens/metal cover shall be removed completely; care shall be taken while doing it not to damage cable.

p) Ground rollers shall be set in straight portions at such intervals to avoid cable from touching bed due to slack between two rollers.

q) The pressure cum bend roller in bend portions shall be set as close as possible, so as not to subject cables to sidewall pressure.

r) Enough numbers of bend roller are to be positioned on the curves in the trench, to prevent cable sliding off.

s) Anchor rods have to be tightened for anchoring the bend and pressure cum bend rollers to side walls.

t) Power rollers shall be installed for longer route length or route with more no of curves.

u) These power rollers are to be connected to a power source (DG set) shall be wired in such way to facilitate all power rollers to rotate in one direction.

v) Operator shall always present to control the power rollers.

w) If the cable is cut, the exposed end shall be sealed to protect from damage by heat shrinkable caps.

x) During the cable laying, supervisors shall be deputed at cable head, near drum, regular intervals (at least at 50 mtr),

y) Each corner and entrance to duct to guide/monitor cable movement.

z) Effective communication shall be established between the drum, power rollers, control station; the head of the cable, on curves, intermediate post and the winch to facilitate the pulling work, preferably VHF sets shall be used for this.

aa) The communication methodology to be used shall be of proven reliability and shall be thoroughly tried and tested before beginning cable pulling.

bb) Ensure that the winch has a pulling recorder and a tension meter, to continuously monitor the cable pulling force.

cc) The cable pulling head along with the swivel, winch wire rope and belt (if a second winch is used) taking the cable pulling tension should be tested at 10 tons load.

dd) It shall be confirmed that cable drum, drum brake, winch, rollers, wire rope, drum for wire rope and any other necessary tools/equipment have been set properly.

ee) After everything is set, winch rope should be pulled from winch machine through rollers to cable drum. Friction reducing agent shall be applied on winch rope for protecting it against excessive wear and tear.

ff) Swivel shall be installed between rope and pulling eye to prevent the cable from twisting.

gg) If pulling eye is cut then pulling socks shall be installed on cable end and swivel is to be attached to it.

hh) The rollers shall be inclined towards one side of trench and shall be aligned in line for pulling first cable.

ii) Trench shall be checked finally to find out and eliminate any risks that may damage the cable.

1.1.2 Cable pulling

a) A person shall be deployed near cable drum to check if any manufacturing defect exists in cable drum.

b) If any defect found manufacturer should be consulted immediately to rectify the defect.

c) There are two methods of cable pulling they are, manual cable pulling, mechanical cable pulling.

d) For smaller route length and routes with few curved sections manual pulling method may be used otherwise mechanical pulling is to be used.

e) Technique wise both methods are similar except the tools/machines used.

f) Cable pulling shall be started simultaneously by winch operator, cable drum controller, power roller operator.

g) For any abnormality reported, pulling shall be stopped from all sources together.

h) Sufficient break force to be applied to stop cable at minimum possible distance to avoid damage to it.

i) Pulling speed shall be reduced at inlet of bends, duct, etc. to avoid damage to cable.

j) The cable pulling tension should be maintained below 3 tons on the winch and winch to be set for tripping at 3 tons.

k) As cable pulling is done by electrical equipment ELCB should be used.

l) Cable shall be checked at their outlets to confirm no damage has occurred at these portions, the pulling speed may be increased after that.

m) In case of any damages necessary action shall be taken to eliminate the cause.

n) Cable shall be monitored on the cable rollers, especially at pressure cum bends to maintain sufficient clearance between existing utilities along the route during pulling.

o) The outer layer of the cable shall be monitored and it shall be confirmed that the cable has not been damaged during cable pulling.

p) The cable pulling shall be stopped immediately on finding any damage and shall not be resumed until the causes are removed.

q) The damage portion of cable shall be repaired as required.

r) If any major damages found cable manufactures is to be consulted immediately.

s) If the inner end of the cable on the cable drum is loosened during cable pulling, it shall be tightened again to the cable drum prior to resuming the cable laying.

t) After first cable pulling activity is over, cable shall be lowered from rollers and settled on laying bed. Care shall be taken while lowering to avoid any damage to cable.

u) Rollers shall be set for second cable pulling and cable is to be pulled like the first one and subsequently third cable shall be pulled.

v) After pulling is over cables are to be set in required formation (closed trefoil, open trefoil or flat formation) as per design.

1.1.3 Post Cable Pulling Activity

a) Outer layer of the cable shall be checked whether the cable has been damaged or not during lowering and setting activity.

b) Any damage shall be repaired in a proper manner after careful examination.

c) As built drawings will be prepared by taking measurements for Cable route alignment, cross references, depth, details of other utilities in the vicinity, date of laying, details of working crew etc.

d) Cable ends shall be exposed and outer graphite layer shall be peeled off.

e) Healthiness of lead sheath shall be checked by carrying out DC sheath test at 10 kV for 1 minute after first layer backfilling of FTB/ sand.

f) Resistance of cable shall be checked (Megger value at 5kv) for confirming healthiness of insulation.

g) Upon completion of tests cable ends shall be sealed with heat shrinkable caps to protect against ingress of water or any foreign particles.

h) Cable ends shall be raised up and supported at higher level than the maximum water level expected.

i) The FTB will be filled till the desired level as per standard drawing and thereafter the same will be covered by RCC warning tiles on top.

j) It has to be ensured that all other utilities are lifted sufficiently to avoid encasement of FTB.

k) In case the FTB is also encasing any other utility services, due care should be taken to provide the marking tile on top and capturing the information in our drawings for future reference.

l) Complete backfilling of trench shall be done as soon as possible because leaving the cable exposed may cause mechanical damage, theft and any other possible damage.

m) In case the cable ends have to be buried underground during the monsoon they should be sealed by a lead cap, then sealed by a heat shrinking cap and then buried in a chamber filled with bitumen.

1.1.4 Laying of Fibre Optic Cables

Laying procedure of Fiber Optic (FO) -cable as mentioned in section 3.4 of specifications if required to be revised in consultation with cabling team for process related of laying of Fiber in FTB

a. After having laid the 3 lengths of the power cables (for 3 phases) and two pre-lubricated HDPE pipes along with the guide wire will be laid for two Fibre Optic cables than filing STB. The pre-lubricated HDPE pipes required shall be supplied by Contractor along with guide wire to enable pulling of Fibre Optic Cable under the present Contract.
b. The Fibre optic cable drums will be positioned and jacked up on appropriate capacity jacks.
c. The cable will be pulled through pre-lubricated HDPE pipes along the entire route with the help of guide wire.
d. End termination boxes LC type (96 Core per FO-Cable) Rack mountable loaded with all standard accessories and 42 U Fiber termination racks.
e. Services for midspan jointing at each handhole location and end termination of FO-cables to be considered.
f. Providing of Joint details ,route details and circuit test reports of all Fiber optic circuits to be considered as part of deliverables from the bidder.
g. Scope of work of bidder as far as FO-cable is considered will include but not limited to:
    i. Supply, Laying of FO cable from Communication fiber termination panel
    ii. Supply of fiber termination boxes, Underground joint boxes, Fiber termination racks.
    iii. Services for Midspan FO-cable jointing, creation of accessible joint hand holes at appropriate locations.
    iv. Creation and submission of documentation related to fiber routes, Fiber test reports and joint locations
    v. Service for termination of fiber cables at end stations.

h. Laying procedure of FO-cable to be revised in consultation with cabling team for process related of laying of Fiber in FTB
i. Pre-lubricated HDPE duct with Nylon rope specifications to be provided to the bidder.
j. FO Cable make should be as per standard specifications of TATA Power and approved FO-supply vendors are M/s APAR, KEC, Finolex.
k. Make of Accessories such as Underground FO-jointing kits should be of Raychem make.
l. Termination Boxes should be of make such as of M/s Raychem, AFS, TYCO

1.1.5 TEMPERATURE MONITORING EQUIPMENT (If asked by the Purchaser)

Contractor shall arrange for following activities in case the temperature monitoring system is required to be installed.

a. The temperature monitoring cabinet shall be installed by the Contractor.

b. Temperature monitoring junction boxes shall be installed in the RCC chamber 5 metres away from each of the joint bays and at other points along the route as may be decided by the manufacturer. The auxiliary cable laid will be terminated in these junction boxes using standard quality lugs and connected as per the drawing, supplied by manufacturer.

c. The waterproof enclosures shall be placed in RCC chambers constructed close to the chamber described in 6.8.2 above. The auxiliary cable leads and the thermocouple leads emanating from the cable sheath will be terminated into the temperature transmitter contained inside the waterproof enclosure.

Annexure - 5

TATA POWER	**The Tata Power Company Limited** **Quality Assurance Inspection & Testing.**	TATA
TPQAIT-QAXX-00-EX-SQP-005 **Rev.1**	**STANDARD QUALITY PLAN FOR EHV CABLES**	**Date of Issue:** **28.02.2021**

Sr. No	COMPONENT / OPERATION		CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	REMARKS
1	2		3	4	5
1.0	**MATERIAL:**		(Generally in-line with manufacturer standard / technical specification)		
1.1	Copper	a.	Diameter	Physical	Review of Supplier TC during Final Inspection.
		b.	Resistivity	Electrical	
		c.	Tensile strength and elongation	Physical	
		d.	Purity/Chemical Composition	Chemical	
		e.	Surface finish	Visual	
1.2	XLPE Compound	a.	Packing	Review.	
		b.	Compound grade and make		XLPE compound sourced from DOW and Borealis.
		c.	Review of Supplier's TC		
1.3	Semi-conducting Compounds	a.	Packing	Review.	
		b.	Compound grade		
		c.	Review of Supplier's TC		
1.4	PE/PVC Compound	a.	Physical Appearance	Visual	
		b.	Type/Grade	Review.	
		c.	Tensile strength		
		d.	Elongation at break		
		e.	Specific gravity		
		f.	Carbon black content		Only for Black PE.
		g.	Thermal Stability		
1.5	Pig Lead	a.	Chemical Composition	Review.	
1.6	Copper Tape	a.	Thickness of Tape	Review.	
		b.	Width of Tape		
		c.	Tensile strength		
		d.	Elongation at break		
		e.	Resistivity at 20degree C		
1.7	Semi-Conducting Tape	a.	Grade	Verification	
		b.	Thickness/Dimensions	Review.	
		c.	Swelling Height		for Water Swellable tape.
		d.	Volume/Surface resistivity	Electrical	
		e.	Breaking/Tensile strength	Physical	
1.8	Stainless steel tape	a.	Grade of material	Verification	
		b.	Mechanical Properties	Review.	
		c.	Thickness of Tape		
		d.	Non-magnetic property		
2.0	**INPROCESS INSPECTION:** (Generally in line with manufacturer standard)				
2.1	Wire drawing	a.	Surface finish	Visual	
		b.	Diameter	Review.	
		c.	Elongation(Copper wires)		

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Sr. No	COMPONENT / OPERATION		CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	REMARKS
1	2		3	4	5
2.2	Stranding	a.	No of wires	Review.	
		b.	Diameter of wires		
		c.	Stranding lay and direction		
		d.	Make and grade of water swellable tape at each layer		Only for Water Sealed conductor.
		e.	No of segments		Only for Segmental (Miliken) conductor.
		f.	Diameter of conductor		
		g.	Surface finish		
		h.	Conductor weight		
2.3	Separator over Conductor	a.	Material Grade	Review.	
		b.	Application of Tape		
2.4	Core Extrusion/Rewinding	a.	Thickness of insulation	Review.	Triple extrusion process to be used for conductor screen, XLPE insulation and insulation screen.
		b.	Thickness of extruded semi conducting layers		
		c.	Surface Finish		
		d.	Core diameter		
		e.	Eccentricity		To be checked during mfg process
		f.	Tensile strength of Insulation		
		g.	Elongation of Insulation		
		h.	Hot set test on Insulation		
2.5	Water Swellable Taping	a.	Material Grade	Review.	
		b.	Application of Tape		
2.6	Metallic Copper screen	a.	Copper Screen Area	Review.	
		b.	Thickness of Cu Tape Binder		
		c.	Lay length of Cu wires		
		d.	Width of Cu tape binder		
2.7	Lead Sheathing	a.	Sheath thickness	Review.	
		b.	Chemical composition		
		c.	Surface finish		
2.8	Inner sheath	a.	Material and type	Review.	
		b.	Thickness		
		c.	Surface finish		
2.9	Armour	a.	Material and grade	Review.	
		b.	Thickness of Tape		
		c.	Application of Tapes		
		d.	Application of Binder tape		If required, over armour.

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Sr. No	COMPONENT / OPERATION		CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	REMARKS
1	2		3	4	5
2.10	Outer Sheath(Extrusion/ Rewinding)	a.	Material and type	Review.	
		b.	Thickness		
		c.	Surface finish		
		d.	Outer Conducting layer		
		e.	Overall diameter		
		f.	Marking on cable sheath		TATA Power, OEM name, Year of mfg, cable no and meter marking.
		g.	Cable length		
		h.	Cable Winding		
3.0	**Final Inspection: as per IEC 60840, 60229 & 60228.**				
3.1	Routine Tests.	a.	Partial Discharge Test	60840-9.2	Supplier to conduct routine tests on all cable before offering to Tata Power for inspection
		b.	High Voltage Test	60840-9.3	
		c.	Electrical Test on outer sheath	60840-9.4	
		d.	Conductor Resistance		
		e.	Capacitance measurement		
		f.	Insulation resistance at ambient temperature		
		g.	Insulation resistance of outer sheath		
3.2	Acceptance Tests	a.	Conductor Examination	60840-10.4	CHP All Acceptance tests will be witnessed by Tata Power representative
		b.	Conductor Resistance	60840-10.5	
		c.	Verification of construction	Physical.	
		d.	Screen resistance	60840-10.5	
		e.	Thickness of Insulation	60840-10.6	
		f.	Thickness of lead sheath	60840-10.6	
		g.	Copper screen area.	60840-10.8	
		h.	Thickness of metallic sheath.	60840-10.7	
		i.	Thickness of inner sheath	60840-10.8	
		j.	Thickness of outer sheath	60840-10.7	
		k.	Overall cable diameter	60840-10.8	
		l.	Hot set test of XLPE insulations.	60840-10.9	
		m.	Capacitance measurement	60840-10.10	
		n.	Water penetration test	60840-10.13	
		o.	Measurement of density of HDPE insulation#.	60840-10.11	
		p.	Lightning impulse voltage test followed by power frequency voltage test. (Only incase of conductor stress > 8KV/mm).	60840-10.12	
		q.	Tests on components of cables with a longitudinally applied metal tape or foil, bonded to the oversheath.	60840-10.14	
		r.	Cable Marking,length & Surface finish check by drum rewinding.	Physical	
		s.	Load test on pulling eye#.	Physical	

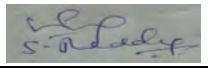
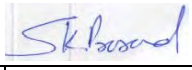
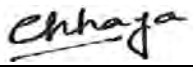
Sr. No	COMPONENT / OPERATION		CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	REMARKS
1	2		3	4	5
3.3	Type Tests#.	a.	Bending test on cable followed by partial discharge test.	60840-12.4.2.a	There shall not be any movement of HDPE, inner sheath or armour w.r.t conductor#.
		b.	Tan Delta measurement & capacitance measurement.	60840-12.4.5	Type test will be decided during discussions with vendor in pre-ordeing stage. However for any new design, new supplier, type test are mandatory. In case if its not new design type tests reports will be verified for similar design.
		c.	Heating cycle voltage test.	60840-12.4.6	
		d.	Partial discharge test at ambient temperature and at high temperature.	60840-12.4.4	
		e.	Switching Impulse test (for Um>300KV)	60840-12.4.7	
		f.	Lighting Impulse test followed by power frequency voltage test.	60840-12.4.7	
		g.	Resistivity of semiconducting screens.	60840-12.4.9	
		h.	Examination of the cable system with cable and accessories on completion of tests.	60840-12.4.8	
		i.	Checking of Cable construction.	60840-12.5.1	
		j.	Mechanical properties of XLPE insulation before and after ageing.	60840-12.5.2	
		k.	Mechanical properties of sheath before and after ageing.	60840-12.5.3	
		l.	Additional ageing tests on complete cable.	60840-12.5.4	
		m.	Loss of mass tests on PVC oversheath of type ST2.	60840-12.5.5	
		n.	Pressure test at High temperature on over sheath.	60840-12.5.6	
		o.	Tests on PVC oversheath at low temperature#.	60840-12.5.7	
		p.	Heat shock test for PVC oversheath.	60840-12.5.8	
		q.	Hot set test for EPR & XLPE insulation.	60840-12.5.10	
		r.	Measurement of density of HDPE insulation#.	60840-12.5.11	
		s.	Measurement of carbon black content of black PE oversheaths.	60840-12.5.12	
		t.	Test under fire conditions (only for PVC Sheathed Cable).	60840-12.5.13	
		u	Water penetration test.	60840-12.5.14	
		v.	Tests on components of cables with a longitudinally applied metal tape or foil, bonded to the oversheath#.	60840-12.5.15	
		w.	Shrinkage test for PE, HDPE and XLPE Insulations#.	60840-12.5.16	

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Sr. No	COMPONENT / OPERATION		CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	REMARKS
1	2		3	4	5
4.0	**PACKING, PRE-SHIPMENT & DISPATCH:**				
4.1	PRE-SHIPMENT & PACKING	a.	Pulling eye and end sealing	Visual	Pulling Eye Design to be confirmed by TATA POWER.
		b.	Drum Marking	Visual	
4.2	DISPATCH:		Issue of Release note / MDCC#.	Customer Hold Point	

NOTE

A) STATUTORY REQUIREMENTS WILL BE COMPLIED BY THE CONTRACTOR.
B) ALL MATERIAL SHALL BE AS PER APPROVED DRAWINGS / DATA SHEET.
C) TATA POWER / ITS REP IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED, IF REQD, SAME SHALL BE TRANSFERRED BY TATA POWER / ITS REP ONLY
D) FINAL INSPECTION OF THE MAJOR ACTIVITIES ARE WITNESSED BY CLIENT AND IT IS HOLD POINT (AT THE DISCRETION TATA POWER)
E) MANUFACTURER SHALL PREPARE AND SUBMIT COMPLETE MANUFACTURING QUALITY PLAN IN PRESCRIBED FORMAT OR THEIR REGULAR FORMAT INDICATING THEIR REGULAR PRACTICES, TAKING CARE OF MINIMUM REQUIREMENT AS INDICATED ABOVE.
F) INSPECTION OF SPARES SHALL BE MANUFACTURED & INSPECTED AS PER APPLICABLE CLAUSES OF THIS QUALITY PLAN .SPARES OFFERED FOR INSPECTION SHALL BE PREFFERED ALONG WITH MAIN ITEMS (IF ORDERD).
G) AS PER SEPCIFICATION PROPER PAINTING & PACKING SHALL BE ENSURED BY VENDOR BEFORE SHIPMENT TO AVOID ANY TRANSIT DAMAGE.
H) ANY SEPARAT TEST SHALL BE CARRIED OUT IF CALLED FOR IN ACCORDANCE WITH TATA POWER TECHNICAL SPECIFICATION OR AS PER MUTUALLY AGREED IN MQP.
I) CALIBRATION CERTIFICATES OF THE EQUIPMENT(INSTRUMENTS) USED FOR INSPECTION SHALL BE PROVIDED FOR REVIEW.
J) TATA POWER RESERVES THE RIGHT TO DEMAND/VERIFY/AUDIT/WITNESS ANY OF THE CHECK POINTS MENTIONED IN THE SCOPE OF THE SUPPLIER .

				
R1	#Inputs from division and technical specifications	SR/ 28.02.2021	SKP	CRB
R0	ISSUE FOR USE	SR & 12.12.2014	CB & 12.12.2014	SS / SGP
Rev. No	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date.

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Annexure - 6

TATA POWER	The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing	TATA
TPQAIT-QAXX-00-EX-SQP-028 REV 0	STANDARD QUALITY PLAN FOR EHV Termination Kits	

Sr. No	COMPONENT / OPERATION		CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	REMARKS
1	2		3	4	5
1.0	FINAL INSPECTION:				
1.1	GIS Termination				
a.	Insulator	1	Visual Inspection	TC Verification as per IS-731/ IEC 575/ relevent standard for GIS sealing end	All tests have to be done as specified in the appropriate standards for GIS sealing ends
		2	Dimensional check		
		3	Routine 4 way bend test		
		4	Routine Electrical test		
		5	Ultrasonic test		
		6	Dye penetratrion Test		
		7	Burst/ Puncture Pressure Test		
		8	Temparature cycle Test		
		9	Porosity Test		
b.	Stress cone	1	HV-Test	Testing as per IEC 60859 / IEC 62271-209	CHP
		2	PD-Test		
c.	Mechanical connector,Cable Gland, fixing ring, Head armature	1	Dimensional check	TC Verification . as per IEC 60840 IEC 60859/ relevent standard for GIS sealing end	
		2	Mechanical Properties		
		3	Chemical Properties.		
1.2	Outdoor Termination				
a.	Insulator	1	Visual Inspection	TC Verification as per IS-731/ IEC 575/ relevent standard for GIS sealing end	
		2	Dimensional check		
		3	Routine 4 way bend test		
		4	Routine Electrical test		
		5	Ultrasonic test		
		6	Dye penetratrion Test		
		7	Burst/ Puncture Pressure Test		
		8	Temparature cycle Test		
		9	Porosity Test		
b.	Stress cone	1	HV-Test	Testing as per IEC 60859 / IEC 62271-209	CHP
		2	PD-Test		
c.	Mechanical connector, Cable Gland, fixing ring, head armature	1	Dimensional check	TC Verification as per IEC 60840 IEC 60859/ relevent standard for GIS sealing end	
		2	Mechanical Properties		
		3	Chemical Properties.		
1.3	Joint with cross bonding arrangement: (Straight through joint)				
a.	Insulator	1	Visual Inspection	TC Verification as per IS-731/ IEC 575/ relevent standard for GIS sealing end	
		2	Dimensional check		
		3	Routine 4 way bend test		
		4	Routine Electrical test		
		5	Ultrasonic test		
		6	Dye penetratrion Test		
		7	Burst/ Puncture Pressure Test		
		8	Temparature cycle Test		
		9	Porosity Test		

TATA POWER	The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing	TATA
TPQAIT-QAXX-00-EX-SQP-028 REV 0	STANDARD QUALITY PLAN FOR EHV Termination Kits	

Sr. No	COMPONENT / OPERATION		CHARACTERISTICS CHECKED	TYPE / METHOD OF CHECK	REMARKS
1	2		3	4	5
b.	Stress cone	1	HV-Test	Testing as per IEC 60859 / IEC 62271-209	CHP
		2	PD-Test		
c.	Mechanical connector, Cable Gland, fixing ring	1	Dimensional check	TC Verification as per IEC 60840 IEC 60859/ relevent standard for GIS sealing end	
		2	Mechanical Properties		
		3	Chemical Properties.		
2.0	**TYPE tests on cable accessories**				
2.1	TYPE tests	1	Partial discharge test at ambient temperature & higher temperature	TC Verification IEC 60840/ IEC 60859/ IEC 62271-209	On one sample/ TC verification
		2	Heating cycle voltage test		
		3	Lightning impulse voltage test		
		4	Power frequency with heating cycle test.		
		5	Power frequency 24hrs voltage test		
		6	Thermal ageing test		
		7	Short time current test		
		8	Test on outer protection (Applicable for buried joints)		
3.0	**Document review & issuance of IRN**	1	Review of quality dossier (*) & inspection report	Review	(*) along with index

NOTE

A) ALL MATERIAL SHALL BE AS PER APPROVED DRAWING/ DATA SHEET.
B) STATUTORY REQUIREMENTS WILL BE COMPLIED BY THE CONTRACTOR.
C) TATA POWER / ITS REP IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED, IF REQD, SAME SHALL BE TRANSFERRED BY TATA POWER / ITS REP ONLY FOR MATERIAL TRACEBILITY.
D) FINAL INSPECTION OF THE MAJOR ACTIVITIES ARE WITTNESSED BY CLIENT AND IT IS HOLD POINT (AT THE DISCRETION TATA POWER)
E) MANUFACTURER SHALL PREPARE AND SUBMIT COMPLETE MANUFACTURING QUALITY PLAN IN PRESCRIBED FORMAT OR THEIR REGULAR FORMAT INDICATING THEIR REGULAR PRACTICES, TAKING CARE OF MINIMUM REQUIREMENT AS INDICATED ABOVE.
F)INSPECTION OF THE MAINTAINCE SPARES SHALL BE OFFERED ALONG WITH THE MAIN SUPPLY AS PER THE INSPECTION STAGES OF 1 TO 4.
G)CALIBRATION CERTIFICATES OF THE EQUIPMENT USED FOR TESTING SHALL BE PROVIDED FOR REVIEW.
H)TATA POWER RESERVES THE RIGHT TO DEMAND / VERIFY/ AUDIT/ WITNESS ANY OF THE CHECK POINTS MENTIONED IN THE SCOPE OF SUPPLIER.
I) AS PER SPECIFICATION PROPER PAINTING & PACKING SHALL BE ENSURED BY VENDOR BEFORE SHIPMENT TO AVOID ANY TRANSIT DAMAGE.

Meant for (Internal Circulation / External – Stakeholders Circulation)

		Pallali 11/03/2015	CRBhonsle 11/3/2015	11/3/2015
R0	First issue	RP	CRB	SGP
Rev No	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date

Meant for (Internal Circulation / External – Stakeholders Circulation)

TATA POWER	The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing.	TATA
TPQAIT-QAXX-00-EX-FQP-006 Rev.0.	STANDARD FIELD QUALITY PLAN (FQP).	Date of Issue: December 2014.

STANDARD FIELD QUALITY PLAN FOR EHV CABLES.

Rev. No	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date	Issued by
R0	Issue for use	SR & 12.12.2014	CB & 12.12.2014	SGP	

Annexure - 7

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TATA POWER	The Tata Power Company Limited Corporate Engineering-Quality Assurance Inspection & Testing	TATA
TPQAIT-QAXX-00-EX-FQP-006 Rev.0.	STANDARD FQP FOR EHV CABLES (110 KV and above)	Date of Issue: December 2014.

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
1.0	MATERIAL RECEIPT	Check cable quantity and size	Major	Visual	100%	Packing list	Site register	Drum inspected for external damage, name plate checked and no other checks done.
		Report shortage/damage, if any	Major	Visual	100%	Packing list	Site register	Joint Report shall be prepared incase of damage.
		Unloading of cable.	Major	Visual	100%	Manufacturer's instructions	Site register	Spreader used for the slings while unloading cable.
		Ensure cable ends are in sealed condition	Major	Visual	100%	Manufacturer's instructions	Site register	
2.0	MATERIAL STORAGE	Storage area should be properly ventillated,hard surface,avoid water entry and damage.	Major	Visual	100%	Manufacturer's instructions	Site register	Cable drums are stored in cable yards in open plots. Proper access should be there for trailor and crane.
		Storage area should have provision for water Draining.	Major	Visual	100%	Manufacturer's instructions	Site register	Storage area should be fenced and there should proper security.

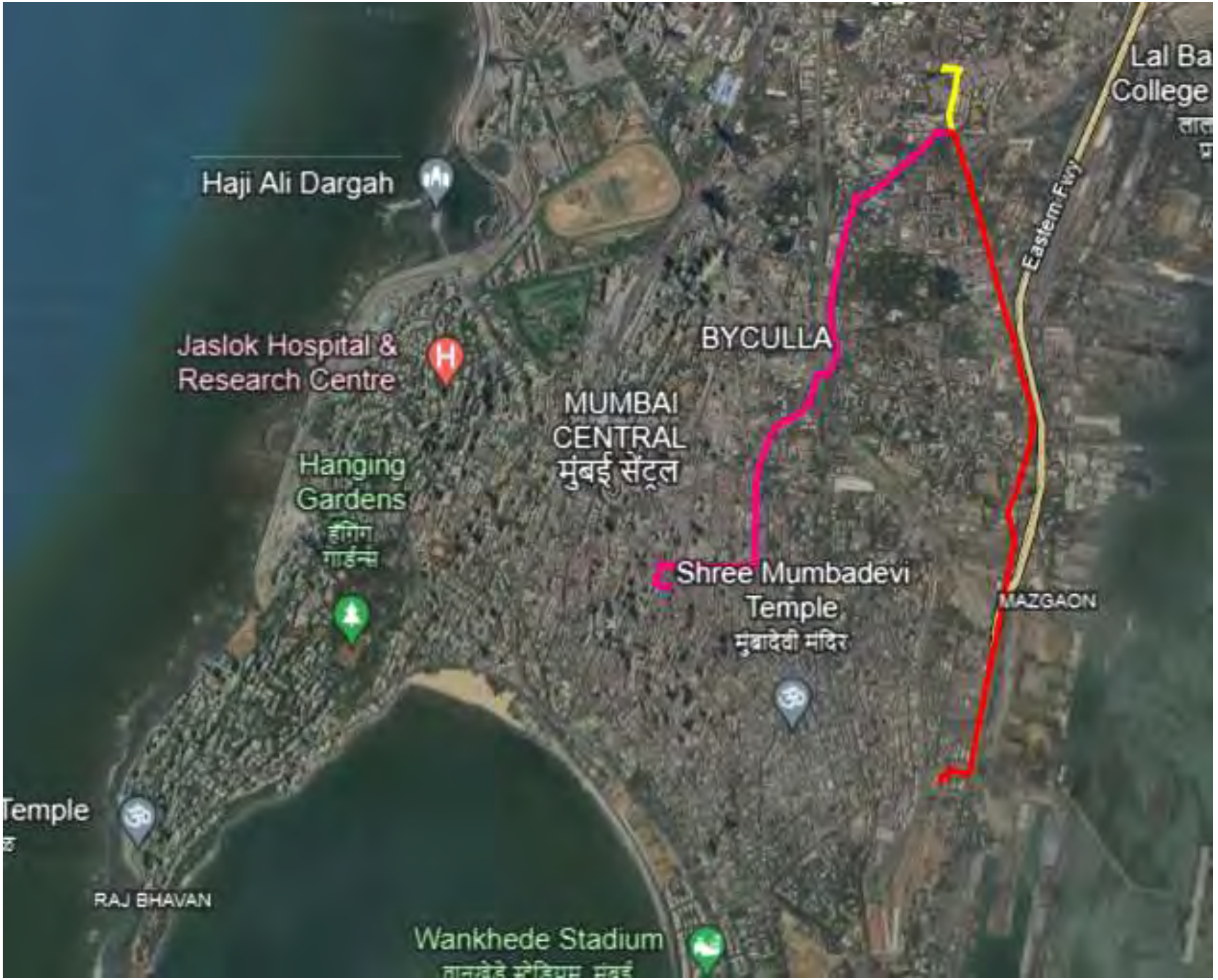
Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
		Drum must be stacked or stored standing on the flanges, not lying flat.Wood chocks should be placed under the flanges to prevent accidental rolling.When stacking it is essential to have the flanges meet,particularly with heavy drums.	Major	Visual	100%	Manufacturer's instructions	Site register	
		Cable drum should be protected from direct sunlight	Major	Visual	100%	Manufacturer's instructions	Site register	Not required as cables drums are covered with wood planks.
3.0	PRE-ERECTION	Planning: Check availability of cabling notes, layout drawings, drum schedules etc.	Major	N/A	N/A	Engineering & approved notes and details	N/A	
		Route survey: i. Check the route for laying of cable as per approved drawings. Ii. Check for any obstacles in conduits/ hume pipes. Iii. Preperation of bedding incase of trenches. Iv. Check for arrangement of backfilling, protective tiles, caution tape and cable route markers etc.	Major	Visual	100%	Manufacturer's instructions	Site register	1) Intrench diversion of other utilities may be required. 2) Concrete duct to be installed at site. 3) Joint bays to be prepared at either ends. 4) Check the trench for proper cable bending radius. 5) Barricading, Walkways and proper lighting should be provided on site.

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
		Availibility of tools and tackles: Drum handling equiment, cable pulling equipment, jacks, megger, rollers etc.	Major	Visual	100%	Manufacturer's instructions	Site register	1)Cable laying equipments like winch, power rollers and other rollers should be properly placed at site. 2) Generator for power supply should be arranged.
4.0	ERECTION	Transportation of cable drums to site.	Major	Visual	100%	Cable schedule/ Approved layout drawings	erection protocol	Transportation done during night time to avoid traffic hassles.
		Cable pulling(Check IR Value before Pulling).	Major	Visual	100%	Manufacturer's instructions	erection protocol	
		Cable cutting/laying.	Major	Visual	100%	Manufacturer's instructions/ Cable schedule/ Approved layout drawings	erection protocol	Walkie talkie communication required while laying cables. Cable sheath test has to be done.
		Terminal/Phase sequence check, clamping.	Major	Visual, Measurement	100%	Manufacturer's instructions/ Cable schedule/ Approved layout drawings	erection protocol	
		End termination and installation of other accessories.	Major	Visual	100%	As per the approved drawing and manufacturers instruction.	erection protocol	OEM supervisor or jointes to be certified for installation of accessories.

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
		MARKING & TAGGING: i. Route marking for cables routed through underground. Ii. Tagging of cables along the cables at 50 mtr intervals and at both sides of corners.	Major	Visual	100%	Cable schedule/ Approved layout drawings	erection protocol	Details route binding of the cable is prepared and tagging not required.
		Ensure clearances, earthing, protection from sharp edges. (As applicable).	Major	Visual	100%	Manufacturer's instructions/ Cable schedule/ Approved layout drawings	erection protocol	
5.0	**Pre-commissioing & Commissioning checks.**	Insulation Resistance test.	Major	Measurement	100%	Manufacturer's instructions	Test Report	
		DC High voltage test on Cable metallic Sheath.	Major	Measurement	100%	Manufacturer's instructions/ IEC 62067.	Test Report	Sheath bonding arrangement to be check.
		Phasing check at both ends.	Major	Visual	100%	Approved layout drawings	Test Report	Third party inspection to be done.
		Check all the local grounds removed.	Major	Visual	100%	Approved layout drawings	Test Report	
		Cable system test charged at minimum relay settings and then the same is continued for next 24 hrs as Soak test.	Major	Measurement	100%	Manufacturer's instructions	Commissioning Protocol	
		On successful completion of Soak Test, the cable system to be released for Load service	Major	Measurement	100%	—	Test Report	

Sr. No	COMPONENT / OPERATION	CHARACTERISTICS CHECKED	CLASS OF CHECK	TYPE OF CHECK	EXTENT / FREQUENCY OF CHECK	REFERENCE DOCUMENTS / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
NOTE	A) STATUTORY REQUIREMENTS WILL BE COMPLIED WITH BY THE CONTRACTOR. B) FOR STAGES WITNESSED / DOCUMENTS REVIEWED BY TATA POWER, COPIES OF RELEVANT DOCUMENTS WILL BE FURNISHED TO TATA POWER. C). TATA POWER / ITS REP. IDENTIFICATION STAMP ON MATERIALS WILL BE PRESERVED / GOT TRANSFERRED BY TATA POWER / IT'S REP AT APPROPRIATE STAGES.(IF REQUIRED). D). THE EXTENT INDICATED IN COLUMN 6 IS IN CONTRACTOR'S SCOPE.TATA POWER MAY INSPECT AS PER THIS COLUMN OR RANDOM SAMPLES AT IT'S DESCRETION. E). COLUMN 7 WILL BE AS PER TATA POWER APPROVED DRAWINGS / DATA SHEETS / CONTRACT DOCUMENTS WHEREVER APPLICABLE. F). INSTRUMENTS FOR LEAK TESTS AND PERFORMANCE TESTS WILL HAVE VALID CALIBRATION CERTIFICATE WITH TRACEABILITY TO NATIONAL LEVEL.							
Critical Category is HOLD point.	This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing is permitted., 24 Hrs advance notice to be given to TATA POWER QA/QC. Contractor /sub contractor shall not process activity beyond HOLD point without written permission by TATA POWER QA/QC. This activity shall be formed by TATA POWER (Execution +QA/QC), Main & Sub- Contractor (Execution +QA/QC) . (Also Surveillance by Head FQA / Project Head)							
Major Category is Witness point.	This activity required inspection / Verification & acceptance by inspection authority responsible for this stage before further processing. 24 Hrs advance notice to be given to TATA POWER (Execution) . Contractor /sub contractor shall not process activity beyond Witness point without written permission by TATA POWER (Execution). This activity shall be performed by TATA POWER (Execution), Main and Sub- Contractor (Execution +QA/QC) . (Surveillance by FQA)							
Minor Category is Review point.	This activity required review of documents by TATA POWER for the compliance & acceptance, However 24 Hrs advance notice to be given to TATA power (Execution). This activity shall be formed by Main and Sub- Contractor (Execution +FQC) . (Surveillance by Execution / Project Head).							
	TATA POWER QA/QC is also authorized to carryout surveillance in any major & minor class of check at their discretion.							

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Haji Ali Dargah
Jaslok Hospital &
Research Centre
Hanging
Gardens
हैंगिंग
गार्डन्स
MUMBAI
CENTRAL
मुंबई सेंट्रल
BYCULLA
Shree Mumbadevi
Temple
मुंबादेवी मंदिर
Eastern Fwy
Lal Ba
College
MAZGAON
Temple
RAJ BHAVAN
Wankhede Stadium

Annexure 9

Design, Engineering, Manufacturing, Factory Acceptance Test, Transportation to site, Installation and Commissioning of 110 kV Carnac Grant Road Cable project with 1C x 1600 Sqmm Copper Conducror XLPE, lead sheath cables of 220 kV

SUPPLY PART

Sr. No.	Item Description	Qty.	UoM	Remarks
1	Supply of 1C x 1600 Sqmm Copper Conducror XLPE, lead sheath cables of 220 kV	30000	Mtrs.	
2	Supply of 1C x 1600 Sqmm Copper Conducror XLPE, lead sheath cables of 110 kV	900	Mtrs.	
3	Sealing End for GIS termination with Cable 110 kV 1C XLPE Copper 1600 sq mm as per specifications	9	Nos	
4	Supply of cross bonded straight joints for 220 kV 1C 1600 Sqmm Cu. XLPE Cable	64	Nos	
5	Supply of 3 piece straight joints for 220 kV & 110 kV 1C 1600 Sqmm Cu. XLPE Cable	8	Nos	
6	Supply of Three Phase link box with SVL for cross bonding	11	Nos	
7	Supply of Three Phase link box without SVL for cross bonding	9	Nos	
8	Supply of Coaxial Cable along with Lugs and Connectors	2000	Mtrs.	
9	Supply of Single Phase link box for sheath bonding	6	Nos	
10	Sheath bonding cable	500	Mtrs.	
11	Supply of HDPE pipes for EHV cable (OD 250 mm & 6 mtr length)	1500	Nos	
12	Supply of Fibre optic cable along with patch cord **(Quantity considered 2 no. 96 Core FO cable per circuit)**	21.0	KM	
13	Cable Cleats	50	Nos	
14	Galvanised Steel structure for cable Cleating arrangement	3	MT	
15	Supply of Fiber termination Rack	2	Nos	
16	Supply of HDPE pipes for FO cable (dia 40 mm)	31.5	KM	Including DTS & DAS FO cable HDPE pipe
17	Supply of FOP joint boxes	24	Nos	
18	Supply of cable tiles	30000	Nos	
19	PATCH CORD FOR 96F OPTIC FIBER CABLE	100	Nos	
20	Supply of FO termination kit	8	Nos	
21	DISTRIBUTED TEMP MONITORING SYSTEM(DTS)	1	Set	
22	OPTIC FIBER CABLE FOR DTS	10.5	KM	

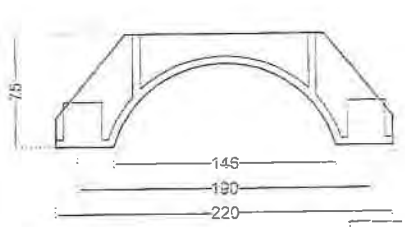
SERVICE PART

PART A - For EHV Cable

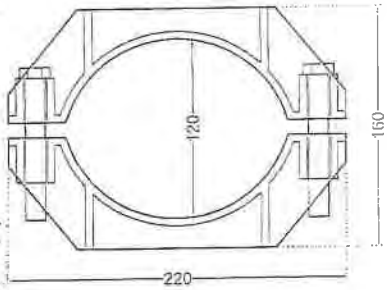
	Sr. No.	Item Description	Qty.	UoM	Remarks
	23	Detailed surveying of the Cable route along the alignment fixed by the owner & preparation of profile drawing for cable laying and preparation of final cable route in 6 sets of hard & soft copy in a scale of 1:10 indicating the position of cable jointing chambers, earthing details, position of cable route marker, land marks etc., after completing the work & energizing for the use of permanent record, GPS mapping of utilities to be indicated in the drawing complete. **(Based on preliminary route survey, total route length 5000 mtr.**	10000	Mtr	
	24	Excavation of Cable trenches as per approved drawings with proper wooden shoring, de-watering arrangement & with sufficient clearances from all sites . Excavation in all types of soil -except hard murrum, earth rock/debries, backfilled earth, where underground service lines are likely to be present, shoring the trenches, demolising PCC, Brick work, Rubble masionary encountered while making the trenches, disposal of excavated earth within 24 hours. Laying of PCC bed erecting side tiles ,Warning tape refer Approved trench drawing. Backfilling with STB upto 660 mm as per drawing of trench. Backfilling above RCC tiles upto road level with excavated earth as per approved trench drawing with Compaction and NOC from Concern Authority/Agency complete (For two Circuits). Trench Cross sectionDrawings shall be prepared by Bidder as per Specifications and approved by Owner.	1000	RMtr	

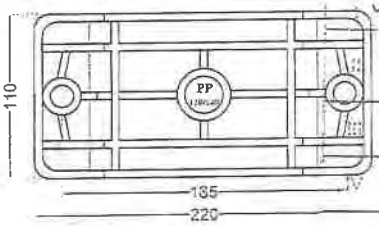
	25	Excavation for Major Road crossing as per approved drawings with proper, de-watering arrangement & sufficient clearances from all sites . Excavation in all types of soil - hard murrum, earth rock, debris, backfilled earth, where underground service lines are likely to be present, demolising PCC/brick work/rubble masionary encountererd while making the trenches, disposal of excavated earth within 24 hours. Laying of PCC bed, & erecting side tiles approved trench drawing. Backfilling with (sand metal mix) ,Warning tape, Top will be Reinstated with Soling & Compaction , Asphalt,& PCC M 20 or Satutory requirement on Top Crossing drawing complete. (For two Circuits) Trench Cross sectionDrawings shall be prepared by Bidder as per Specifications and approved by Owner.	1000	RMtr	
	26	Excavation for Minor Road crossing as per approved drawings with proper, de-watering arrangement & sufficient clearances from all sites . Excavation in all types of soil - hard murrum, earth rock, debris, backfilled earth, where underground service lines are likely to be present, demolising PCC/brick work/rubble masionary encountererd while making the trenches, disposal of excavated earth within 24 hours. Laying of PCC bed & erecting side tiles approved trench drawing. Backfilling with (sand metal mix) ,Warning tape, Top will be Reinstated with Soling & Compaction , Asphalt,& PCC M 20 or Satutory requirement on Top Crossing drawing complete. (For two Circuits) Trench Cross sectionDrawings shall be prepared by Bidder as per Specifications and approved by Owner.	200	Rmtr	
	27	HDD services for crossings (100 mtr for 8 runs of cable)	200	Mtr	
	28	Services for laying of tiles 660x500x60 mm complete (including shifting, transportation and laying in trench).	30000	Nos	
	29	Services for un-coiling & laying 220 kV, 1600 Sq.mm XLPE insulated cable as per approved drawing, & specification in open trench & through HDPE pipe laid along the route,including Loading from store ,transportation,unloading at site , returning cable drum to tata power warehouse ,permits from concern authority ,trefoil formation ,phase marking complete.	31	kM	
	30	Serices for un-coiling & laying optical fibre cable 96 Fibre of specified type along the cable trench through HDPE pipe as per approved drawing & specifcation including Loading from store ,transportation,unloading at site , returning cable drum to tata power warehouse ,permits from concern authority , labour charge complete, Tests.	31.5	kM	
	31	Services for OFC splicing & termination	5	Nos	
	32	Construction of FO cable hand hole	17	Each	
	33	Services for construction of cable jointing chamber (RCC types) along with Below ground Earth mat (along with supply of material as per specification) for Joint bay of suitable dimensions as mutually agreed for 1 circuits i.e., 3 no of cable with link boxes, earthing as per site requirement as per specifications. Including supply & filling submerged (Including supply and filling of STB) [10.0 mtr] **(As per Site conditions, final number of joint bays will be decided)**	10	Nos	
	34	Services for installation of straight joint/cross bonding joint of 220 kV UG cable.	60	Nos	
	35	Services for installation of 3 Piece joint of 220 kV UG cable.	6	Nos	
	36	Services for installation ofGIS termination of 110 kV UG cable.	6	Nos	
	37	Services for 40 mm dia duct for 96F optical fibre cable complete	31.5	KM	including DTS FO cable duct
	38	Services for termination rack for 96F optic fibre cable complete	2	Nos	
	39	Services for FO Termination box	8	Sets	
	40	Services for Joint box for FO cable	17	Sets	
	41	Installation of Link Box in Termination/joints including earthing	26	Nos	
	42	Fabrication of Structural Steel for cable cleating arrangement	3	MT	
	43	INSTALLATION OF DTS SYSTEM	1	Each	
	44	INSTALLATION OF DAS SYSTEM	1	Each	
	45	PATCH CORD FOR 96F OPTIC FIBER CABLE	100	Nos	
	46	Trial Pits	50	Nos	
	47	Testing & Commisioning (Per Circuit)	1	Lot	
	48	HDPE pipe cleaning (4 nos Each)	4	kM	

Annexure - 10a



SIDE VIEW





TOP VIEW

THE TATA POWER COMPANY Ltd.
PROJECT ENGINEERING DEPARTMENT
APPROVAL STATUS
Approved
Approved subject to incorporation of comments as marked. Resubmit after incorporation of comments.
Not Approved, incomplete data submitted. Resubmit after incorporation of comments as marked.
Retained for Information/Resubmission/Record review and incorporation of comments.
Checked By
Approved by

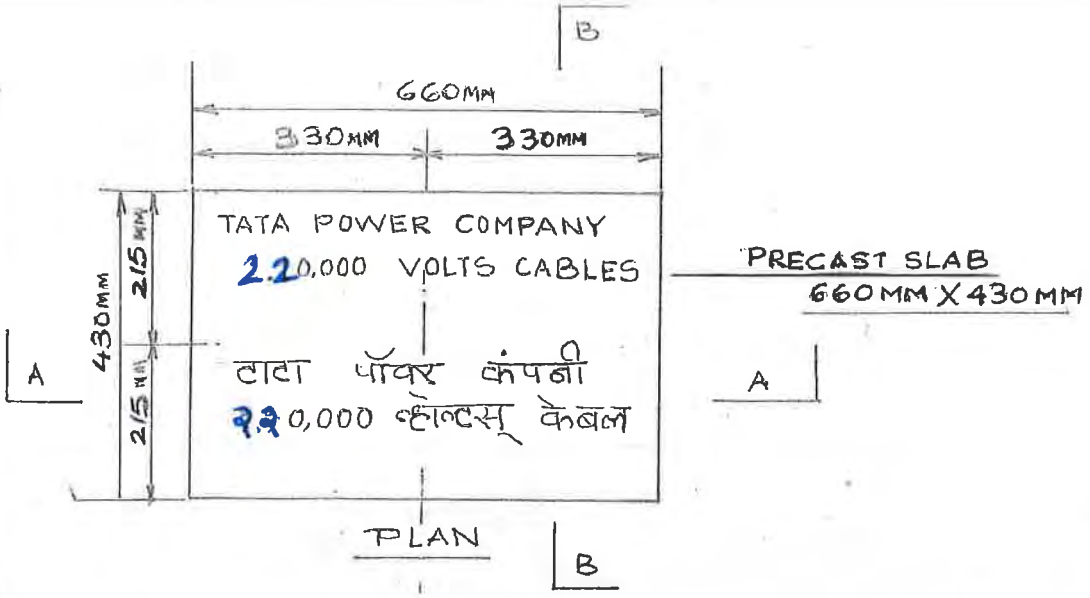
TECHNICAL SPECIFICATIONS:

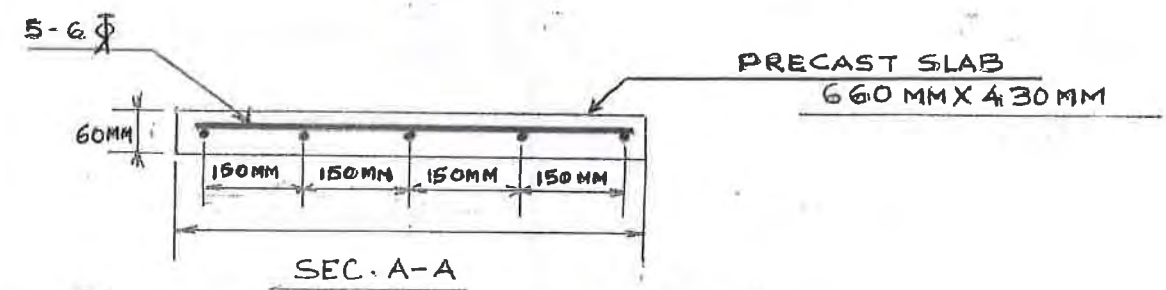
- Material Type : Nylon with Glass filled Fiber
- Cable OD : 120 mm
- Dim. : 220mm x 110mm x 160mm
- Tolerance : +/- 5mm
- Two Piece, Two Bolts, Two Nuts, Two Washers

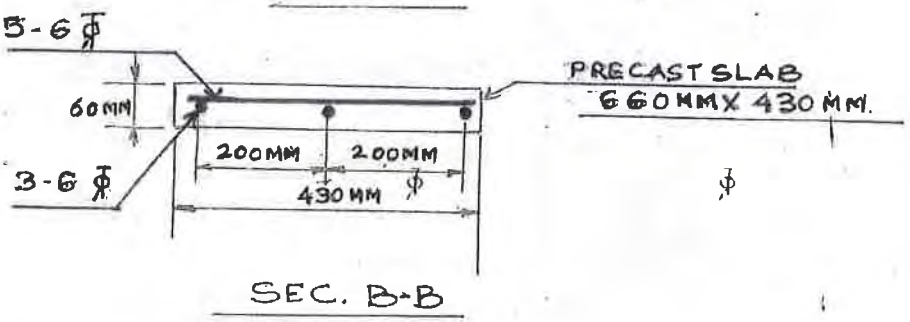
Note: All Dimensions are in mm.

PEACEPOWER	214, Anandraj Industrail Estate, Off Sonapur lane, LBS marg, Opp. Asian paints gate no.3, Bhandup (West), Mumbai- 78 Tel: 25666524/ 25669069. Email: info@peacepower.in	DRAWING TITLE: 220 KV CABLE CLEAT FOR TATA POWER	CLIENT NAME : UNIVERSAL CABLE LTD. / SCALE: N.T.S
			END USER : TATA POWER / DRAWN BY: VAIBHAVI
		NOTE: ALL DESIGN, LAYOUTS & DRAWINGS REMAIN THE PROPERTY OF PEACEPOWER POWER INTERNATIONAL & NO REPRODUCTION IN WHOLE OR PARTS IS ALLOWED WITHOUT WRITTEN CONSENT.	DATE OF ISSUE: 25.07.14 / APPROVED BY: PEACEPOWER

Annexure - 10b





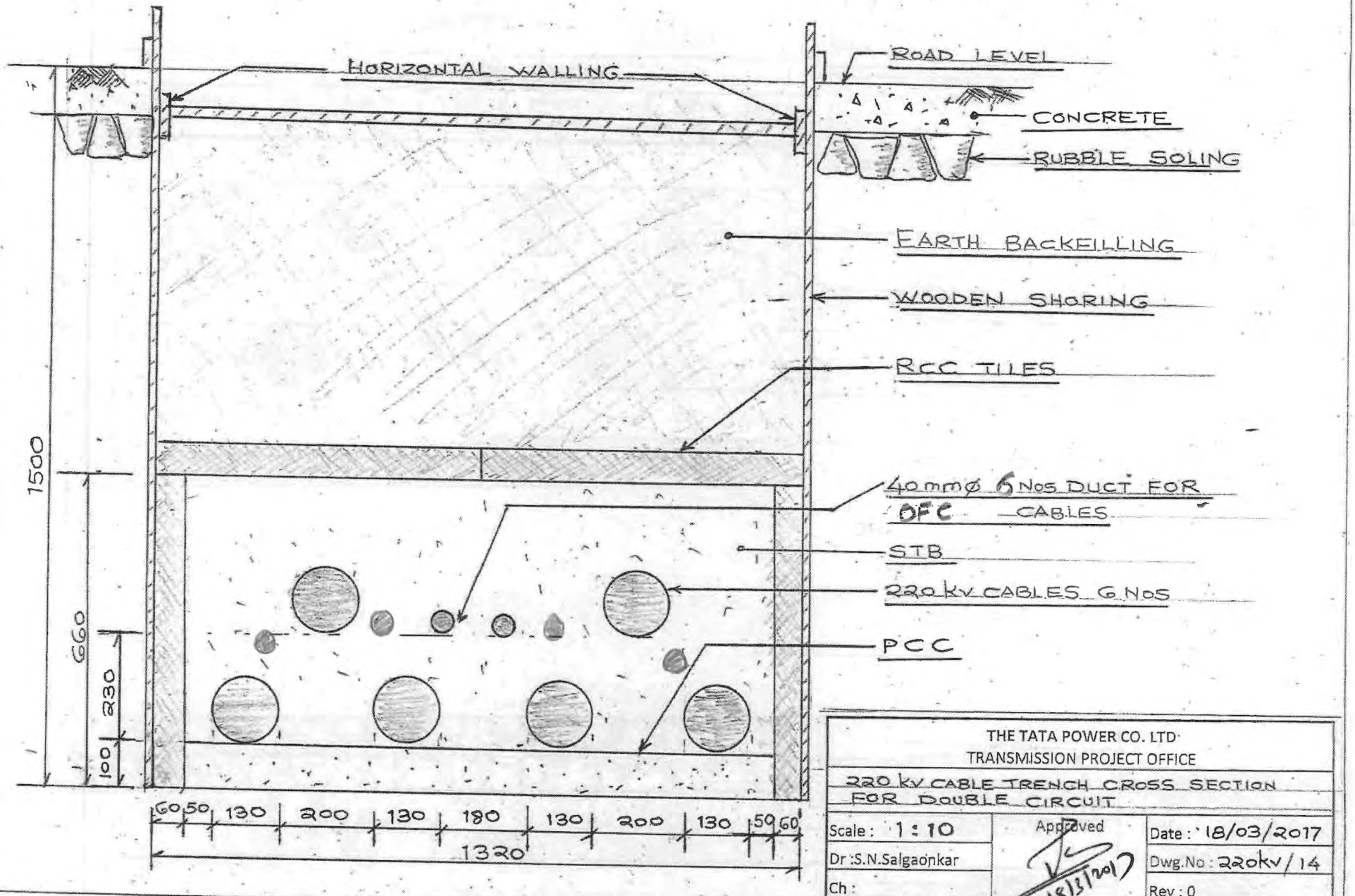


NOTE:-

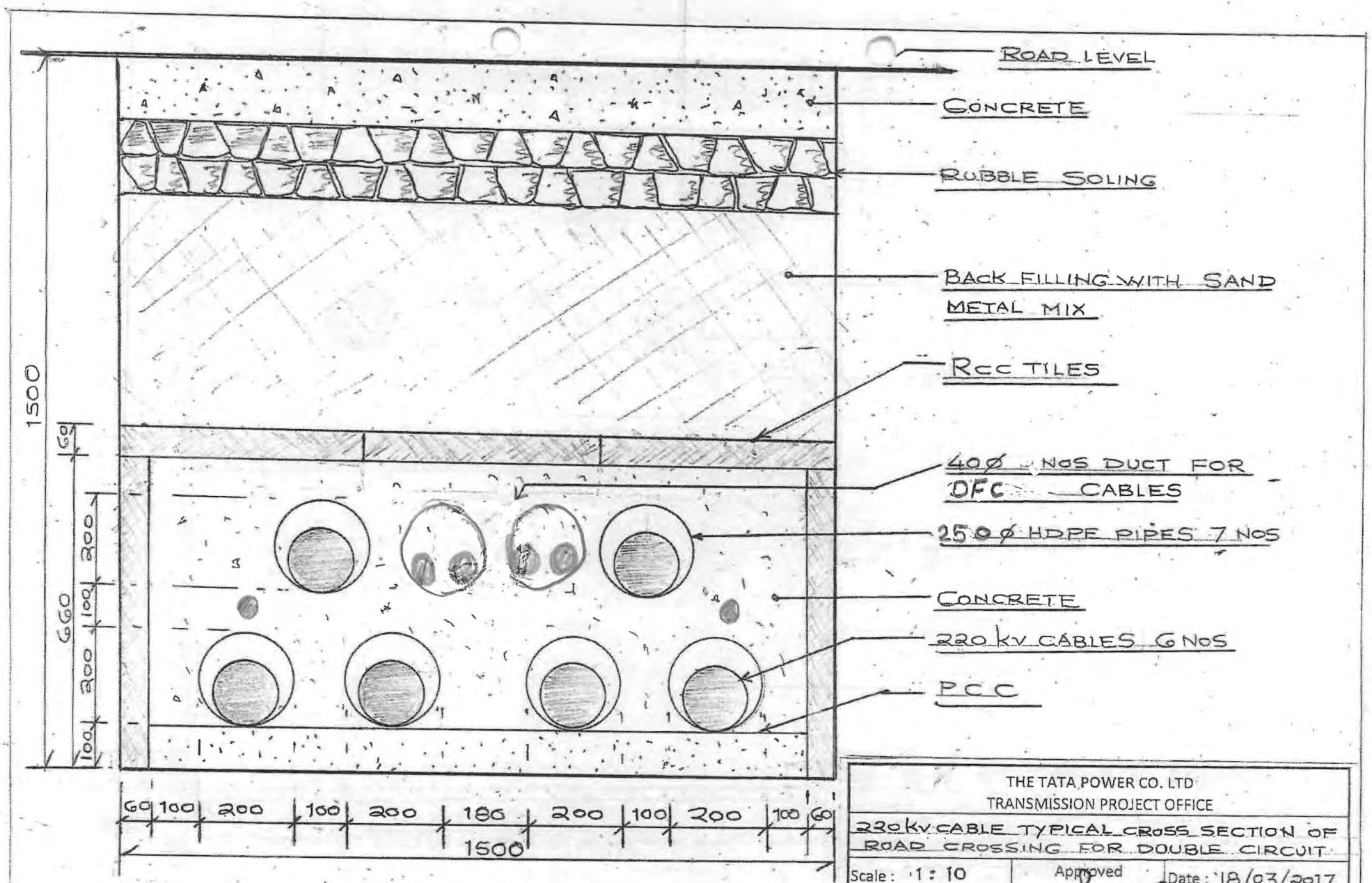
1) TOP SURFACE SHOULD BE IN WHITE COLOUR
2) ALL THE REINFORCEMENT BARS SHOULD BE WELDED
3) CASTING SHOULD BE DONE IN PVC MOULDS
4) RCC SLAB MUST BE KEPT FOR 7 DAYS FOR CURING

THE TATA POWER CO. LTD TRANSMISSION PROJECT OFFICE		
RCC PROTECTION SLABS (110 kv)		
Scale : N.T.S.	Approved	Date : 26/8/2015
Dr : VDalal	26/8/2015	Dwg.No : 110kV/8
Ch :		Rev : 0

Annexure - 10C



THE TATA POWER CO. LTD TRANSMISSION PROJECT OFFICE		
220 kv CABLE TRENCH CROSS SECTION FOR DOUBLE CIRCUIT		
Scale : 1 : 10	Approved 18/3/2017	Date : 18/03/2017
Dr : S.N.Salgaonkar		Dwg.No : 220kv / 14
Ch :		Rev : 0



THE TATA POWER CO. LTD TRANSMISSION PROJECT OFFICE		
220 kV CABLE TYPICAL CROSS SECTION OF ROAD CROSSING FOR DOUBLE CIRCUIT		
Scale : 1 : 10	Approved 18/3/2017	Date : 18/03/2017
Dr : S.N.Salgaonkar		Dwg.No : 220 kv/013
Ch :		Rev : 0

Annexure - 11

THE TATA POWER COMPANY LIMITED

STANDARD

TECHNICAL SPECIFICATION

FOR

GENERAL REQUIREMENTS OF

QUALITY ASSURANCE & INSPECTION

[SHALL BE A PART OF GENERAL TECHNICAL CONDITION]

(DOCUMENT NO - TPQAIT-QAXX-00-GN-QSP-214 R4)

Tata Power

Rev. No	Date	Description	Prepared By	Checked By	Approved By
R04	03/09/2021	Revision	DP/RP R.P.	SR/RS	CRB/CPT
R03	20/07/2020	Revision	SR	RP	CRB
R02	10/05/2017	Revision	DP /RP/RG/PU	SKJ/ RM/CRB	SS
R01	21/07/2016	Revision	SKJ / DP	RG	SS
R00	21/04/2015	First Issue	RG / SKJ / PU	SS	SS

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1.0 PURPOSE

Purpose of these requirements is to provide uniform general requirements for implementation of Quality Management System for projects being executed by OWNER.

2.0 SCOPE

2.1 Scope of these requirement covers pre-requisites of the Bidder's/ Supplier's/ Contractor's Quality Management System (QMS) applicable for all phases of contract execution including design, procurement, manufacture, factory testing, erection, field testing and commissioning, applicable other services and further to establish specific factors for which control shall be carried and put into continuing operation by the Bidder/ Supplier /Contractor to ensure that all supplies and services comply with the contract requirements.

2.2 The required/ specified reliability & other characteristics of quality should initially be "designed in" and then "built in". It is emphasized that, satisfactory product and system performance can be achieved only through strict control of all design, manufacturing and erection/ installation processes as well as test and inspection.

2.3 During bid stage itself, BIDDER shall submit requisite documents to demonstrate that as a supplier/ contractor they have well defined and implemented QMS. They shall also establish that their QMS is taking care of their sub-supplier/agencies, and continually improve its effectiveness in accordance with the requirements of their QMS as per ISO 9001, or any other quality standard.

BIDDER shall submit a project specific organization chart defining the permanent positions responsible for QMS accompanied by a brief description of each position's function and responsibility.

3.0 DEFINITION

- **OWNER**
  Tata Power or its subsidiaries/ JV partners.

- **BIDDER**
  An organization/ agency, who propose to submit their offer against RFQ/enquiry floated by OWNER. Only successful bidder will be converted to supplier/ contractor on award of contract by OWNER.

- **Supplier / Contractor**
  An organization referred as Supplier/ contractor, who execute the contract awarded by Contracts department of OWNER. It also covers the Agency involved in execution of site/ field activities or provides services (as a contractor) when awarded by Contracts department of OWNER. A Supplier can also be a manufacturer for part of supply for his in-house products.

- **Sub-Supplier/ Sub-vendor**
  An organization, who manufactures, supplies the system or equipment or item and provides services to the supplier. It also covers manufacturer who manufactures and supplies the equipment or its components or items to the sub-suppliers to complete the system supply. It

should also cover the agencies which also support execution of main supplier by providing qualified manpower/ services.

- **Third Party Inspection Agency (TPIA)**
  Any third-party organization or neutral agency mutually agreed, deputed for conducting inspection or quality surveillance activities on case to case basic.

- **Inspection Agency (IA)**
  An organization or any agency deputed by OWNER for conducting inspection or quality surveillance activities on behalf of OWNER on case to case basic.

- **Inspection Categorization Plan (ICP)**
  This document shall categorize the Quality Plan and Inspection scope of all equipment/ items in the package. This will also include the schedule for submission and approval of all Quality related documents.

- **Standard Quality Plan (SQP)/ Standard Field Quality Plan (SFP)**
  SQP shall comprise of minimum basic requirements of all tests/ checks to be carried out during manufacturing to meet/ conform technical requirement. SQP may be in the form of Inspection & Test Plan (ITP)/ Technical Specification as part of Bid Document.

  Similarly, SFP shall comprise of minimum basic requirements of all field tests/checks to be carried out during execution of the project.

- **Manufacturing Quality Plan (MQP)**
  MQP shall comprise of all tests/ checks indicated in standard Quality Plan (SQP) and tech specifications. It shall also include any additional quality checks/ tests required as per discussions (pre & post bid) to be followed during manufacturing of particular item/ equipment.

- **Field Quality Plan (FQP)**
  FQP shall detail out the activities and steps to be performed at project site and shall be followed from receipt of material to pre-commissioning stage. Shall include all tests / checks in Standard Field Quality Plan (SFP) & technical specification. FQP shall be prepared by contractor and to be submitted to OWNER at post award stage of contract for OWNER's approval.

- **Hold Point/ Customer hold point (CHP)**
  A check point for an activity mentioned in approved MQP/ FQP, which requires inspection/ verification, and acceptance by the OWNER or its representative for this stage before any further work is permitted.
  Supplier shall not process beyond a CHP without written acceptance & clearance of that activity by OWNER in writing.

- **Witness Point**
  A check point for an activity mentioned in the approved MQP/ FQP, which will be witnessed by OWNER or its representative.
  Supplier will obtain consent from OWNER to proceed for further work, in case OWNER or its representative is not able to attend the activity within notification period.

- **Review / Verification Point**
  A check point for an activity mentioned in the approved MQP/ FQP that requires review of document/ test record by OWNER or its representative performed by the Supplier for acceptance.

- **Test Report Record**
  Such reports / records are document prepared by Supplier/ Sub-Supplier for test/ check conducted indicating details / types of test including test results, relevant codes etc.

- **Inspection Report (IRT)**
  Such report which covers details of all the checks / activities carried out as per approved MQP. It also covers details of the observations and NCRs during those checks / inspection.

- **Inspection Release Note (IRN)**
  IRN is a document issued on standard format after successful quality checks/inspection and confirming to compliances of all observations and NCs if any.

- **Non-Conformity Report (NCR)/ Quality Correction Action Report (QCAR)**
  It is a report on deviation/ non-compliance with respect to the requirements laid down in the PO/ Technical Specification, MQP, Codes & standards. NCR shall be applicable during inspection at Shop as well during site Audits and QCAR shall be applicable for site inspection / surveillance.

4.0 QUALITY ASSURANCE PROGRAMME

To ensure that the equipment and services under the scope of contract whether manufactured or performed within the Bidder/ Supplier /Contractor's works or at his sub-vendor's premises or at site or at any other place of work are in accordance with the specifications, Bidder/ Supplier/ Contractor shall adopt suitable project specific QMS based on his organization's Quality Management System, regular practice, statutory requirements etc. as specified for the contract and submit the same for approval of OWNER, to control such activities at all points, as necessary. Such program shall be outlined by the Bidder/ Supplier/ contractor. Any deviation with respect to all above requirements (as specified in SQP, SFP, Technical specification as minimum quality requirements) shall be brought out clearly in the pre-bid stage by bidder.

4.1 OWNER Quality Document Approval Process & Inspection Process

OWNER uses Wrench software as an online platform for Engineering and Quality documents approval. Further, raising inspection call for STAGE / FINAL inspection for Category A items, Document review and material clearance for Cat B & Cat C items shall also be processed through Wrench. Access for Wrench system and necessary user training will be imparted to the authorized personnel of the supplier post award of contract.

5.0 SUPPLIER QUALITY MANAGEMENT SYSTEM (QMS)

5.1 All materials, components and equipment covered under the contract including bought out items shall be procured, manufactured and tested at all the stages as per a comprehensive Quality Assurance Program. It is the Bidder/ Supplier / Contractor's responsibility to draw up and implement such program duly approved by the OWNER.

5.2 All items/equipment in the scope of the contract shall be classified into categories according to the criticality or other attributes of items/ equipment. A detailed proposal addressing vendor approvals and quality control of all such items/ equipment shall be proposed to OWNER for approval.

5.3 The detailed quality plans for shop manufactured items and for field activities including civil works (if applicable) shall be drawn up by the Bidder/ Supplier / Contractor separately as per the requirement of the specification, standards mentioned therein, quality practices and procedures followed by Supplier's/ his sub vendor's quality control department. MQP shall be prepared by manufacturer and submitted through supplier post award stage of contract for OWNER's approval. OWNER approved MQP to be referred during manufacturing & shop inspection. Typical format of Manufacturing Quality Plan is enclosed as **Exhibit A**.

5.5 Field quality plans shall detail out for all equipment, the quality practices and procedures etc. to be followed by the execution agency, during various stages of site activities right from receipt of materials/ equipment at site to commissioning stage covering receipt, storage, erection & pre-commissioning tests. It shall comprise of all tests / checks indicated in SFP & Technical Specification including any additional quality checks / tests required as per discussions (pre & post bid). It shall also take care of minimum basic requirement of OEM/manufacturer (as the execution agency may not be part of OEM/manufacturer). OWNER approved FQP is to be referred during execution of work. FQP shall have 5 stages: Receipt, Storage, Pre-erection/ pre-fabrication, Erection/ Execution and pre commissioning checks with categorization of checks as Critical (Cr), Major (Mj) and Minor (Mn). Typical format of Field Quality Plan is enclosed as **Exhibit B**.

5.6 In these approved manufacturing and field quality plans, OWNER shall identify "Customer Hold Points" & "Witness Points". "Customer Hold Points" are test/checks which shall be carried out in presence of the OWNER's Engineer or its authorized representative and beyond which the work shall not proceed without consent of OWNER/ its authorized representative in writing. "Witness Points" are tests/checks which shall be carried out in presence of the OWNER's Engineer or its authorized representative but the work can proceed to next operation/ stage in case OWNER's Engineer doesn't attend on the mutually agreed date. The above procedure shall be applicable to the Bidder/ Supplier / Contractor's bought out equipment/ items also.

5.7 All the critical & major items shall be procured from the sub-vendors approved by OWNER. A tentative/ preferred list of sub-vendors for some of the items are indicated in Technical Specification. Based on which Bidder/Supplier/Contractor shall propose a list of sub vendors for bought out items for approval from OWNER. Detailed list of such sub-vendors offered by supplier/vendor/contractor shall be submitted not later than 7 days after the LOI/ Placement of order whichever is earlier and shall be frozen within 15 days of submission. Request for additional sub-vendors shall not be entertained from the Bidder/ Supplier / Contractor after the sub-vendor list is finalized and frozen. Only in case of Force Majure Condition, Supplier/ contractor shall establish such condition and propose new/ alternative source. Contractor / supplier shall provide requisite documents for consideration of OWNER. OWNER has right to accept/ reject based on review of details. If required, physical assessment shall be made before conveying such decision. Delays arising out of such exercises shall be entirely to the account of Supplier/ Contractor and shall not relieve him from any obligation, duty or

responsibility under the contract. For intended manufacturer/ sub-vendors/ sub-suppliers, credential / details to be submitted are as indicated below:

i. Company Profile.
ii. Name of the equipment proposed for approval with rating / capacity.
iii. Financial reports for the past 3 years.
iv. Organizational structure (including QA/QC set-up, man-power & qualification details).
v. In-house design capability, R&D facility & Technical collaborations (if any).
vi. In house manufacturing facilities (Including process flow charts).
vii. In house Testing facilities.
viii. Type Test Reports (as applicable).
ix. List of sub-suppliers for critical/major Raw material & bought out items.
x. In-coming material inspection plan and manufacturing quality plan.
xi. Certification by reputed agencies (ISO/ NABL/ NSIC/ ASME/ CE/ UL/API etc.) & government agencies (Factory licenses).
xii. Product approval certificates from other customers and regulatory Authority etc.
xiii. In case of non- ISO Company, details of quality system followed.
xiv. Experience (Past track records) for last 3 yrs. for similar product from the facility.
xv. Performance certificates issued by other customers.
xvi. Customer / Supplier complaints handling and resolution records
xvii. After Sales / Services details
xviii. Details of out-sourced activities, if any.

5.8 **Non-Conformance Report (NCR) / Quality Correction Action Report (QCAR)**
Wherever the non-conformity is found during inspection either by Supplier or OWNER or its representatives, NCR / QCAR shall be issued in prescribed format. Manufacturer /Supplier shall indicate the Correction / CAPA and submit these NCRs/QCARs to OWNER or its representative for their review & resolution. Till such time identified item/ equipment will be kept under quarantine. Upon satisfactory completion of the rectification work, final acceptance of the item/equipment shall be documented on the NCR/QCAR format.
Supplier has to close all NCR / QCAR in systematic & time bound manner including all corrective and preventive actions. Job shall progress only after effective resolution of NCR / QCAR.

Note: If OWNER observes that any material or equipment is unacceptable with respect to potential safety, reliability, interchangeability or workmanship, OWNER shall issue a non-conformance report NCR / QCAR in this regard to the Supplier/ Contractor. Such NCR/QCAR shall be dealt as above.

5.9 No material shall be dispatched from the Bidder's/ Supplier's/ Contractor's /manufacturer's works before the dispatch instruction is given in writing by the OWNER, Subsequent to pre-dispatch inspection including verification of records of all previous tests/ inspections by OWNER/ authorized representative. Any such item/material dispatched by party without clearance from OWNER shall be at suppliers' risk & cost only. No IRN/ dispatch clearance shall be issued for the same as post facto.

5.10 OWNER or its nominated representative reserves the right to carry out quality audit/ quality surveillance of the systems and procedures of the Bidder/ Supplier/ Contractor's or their sub-vendor's Quality Management System and control activities without prior intimation. The Bidder/ Supplier/ Contractor shall provide all necessary assistance to OWNER or its nominated representative to carry out such audit/ surveillance.

5.11 The Bidder/ Supplier/ Contractor shall be responsible for providing, controlling, calibrating, and maintaining the 'measuring & test equipment' required by them for demonstrating compliance of supplies within contract requirements at shop and at site. All the measuring instruments shall be calibrated at periodic intervals determined by Bidder/ Supplier/ Contractor/ sub-vendor on the basis of his suitability, purpose and usage as per the system adopted by him for calibration of such measuring and test equipment. However, in no case, shall the interval between successive calibrations be more than 12 months. All measuring and test instruments shall have valid calibration certificates and calibration data shall be made available to OWNER or its nominated representative on demand.

5.12 Quality surveillance/ approval of the results of the tests and inspection shall not, however, prejudice the right of the OWNER to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Bidder/ Supplier / Contractor in ensuring complete conformance of the materials/ equipment supplied to relevant specification, standard, data sheets, drawings etc.

5.13 For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable. Inspection of all mandatory spares and commissioning spares shall be in line with the approved MQP of respective equipment/item. Interchangeability Certificate shall also be part of quality records for all spares.

5.14 **Statutory Inspection**

Supplier to ensure that Equipment/ items which fall under statutory requirements of country where the equipment will be installed, shall be inspected by statutory authority like IBR etc. In case of imported items, statutory inspection will be carried out by the agency as nominated by Statutory Authority or Statutory authority of the country of origin. Original certificates endorsed by statutory authorities shall be submitted to Project Manager as identified in the contract.

Such items shall also be offered to OWNER for inspection irrespective of country of origin.

5.15 **Failure to Pass Tests**

If any item/ equipment fails to pass any test, the Bidder/ Supplier shall rectify or replace the same and, unless OWNER agrees to dispense with repetition of the test, shall repeat the test following a further notice. The cost and expense of any such retest shall be fully borne by the Bidder/ Supplier only.

5.16 Major repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the OWNER/ its authorized representative.

5.17 All tests shall be carried out to the satisfaction of the OWNER/ its authorized representative either in their presence or as agreed by OWNER. All reports/ protocols, site and shop inspection reports shall be developed specific to the requirements of the project which is acceptable to OWNER. The same shall be applicable to erection testing and pre-commissioning reports and protocols also.

Only tested, inspected and accepted (by OWNER) material as listed in PO / ICP shall be dispatched to project site. Any diversion of such accepted material without any prior approval shall be considered as deviation/ breach of contract and a minimum penalty of 5 times the cost of inspection will be levied.

5.18 Approval of any concession shall be the prerogative of the OWNER and approval of concession for a particular case shall not be set as a precedent.

5.19 All the equipment shall be of proven design and type tested. Valid type test reports shall be furnished to engineering for review and acceptance prior to offering equipment for inspection.

5.20 All documents/ reports/ records shall be issued either in English language or bilingual with English.

6.0 INSPECTION CATEGORIZATION PLAN, WELDING & NDT REQUIREMENT

6.1 **Inspection Categorization Plan (ICP)**

This document shall be prepared by supplier and to be submitted to OWNER for approval in attached standard format for all package items within 15 days of award of contract.
The schedule shall be prepared considering that all MQP should be approved at-least 15 days prior to start of any manufacturing activity and FQP with related procedures shall be finalized at least 15 days prior to dispatch schedule/ site mobilization.

ICP, MQP, FQP and related procedures shall form part of Master Drawing List (MDL)

All the items/equipment in the scope of the contract shall be classified into categories (A/ B/ C) according to the criticality or other attributes of items / equipment. A detailed proposal addressing vendor approvals and quality control of all such items /equipment shall be proposed to OWNER by the Supplier/ Contractor for approval.

Category "A": Manufacturing Quality Plan (MQP) shall be approved by Tata Power.
Stage &/ or Final Inspection including document review by EPC Contractor and Tata Power (or its appointed Inspection Agency) as per approved MQP.

Category "B": Manufacturing Quality Plan (MQP) shall be approved by Tata Power
Stage &/ or Final Inspection including document review by EPC contractor or Tata Power (in case no EPC Contractor) as per approved MQP. Inspection report of EPC contractor/ Supplier with supporting documents review by Tata Power.

Category "C": Supplier shall carry out inspection as per their regular practice/ standard manufacturing quality plan. Supplier shall submit test report and COC (Certificate Of Conformance) to EPC Contractor/ Tata Power for approval/acceptance. COC shall be in standard format of Tata Power.

6.2 **Welding & Non-Destructive Testing** (applicable for shop as well project site)

6.2.1 Bidder / Supplier/ Contractor shall submit the following documents in requisite copies for review and approval of OWNER/ its authorized representative at least FOUR weeks prior to commencing fabrication/ manufacturing and finalize before start of job. All such submissions shall be made in ENGLISH language only.

i. Welding procedures together with the relevant procedure qualification records.
ii. Non-destructive testing procedures.
iii. Heat treatment procedures.

iv. Any other special procedure (as applicable) proposed to be used during project execution Welding procedures and welders' qualifications in accordance with the latest revision of ASME Boiler & Pressure Vessels Code, Section IX, (structural welding as per AWS D1.1) or equivalent standard covering all essential & non- essential variables shall be acceptable to OWNER.

6.2.2 Only qualified welders shall be deployed. Welders shall be qualified as per approved WPS in presence of OWNER/ its authorized representative. Electrode/ welding rod used at project site shall be of OWNER approved make. Supplier/ Contractor shall take prior approval.

6.2.3 Weld repair procedures are subject to approval of the OWNER. No welding is permitted on C.I. Castings. OWNER reserves the right to examine and witness acceptance tests, prior to and following weld repairs and subsequent post weld heat treatment, mechanical tests etc, at the material manufacturer/ Supplier works.

6.2.4 Should any of these welds prove to be defective on inspection, the number of welds to be tested in that system shall be twice that of originally selected. Should any of the second incremental welds prove to be defective, then 100 % of the welds in that system/ group shall be tested.

6.2.5 NDT operators shall be qualified in accordance with an agreed nationally accredited scheme such as the Personnel Certification in Non-destructive testing (PCN) scheme and shall be certified to level II or higher of that system.

6.2.6 Plate thickness ≥ 32mm (for structure), Plate thickness ≥ 25mm (for pressure vessel), Forging / Bar dia. ≥40mm (finished) shall be UT tested (Ultrasonic).

7.0 INSPECTION AT SHOP

7.1 Inspection Scope

The scope of inspection shall be as per Witness/ Hold Point as defined in approved MQP/ SQP. Supplier has to ensure that all applicable and agreed approved Drawings, Data Sheet etc. are available for any inspection and equipment used for measurement are calibrated. Supplier shall intimate all such cases in advance (as inspection rolling plan) and also through inspection call as per contract agreement.

7.2 Inspection Coordination

Supplier has to identify single point of contact for coordination of the entire inspection activities on behalf of Supplier/ sub-supplier. Supplier to ensure that monthly and 3 monthly rolling inspection plans are prepared and submitted in advance to OWNER by 1st working day of each month for effective inspection coordination.

7.3 Inspection Request

7.3.1 Depending upon the stages of inspection as agreed in manufacturing quality plan, supplier to send Inspection Request through Wrench system with approved inspection reference documents to OWNER Project Manager for inspection activities to be attended at supplier's /sub-supplier's premises. Supplier to confirm the possibility for conducting remote inspection through Video calling system (preferably MS Teams), if required. Further, supplier to discuss & confirm the readiness of material by submitting internal test reports of the item/ equipment offered for inspection, job readiness pictures and testing schedule

through email. Supplier has to give sufficient advance notice, as defined below for inspection of any stage. Contractor/Supplier to strictly adhere to notice period indicated below and the testing schedule shared. Any additional expenses incurred due to the improper planning at supplier end for travel/ accommodation shall be in Supplier / Contractors scope.

7.3.2 The minimum advance notice period for inspection shall be given below:

i. Inspection within INDIA : 7 Days

ii. Overseas (Outside India) Inspection : 30 Days

Supplier to strictly adhere the above mentioned minimum advance notice period.

7.3.3 Supplier shall plan the inspection visits required in a manner so as to achieve maximum inspection stages attended with minimum possible inspection visits/ time where-in more than one external inspection agencies are involved for single inspection activity, inspection by all agencies may be done concurrently.

7.4 **Inspection Methodology**

7.4.1 Suppliers shall ensure internal inspection before offering inspection to OWNER or its representative. Internal test certificates and previous stage inspection reports submitted for review and made available during inspection.

7.4.2 During inspection, Supplier to produce copies of the latest revision of the approved MQP along with drawings, Data Sheet, Standard and accepted type test reports as indicated in approved MQP / agreement to ensure that the inspection is carried out as per the latest revision and approved documents. **If required, supplier to arrange the necessary codes and standards for reference purposes.**

In case inspection cannot be completed or undertaken due to reasons such as non-readiness of material, back up documents, false inspection calls etc. then such reason shall be recorded in inspection report. **If supplier fails to offer the item / equipment for inspection as per the agreed date, supplier liable to pay for the time and expenses for the abortive visit of the OWNER or its representative.**

7.4.3 All inspection related documents i.e. mill test reports, supplier inspection/ tests reports, all inspection/ tests carried out including other records such as stress relieving charts, radiographic reports and other non-destructive testing records in accordance with provision of contract shall be submitted in original form. All such reports shall be duly endorsed/ certified by the main supplier.

7.4.4 Results of tests and copies of inspection report, test reports, original material test certificates (MTCs), calculations, performance curves etc. shall be promptly made available to the OWNER or its appointed representative by the Supplier, in accordance with this document and shall form part of the subsequent Manufacturers Test Record Book in accordance with the requirements of this document.

7.4.5 Supplier to ensure that all the materials are properly identified/ coded to confirm traceability and correlation purposes.

7.4.6 Supplier shall take special care including packing to protect the final painting and finish product (equipment / item) during handling, transportation, storage and execution stage so

that there is no damage occur. In case of any such damage, joint inspection to be carried out at site and necessary action to be taken.

7.4.7 Supplier to ensure finish product is properly identified after completion of inspection and are suitably recorded in Inspection Report by inspection engineer.

7.4.8 Corrosion testing as per ASTM A262 Practice E for Austenitic Stainless Steel and ASTM A923 Practice A and C for Duplex Stainless Steel components has to be carried out.

7.4.9 For rubber lining application, following checks shall be carried out on raw material for rubber – Grade identification, Tensile Strength, Elongation, Maximum Compression test, Ageing Test, Water Absorption test, Specific Gravity, Hardness, Ash Content, Bleed resistance, Ozone resistance test.

7.5 **Inspection Report & Clearance**

7.5.1 **Inspection Report (IRT)**

All inspection by OWNER or its appointed agency shall be supported by an inspection report as per the standard format (sample enclosed). Any shortcoming observed w.r.t. approved MQP/ Drawing/ Data Sheet / specification etc. shall be recorded as NCR. IRT shall have detail references of all such NCRs. All such inspection report / NCR shall be jointly signed by supplier and Inspection Engineer. IRT shall be issued to all concern including Supplier and Sub-supplier/ Manufacturer. Same will be uploaded in Wrench system by OWNER

7.5.2 **Inspection Release Note (IRN)**

IRN shall be issued through Wrench system by QA&I dept. to Project Manager of OWNER, only after satisfactory compliance for Inspection remarks.

IRN for Category 'A' item (as defined in ICP) shall be issued only after ensuring inspected Equipment / Item meets the requirements of the applicable documents and all NCs have been closed to the satisfaction of OWNER.

For Category 'B' items (as defined in ICP) IRN shall be issued through Wrench after review of supplier inspection report, compliance report and required applicable documents as per approved MQP & Closure of NCs if any are verified and accepted to the satisfaction of OWNER

For Category 'C' items (as defined in ICP), IRN shall be issued through Wrench after review of original manufacturer test certificates, Certificate of Conformance (CoC) from supplier/contractor in OWNER standard format and required applicable documents as per MQP approved by main supplier / as per their standard procedure are verified and accepted

7.6 **Material Dispatch Clearance Certificate (MDCC)**

Supplier shall obtain dispatch clearance certificate (MDCC) through Wrench from project / Plant Manager depending on the project progress and material requirement at site based on IRN prior to dispatch of any billable material/ equipment / item from Manufacturer place to OWNER Project Site / Plant. One set of Quality Dossier (hard copy) for which MDCC has been issued, shall be sent to project site along with material / equipment/ item.

MDCC is not required for material / equipment/ item/ Part supply which are dispatched from one sub-supplier works to another sub-supplier/ supplier works for further assembly and

testing (to make it billable). However, clearance in the form of Inspection Report (IRT) is needed in this regard.

8.0 QUALITY DOSSIER (FOR SUPPLY PORTION) [Package wise]

Supplier shall compile and submit all stage and final inspection reports as per approved MQP, duly reviewed and endorsed by inspection engineer for reference and records of OWNER. Documents shall be submitted with-in 4 weeks of issuance of final MDCC

Dossier shall consist of following documents, as minimum:

i. Index Sheet
ii. Approved bill of material of package.
iii. All Approved documents (MQP, Drawings & Data Sheet etc.)
iv. MDCC, IRN & IRT along with all closed NCR of all items.
v. Factory Acceptance Test (FAT) reports.
vi. Raw material and bought out item MTC's
vii. Test Reports corresponding to IRT & MQP.
viii. Supplier internal inspection reports as per MQP.
ix. Copy of Statutory and IBR certificates as applicable.

Note:

1. Each package compilation shall be done on the basis of unit wise and common systems.
2. Each volume/ dossier shall be spiral/ hard bounded. Each sheet of dossier to have running numbers.
3. One hard copy (in addition to the dossier dispatch with material / equipment/ item) and 2 Soft copies of documents to be submitted as final dossier (shall also be uploaded in Wrench System for future reference.

9.0 FQC DURING CONSTRUCTION AND PRE-COMMISSIONING.

9.1 Supplier Quality Management System is applicable for field activities also and for his further sub agencies deputed at project / plant. Refer clause no: 5.0 (applicable part). Supplier/ Contractor shall deploy sufficient number of QA/ QC persons to take care of daily activities as per agreed/ approved Quality documents. Some of such activities are detailed below. Also, supplier Project Manager shall regularly co-ordinate with OWNERs FQC team.

9.2 Raising of inspection calls on regular basis for various activities as indicated in approved FQP/ other document, carrying out inspection activities along with OWNER's execution / FQC department and maintaining the records duly signed by all concerned.

9.3 Various inspection/ quality assurance procedures/ methods at different stages of erection and pre-commissioning will be as per OWNERs approved field quality plans/ codes/ IBR and other statutory provisions and as per OWNER's engineer's instructions.

9.4 Preparation of quality assurance log sheets and protocols, welding logs, NDE and post weld heat treatment records, testing & calibration records and other quality assurance documentation as per OWNER's engineer's instructions is within the scope of work/ specification. These records shall be submitted to OWNER for approval from time to time.

9.5 A daily logbook of all measurements and testing/ calibration should be maintained by contractor on the job inspection details for various equipment. Contractor to depute competent engineer for site testing and pre-commissioning of equipment's' (as applicable).

9.6 All the workers of contractor / sub contractor/it's agencies shall carry identity cards as per the Performa prescribed by OWNER. Only workers duly authorized by OWNER shall be engaged on the work.

9.7 Contractor shall provide all the measuring and monitoring devices (MMD) required for completion of the work satisfactorily. These MMDs shall be calibrated & conform to job requirement in respect of measurement range, accuracy level & any other specification**.**

9.8 Re-work necessitated on account of use of invalid MMD shall be entirely to the contractor's account. Contractor shall be responsible to take all corrective actions, including resource augmentation if any, as specified by OWNER to make-up for the loss of time.

OWNER's FQC team / QAI representative will have the right to carry out Surveillance and Audit of supplier/contractor and their agencies including their store without any prior intimation.

9.9 Regular Internal audit shall be conducted by supplier/ contractor QA/QC team of their agencies and their other dept. Such audit reports shall be made available whenever ask for by OWNER FQC team. OWNER FQC/ QA&I have the right to carryout 2nd party audit of supplier/ contractor and their agencies as per predefined Audit schedule.

In course of work OWNER may counter/ finally check the measurements with their own MMDs. Contractor shall render all assistance in conduct of such counter check/ final measurements.

9.10 **Communication**

Direct, formal communication between the SUPPLIER's field QC and OWNER's field QC representative is mandatory. All inspection activities as per field quality plan shall be intimated to OWNER in the form of Request for Inspection (RFI) at least 24 hrs. in advance with intimation to OWNER execution group.

Whenever any major issues / deviations related to design or fabrications are noticed, the same shall be immediately informed to OWNER's field QC by supplier's field QC/ Supplier Project Head. On completion of above activity, joint inspection reports/ protocol shall be made and circulated to concern agencies. Any part of work at the site shall not be **covered up or made inaccessible** without the OWNER Representative's prior approval in the form of joint protocol or otherwise.

Contractor to prepare acceptance test records as indicated in field quality plan for all Minor/ Major / Critical checks or activities, such as site register for all storage and receipt of materials, erection protocol for pre-rection and erection activities, testing and commissioning records for all testing, commissioning and charging activity as indicated in the FQP for a particular equipment or system and approved by OWNER. All the critical checks mentioned in the field quality plan to be documented strictly and to be approved by OWNER. All the FQP related Documents shall be uploaded in Wrench, as part of handing over dossier.

Further, SUPPLIER/ Contractor's in-progress inspection reports, logbook, follow up/ punch out sheets; records of all DT & NDT etc. shall be made available to OWNER field QC during entire course of the work. At the end of the work, SUPPLIER/ Contractor's standard inspection reports, check off sheets, radiographs, master copy of loop diagrams, electrical testing data sheets, etc. shall be handed over to OWNER in an organized and agreed format. SUPPLIER/ Contractor shall verify that all of the required documentation of the equipment has been received and placed in the equipment files. The SUPPLIER/ Contractor is responsible for obtaining any outstanding documentation from his sub-supplier/ agencies.

9.11 **Dealing with Open Punch Points (NCR/QCAR):**

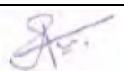
All open points in the form of observations, non-conformities (NCR, QCAR etc.) that are not responded / closed in time as well as, those were not put up by supplier/ Contractor for resolution/ agreement to OWNER, the same will be considered as violation of contractual obligations and will be dealt suitably during closure of contract. Penalty clauses (if any) shall be applicable as per contract.

Supplier/ Contractor's Performance rating will be impacted as per prevailing policy of OWNER in this regard.

10.0 ATTACHMENT

1. Exhibit A – MQP Format
2. Exhibit B – FQP Format
3. Exhibit C – Shop Inspection Request Format
4. Exhibit D – ICP Format
5. Exhibit E – IRN Format
6. Exhibit F – Suggested MDCC Format
7. Exhibit G – RFI Format (For Site Inspection Request)
8. Exhibit H – NCR Format
9. Exhibit I – QCAR Format
10. Exhibit J – Weekly Progress Report format

Document Title: Specifications for Monitoring of EHV cables through Distributed Temperature Sensing (DTS) systems

Revision	Date	Description	Approvals		
			Prepared By	Checked By	Approved By
A	26-11-2020	Issued for Review & Comment	APM	RSM	BSP
B	04-12-2020	Final Issue- after incorporation of comments	APM	RSM	BSP
					

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1.0 INTRODUCTION

The Tata Power Company Limited (Tata Power) hereinafter called the "OWNER" or "PURCHASER", proposes to procure fiber optic sensor based EHV cable / transmission line monitoring system and integrate it with the SCADA System. This system will facilitate Real time monitoring of EHV cable / transmission line and detection of theft, damage and electrical faults.

The system should use highly sophisticated algorithms to analyse and classify the acquired signals to determine the presence and location of a potential threat to the asset in real time and to raise the appropriate alarm. To minimize false alarms the system should use detection modules which dynamically adapt to the environmental conditions. The system should then alert the operators as to the presence and location of a specific activity taking place along the asset.

Following are the major systems to be considered for this project

1.1 Underground Optical fiber optic cable (minimum 12 fiber cores) suitable for DTS sensing of underground EHV cables. Vendor is free to consider HDPE ducts or armoured cable as per sensing and cable protection requirements.

1.2 DTS bider shall consider required civil jointing pits, handholes, etc. required for DTS fiber cable and coordinate with the lead EHV cable package owner and lead cable laying service parties for achiveing the desired DTS system requirements

1.3 Services for FO cable laying and termination

1.4 Underground Optical fiber optic cable fiber termination boxes, termination panel, CT/VT transducers or MFM required for lines. A common panel size 800x800x2300 for Fiber termination boxes, Optical DTS interrogators, Servers machines, workstations,etc. shall be provided at Salsette RSS

1.5 CT / VT transducers along with necessesary cables to be considered as per DTS system requirements (Electrical copper cables will be approved by Tata Power Electrical engineering team)

1.6 Optical Gateway / Interrogators for the Underground Fiber Optic sensors. Long distance monitoring. Ability to monitor buried cable. Digital recording of temperature at every location along a multimode optical fibre.

1.7 Panel mounted Server (Hardware+ OS Software + Application Software, including all licenses)

1.8 Client Workstation (Hardware + OS Software + Application Software, including all licenses) at Local and Remote operating locations

1.9 Integration of alarms and status to Purchasers SCADA system on standard protocols Modbus -serial / IEC -61850 (Hardware ports / protocol convertors)

1.10 Services required for commissioning and testing of offered system and integration of the same with existing Automation & communication system at TATA Power.

1.11 All required licenses shall be perpetual software license, which should include required timely upgrades / patches, with no additional subscription cost (example-monthly / yearly subscription) to the purchaser and shall not have any subscription based licenses for the offered solution

The document covers the specific requirements for complete design, detailed engineering, manufacture, supply, inspection & testing at Bidder's work, packing, transportation, loading and unloading, delivery to site, storage at site, handling at site, testing, commissioning, performance testing and handing over of DTS System and communication links established

All equipment, system and services covered under this specification shall comply with all current applicable statutory regulations and safety codes in the locality where the equipment is proposed to be installed. The equipment and systems shall also conform to the latest version of applicable codes and standards on the date of offer made by the Bidder unless otherwise indicated. Nothing in this specification shall be construed to relieve the Bidder of this responsibility

2.0 BIDDER'S QUALIFICATION REQUIREMENTS

2.1 **Preferred Make / Vendor List**

i. Bandweaver

ii. AP Sensing

iii. Silixa

For all other communication equipment & accessories, bidder to supply as per preferred vendor list attached with this specification **(Refer Annexure 1)**

Items / Systems supplied of different make other than specified above, is not encouraged however if bidder wishes to offer some other make, shall require prior approval from Tata Power during bidding stage as per the Bidders Qualifying requirements as given below.

2.2 Bidder's Qualifying Requirements

Bidder must meet all following qualifying criteria for DTS systems:

i. Bidder should have supplied at least 2 Nos. DTS systems in last 10 years as on date of bid opening. Out of this atleast 1 Nos. DTS systems shall be in satisfactory service for last 1 year as on date of bid submission.

ii. Indian Subsidiaries of global companies having plant in India are also eligible to bid if the qualification requirements stated above are met independently or in combination with the parent company. Declaration from parent company needs to be submitted.

iii. The bidder shall submit Type test reports obtained from NABL/ International Accredited Lab for the equipment / material offered. The type tests should have been conducted on the equipment / material of the same design.

iv. The type tests should have been conducted within 5 years prior to the date of bid opening. Time period for type test can be extended by another 5 years as a special case, if there is no change in design / material of construction (MOC).

v. In case the type test reports furnished are not for the quoted equipment / material but for the equipment / material, then type test reports of next available equipment / material class with higher sensing distance, higher system hardware-Software configuration shall be furnished. If both are not available, then type test shall be carried out for the offered equipment / material from NABL / International Accredited Lab without any cost implication to the owner and the Type Test reports shall be submitted before despatch of the equipment / material.

vi. In case the package involves installation & commissioning of the equipment / material, then the bidder shall have the following experience:

a) He should have successfully completed one single order of value ..... (80% of estimated value of similar work in last three years) OR

b) He should have successfully completed two single orders of value ..... (50% of estimated value of similar work in last three years) OR

c) He should have successfully completed three single orders of value ..... (40% of estimated value of similar work in last three years).

3.0 SYSTEM DESCRIPTION AND SCOPE

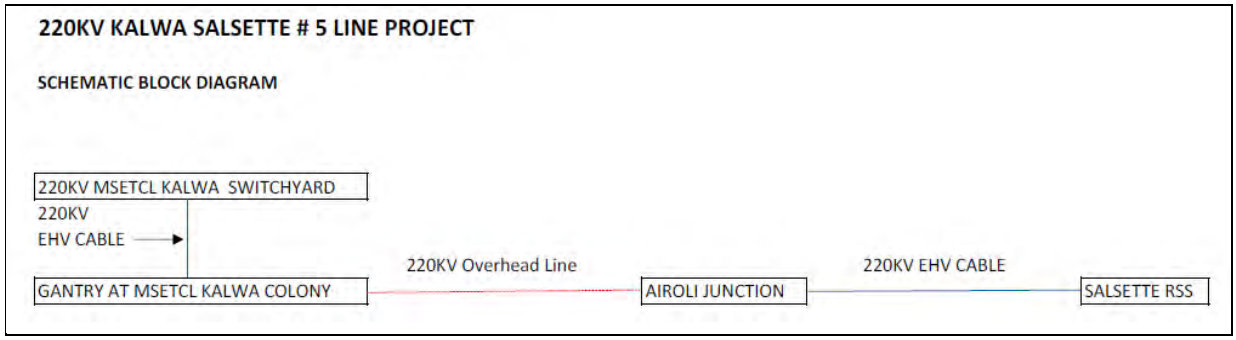
3.1 The scope of work shall include complete design, detailed engineering, manufacture, supply, procurement, inspection & testing at Bidder's work, packing, transportation, loading and unloading, delivery to site, storage at site, handling at site, testing, commissioning, performance testing and handing over of DTS system at various site locations along with necessary components/auxiliaries. Also refer fundamental scope as described in specification clause 1.0

3.2 All required licenses shall be perpetual software license, which should include required timely upgrades / patches, with no additional subscription cost (example-monthly / yearly subscription) to the purchaser and shall not have any subscription based licenses for the offered solution

3.3 Specific EHV cable / transmission Lines which are to be monitored through the DTS system, are as per following table: Bidder to note that the locations are tentative which may change during detailed engineering.

Sr. No.	EHV cable / transmission Line Description	Line length (kms)	Underground Fiber cable details
1	110KV Airoli junction to Salsette underground EHV cable section.	4.2	12 core Multi-mode fiber cable with appropriate wavelength & cable strength suitable for DTS
Total Quantity		**5.0**	Total length of DTS-OFC cable to be considered

Table -1: EHV cable length details



Schematic Block diagram -A

3.4 The indicative BOM **(Refer Annexure- 2)** is attached with this document for bidders consideration. Bidder to propose suitable make, model and quantity as per specification scope requirements

3.5 It is recommended bidder shall visit the site for finalization of BOM for the respective station including associated remote sites. The final BOM along with detailed architecture shall be submitted by the bidder before placement of the Order by purchaser.

3.6 Bidder to submit the detailed architecture drawing for end to end DTS communication, protocol, integration with SCADA and signalling details, etc.

3.7 All necessary hardware, software, licenses or any other item required and not covered in the RFQ & BOM shall be included in the Bidders BOM as separate line items for purchasers technical evaluation and consideration

3.8 Demonstration / testing of the system at OEM works (FAT-Factory Acceptance Testing), before dispatch of the system at site.

3.9 Suitable O& M spares to be considered for maintenance of the proposed system

3.10 The installation of DTS at each station locations is to be done on a pre-wired Panel (size 42U, 800x800x2300mm) with necessary communication accessories to be considered by vendor

3.11 The successful bidder should take care of any firmware, patch upgrades in the DTS at no extra cost during the warranty period of 5 years. Any hardware failure of active system components shall be replaced with a new system components as per agreed timelines

3.12 The bidder should offer a product which is recent and should support the offered system (life cycle management support) spares & services for a minimum period of 10 years from the date of commissioning. (OEM shall maintain requisite inventory in case of product end of life, before the agreed 10 year period)

3.13 Bidder has to consider complete scope from design, supply of DTS and miscellaneous passive cable, accessories, CT/ VT transducer, supply of installation accessories, services for installation and termination of fiber cables, testing and handover of the DTS as per agreed parameters.

3.14 Bidder has to consider all licenses required for all the features mentioned in the specifications. This licenses should be one time procurement and should not require any renewals in future.

3.15 In case that the product going obsolete within the period of 10 years and bidder is not able to support the product, it will be bidder's responsibility to replace the product with the similar current product with no cost implication to TATA POWER. Hence it is advised to the bidder to offer the most recent and latest product with service and spares support for minimum 10 years from date of installation.

3.16 Offered product should be cyber secure and should be well protected from cyber threats. Further security updates and patch upgrades to be considered by bidder during the warranty period at no additional cost. Suitable test certificates from accredited agency should be submitted by bidder with product offer.

3.17 All requirements from the bidder should be made clear during the site visit and also in the offer made by the bidder. Any other requirements coming up during later stages after award of contract will strictly not be accepted and will be to bidders account.

3.18 Submission of all project documents design, as-built will have to be submitted by the bidder in appropriate soft and hard copy formats.

3.19 All engineers deputed at site along with technicians should be well trained and experienced on the proposed system

3.20 Successful bidder team has to follow the safety procedures laid down by TATA POWER and have to undergo all necessary trainings specified for carrying out such jobs. All necessary procedure to be followed as laid down by respective divisions and appropriate documentation for getting working permissions will be in bidder's scope.

3.21 Transportation of material to individual site along with manpower will be in bidder's scope

3.22 The bidder shall arrange the local transport for Tata Power inspection team during their stay of FAT inspection including airport pickup and drop.

3.23 FAT and SAT Checklist and documentation should be submitted in advance by the bidder for approval by Tata Power.

3.24 FAT and SAT testing of the system as per approved design outcomes, healthiness checks of all configured channels using appropriate test instruments in presence of TATA power engineers

3.25 Bidder shall submit typical general arrangement drawings for the supplied equipment, detailed architecture, Signal list, Data sheet, BOM, ICS during detailed engineer.

3.26 Bidder shall submit As- build drawings and network architecture within one week of handing over the system to the purchaser.

3.27 Bidder to consider the scope of fiber extension from existing fiber termination panel to his equipment panel. All material required for this extension including the fibre cable, fibre termination, optical patch cords and service required for splicing and cable patching will have to be considered by the bidder.

4.0 CODES AND STANDARDS

The design, manufacture and performance of the DTS system shall comply with all the requirements of the latest editions of international codes and standards applicable.

5.0 SPECIAL NOTES TO BIDDER

5.1 Bidder shall depute OEM engineer / OEM certified DTS system engineer at site for site visit, commissioning, configuration, testing and handing over the system to the purchaser

6.0 DESIGN REQUIREMENTS

6.1 Compatibility with the existing purchasers network

7.0 CYBER SECURITY REQUIREMENTS

7.1 The solution shall be in line with industry best practises and complying to cyber security standards for industry .Necessary support documents in support of the same should be submitted by the bidder.

8.0 LAYOUT REQUIREMENTS

8.1 All systems shall be installed as per room layout and plot plan for site locations.

9.0 TERMINAL POINTS

9.1 Power supply AC / DC for DTS system will be provided by the Purchaser. Extension of power supply from TATA Power terminal point will be in bidder scope.

9.2 Fiber cable termination inside Termination panel and testing is in bidders scope

9.3 CT/VT transducers or MFM's required, if any to be considered along with necessary cables from main CT/VT outputs to transducers and upto DTS systems

9.4 DTS supplier to coordinate with lead EHV cable package supplier and consdier appropriate civil supply & services like jointing pits, handholes, cable ties, etc. as per DTS system requirements

10.0 EXCLUSIONS

10.1 None

11.0 MAINTENANCE REQUIRMENT

i. Bidder shall warrant that the equipment including software, hardware, firmware and associated documentation are free of defects in material and workmanship and from defects or faults in design, in so far as the equipment fails to meet the requirements of this technical specification, bidder to adhere to the warranty clauses mentioned in this RFP from the date of final acceptance by the Tata Power after completion of 30 days trouble free operation.

ii. With respect to defects in equipment part, Bidder's liability is to make good by replacing the faulty equipment. It is the responsibility of the Bidder to replace the faulty equipment within 7 working days.

iii. During the warranty period, the bidder will inform the availability of the latest and factory tested firmware. The same shall be implemented / upgraded on the installed systems after approval of the purchaser. This activity shall be carried out free of cost at site as and when the patches are released. Sample testing for the operation of devices and associated equipment shall be carried out after the Up-gradation of any software, after obtaining the necessary permissions / system outages.

iv. After replacement of the faulty equipment, the Tata Power shall return parts that are defective to the Bidder. The Bidder shall cover the cost associated with the shipping of defective or failed items during warranty period. The new equipment, parts shall be delivered to the Tata Power facility CIF (Cost, Insurance, and Freight) free of charge.

v. With respect to software, the Tata Power shall notify the problem to the Bidder, including a detailed description of the deficiency and associated condition. Bidder shall guide the Tata Power for corrective action. If the same is not resolved, the Bidder shall depute his system expert to attend the same within 7 working days from the time of reporting the problem. Bidder shall be fully responsible to resolve software deficiency reported by the Tata Power within 14 working days

vi. With respect to Hardware, the Tata Power shall notify the problem to the Bidder, including a detailed description of the deficiency and associated condition. Bidder shall guide the Tata Power for corrective action. If the same is not resolved, the Bidder shall depute his system expert to attend the same within 7 working days from the time of reporting the problem. Bidder to note that the purchaser will make best efforts to provide healthy modules from their spare inventory. However bidder shall repair / replenish the same within seven working days.

vii. With respect to third-party hardware and consumable parts supplied, the Bidder shall consider the warranties from the sub-Vendor as per the RFP.

viii. Upgrades & Modifications: Bidder shall continuously keep the Tata Power informed and implement the software upgrades on the supplied Hardware. Any software upgrades which requires hardware modifications shall be informed, for necessary actions by the purchaser.

ix. Bidder shall continuously update the purchaser for any platform change of the product life cycle for necessary action at purchaser's end

x. The system referred to above includes Bidder's own as well as third party components.

xi. Bidder shall port the supplied software onto upgraded hardware (as per Bidder's standard offerings) without additional Software License Fees.

11.2 **TRAINING REQUIREMENT**

i. Bidder should consider training man-days for 5 engineers of TATA Power upto expert level on the offered product.

ii. Bidder shall provide training to the Purchaser's personnel on the operation and maintenance of the system supplied including Non-OEM equipment/3rd Party equipment. The training shall cover development, integration, installation and commissioning of both software & hardware components of the system.

iii. The Bidder shall provide Classroom as well as hands-on training on the system. All required training materials such as system catalogues, test instruments, demo equipment, and simulation jigs, etc. shall be provided by the Bidder. The training shall equip the Purchaser's engineers for installation, commissioning, operation and post-warranty maintenance of hardware, software (Operating System, Administration and Applications), protocols and all third-party systems.

12.0 TECHNICAL PARAMETERS OF EQUIPMENT INCLUDING DATA SHEET

S.N.	Technical Requirement	Bidder Response
	DTS functional requirements	
1	The DTS should support detection of Hybrid i.e. Overhead lines and underground EHV cables	
2	Underground Fiber Optic cable with minimum 12 fiber cores with inner and outer sheath of HDPE with glass yarn and 2 no. rip cord, fiber reinforced plastic (FRP) rod as strength member, 4 cores per tube, with core filling jelly as moisture barrier, polyester tape as core wrapping	
3	Fiber cable shall have the maximum (cabled) attenuation or loss as: 850 nm: ≤ 3.0 db/km 1300 nm: ≤ 1 db/km	
4	Dedicated GUI for Overhead / hybrid EHV cable / transmission line monitoring. GUI should have customizations mimics for Circuit layouts which can be mapped and color-coded to show the measured EHV cable / transmission lines instantaneous changes in temperature	
5	Digital recording of temperature at every location along a multimode / single mode optical fiber. (flexibility to operate on single mode or multimode fiber without the introduction of any external or additional apparatus, with no loss of signal quality and while preserving the true nature of the measurement)	
6	System should be with underground fiber cable near the EHV cable and underground fiber core (single mode fiber) for detection of temperature and hotspots	
7	Measurement should provide location of hotspots throughout the length of the cable	
8	System should have storage of measurent data for historical analysis .It should be possible to collect the unique signatures of all scenarios measured and correlate / compare / analyze at a later date	
9	Time synchronization option from external GPS source for DTS internal reference clock	
10	High Spatial resolution (less than 15 meter). should be able to monitor and locate the faults/ temperature hot spots accurately with +/-15meter location accuracy	
11	The system should support classic and modern protocol interfaces (Modbus Serial, IEC 61850, IEC 60870-5-104) for integration with Purchasers SCADA systems	

S.N.	Technical Requirement	Bidder Response
	Optical Gateway / Interrogator	
12	Sensing / Measurement range (per fiber core) of higher than 5 km distance using multimode / single mode optical fiber. The device should be capable to support multiple optical channels in different directions with each channel supporting sensing distance of minimum 5 Km.	

13	The device should be capable to sense and display faults in cases were fiber is made continuous by optical patching at each terminating station. The device should be able to map faults on the lines through which the fiber cable is laid.	
14	Optical Gateway / Interrogators with OTDR functionality with real time alarm update in central monitoring system indicating fiber degradation and fiber faults. This faults should be relayed as SMS/E-mail to relevant teams through appropriate interconnection with SMS gateway and e-mail server. SMS gateway and e-mails server access will be provided by TATA POWER.	
15	Automatic reboot upon power failure – no specific shutdown procedure should be required. System should come back live without any manual intervention	
16	Environmental correction algorithm which can be optimized to take into account specific environmental (wind, rain,etc.) conditions	
17	Data export : Potential free relay contacts, Modbus-serial RS485 / IEC 61850 / IEC-104, sms on mobile	
18	Smart algorithms to analyze specific patterns and reliably classify the events	
19	Optical Gateway / Optical Interrogator capabilities Detection of events Classification of event (example - Electrical flashovers, network failures, human climbing, CABLE breakdown, Impact on UNDERGROUND CABLE (temporary /permanent), etc.) Event location Multiple event detection	
20	Compact & high integration design maximum 4U height (19” rack mounted)	
21	Visible LED indicators / LCD indicators for following alarms : Power, measurement (laser on), faults (system temperature and hardware error states) & alarms	
22	Power supply : 110V DC / 220V DC converted to 48VDC Power Supply.	
23	Operating Temperature Range 10 to 45°C	
24	Optical connector on DTS ITUT G.652 (standard single mode) ITUT G.654 (cut off shifted) ITUT G.655 (NSDSF) ITUT G.656 (wideband NSDF) ITUT G.657 (bend sensitive)	
25	Optical Wavelength supported 1550 / 1330 nm. Confirmation on supporting DWDM wavelengths.	
26	Optical channel (parallel) of min 2 nos.	
27	Higher Depth (radial distance) measurement capabilities -to measure the targets distance from the fiber. Example underground cable fiber sensor used to monitor the EHV lines nearby	

S.N.	Technical Requirement	Bidder Response
	Centralized System (Server) / Data Processing Unit	
28	Centralized Server should be able to consolidate data from various Optical Gateway / Optic interrogator located at remote stations	
29	Should support multiple remote Client Workstation (min. 2nos.). The Workstation Clients should have GUI through installed application or client Browser. (Remote desktop / desktop sharing solution is not acceptable)	
30	Industrial grade 19" Rack mounted Servers with RAM, HDD & OS suitable to the offered solution. The system Server configurations should be such that at any given instance, the Server loading (application / OS processing load) should not be more than 70%	
31	Server should have an independent rack mounted Sliding keyboard and monitor	
32	Communication between clients and DTS server shall be limited by MAC address and/or IP address	
33	Central Server should be able to communicate with remote distributed Optical Gateways / Interrogators through Tata Power existing WAN network connectivity	
34	Central Server should store History of alarms (only critical alarms) for a period of one year	
33	All DTS data recording functions shall be performed at the Server site for each Gateway or interrogator. Data shall be recorded at a variety of levels: • Alert / event logging • Histogram data – user selected • Gateway / Interrogator data – user selected The system shall be provided with sufficient recording capacity to provide for minimum 2 weeks of recording Appropriate storage system to be considered for transfer of data from system to external storage with minimum retention period of 3 months. System should be capable to generate statistical reports on different line that are being monitored. Sample reports may include no of faults during defined period, fault v/s location mapping frequency for the mentioned period, type of fault v/s frequency of occurrence etc.	
34	Central Server capabilities Data acquisition through Multiple Optical Gateway reporting Data presentation on real time map, alarm tables, location details, target calcifications, etc. Archive : all historical data (min. 1 months historical data) (critical alarms -1year)	

S.N.	Technical Requirement	Bidder Response
	Client Workstation	
35	Windows based Client Workstation with HMI & GUI features.	
36	The overhead EHV / EHV cable / transmission line monitoring system shall offer an user interface on HMI for DTS alarms associating them with the correct position on the EHV power lines / cable, therefore ensuring improved usability and moderate training efforts for the operator.	
37	Client Workstation should provide displays with Alarms, events, Digital / analog values, status of the asset being monitored. It should be possible to save and send the data / records for future analysis	
38	GUI for assets visualization which provides real time graphic overview of all distributed temperature information. It should provide at -a- glance information on the condition of power lines. Pre-defined alarm sections, customizable alarm section	

S.N.	Technical Requirement	Bidder Response
	Visualization Software on Server / Client Workstation	
39	Asset visualization and mapping	
40	Satellite image overlay to improve identification of threats	
41	Alarm history table	
42	Fully configurable alarm and pre-alarm levels	
43	3 authorization levels in the client software (Admin, Viewer and Operator)	
44	Automatic backup for detected alarm and event activity with weekly, monthly and daily options	
45	Data Retention time user configurable – separate value for daily, weekly and monthly backups.	

13.0 QUALITY REQUIREMENTS, INSPECTION, TESTING

13.1 Software and Database development & system integration

Software and Database Development and System Integration shall be the responsibility of the Bidder. It shall be the responsibility of the Bidder to indicate and obtain necessary information from the Tata Power and sub vendors.

13.2 Factory Acceptance Test (FAT)

The Vendor shall submit a test specification for factory acceptance test (FAT) and commissioning tests of the DTS System for approval. Vendor to submit the type test certificates, pre-FAT testing reports and document before the start of FAT at Vendor's works. The manufacturing phase of the system shall be concluded by the factory acceptance test (FAT).The purpose is to ensure that the Vendor has interpreted the specified requirements correctly and that the FAT includes checking to the degree required by the user. The general philosophy shall be to deliver a system to site only after it has been thoroughly tested and its specified performance has been verified, as far as site conditions can be simulated in a test lab. The extensive testing shall be carried out during FAT. The purpose of Factory Acceptance Testing is to ensure trouble free installation at site. No major configuration setting of system is envisaged at site.

13.3 Hardware Integration Tests

The hardware integration test shall be performed on the specified systems to be used for Factory tests when the hardware has been installed in the factory. The operation of each item shall be verified as an integral part of system. Applicable hardware diagnostics shall be used to verify that each hardware component is completely operational and assembled into a configuration capable of supporting software integration and factory testing of the system.

14.0 PERFORMANCE REQUIREMENTS

NIL

14.1 Warranty

a) Bidder shall warrant that the equipment including software, hardware, firmware and associated documentation are free of defects in material and workmanship and from defects or faults in design, in so far as the equipment fails to meet the requirements of this technical specification, for a period of **5 years** from the date of final acceptance by the purchaser after completion of **30 days** trouble free operation.

b) With respect to defects in equipment part, Bidder's liability is to make good by replacing the faulty equipment. It is the responsibility of the Bidder to replace the faulty equipment within **7 working days**.

c) During the warranty period, the bidder shall upgrade the firmware of the modules with the latest available. This activity shall be carried out free of cost at site as and when the patches are released. Sample testing for the operation of devices and associated equipment shall be carried out after the Upgradation of any software.

d) After replacement of the faulty equipment, the purchaser shall return parts that are defective to the Bidder. The Bidder shall cover the cost associated with the shipping of defective or failed items during warranty period. The new equipment, parts shall be delivered to the purchaser's facility CIF (Cost, Insurance, and Freight) free of charge.

e) With respect to software, the purchaser shall notify the problem to the Bidder, including a detailed description of the deficiency and associated condition. Bidder shall guide the purchaser for corrective action. If the same is not resolved, the Bidder shall depute his personnel to attend the same within 24 hours from the time of reporting the problem. The system Bidder shall be fully responsible to resolve hardware and software deficiency reported by the purchaser.

f) With respect to third-party software and consumable parts supplied, the Bidder shall make reasonable effort to obtain the best warranties possible from the sub-Vendor thereof and assign to the purchaser any such warranties to the extent that such warranties may be assigned to the purchaser.

g) Bidder may consider longer warranties than included in these specifications.

h) Bidder shall extend all warranties / guarantees to the purchaser, provided by sub- Vendors, of duration longer than that in this specification.

14.2 **Upgrades & Modifications**

a) Bidder shall continuously keep the Purchaser informed of all Software and Hardware upgrades as & when these are released.

b) Bidder shall supply upgrades of all installed software (both own and third party) for a period of seven years from the date of system acceptance without any commercial implication.

c) Bidder shall rectify all design defects and software bugs at no extra cost for a period of 5 years from the date of system acceptance

d) Bidder shall provide lifetime support (10 years) for the system, even if no upgrades are implemented.

e) The system referred to above includes Bidder's own as well as third party components.

f) Bidder shall port the supplied software onto upgraded hardware (as per Bidder's standard offerings) without additional Software License Fees.

15.0 DATA SUBMISSION BY BIDDER

Bidder shall submit the following information along with the Technical Bid

Along with Bid:-

15.1 Bidder to submit technical data sheet of the critical equipment, architecture drawing along with the technical offer.

15.2 Bidder to only provide compliance for other data sheets covered in the specification. However bidder to note that, all data sheets and detailed GTP are required to be submitted during detailed engineering for the approval and finalization by Tata Power.

15.3 Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality Plan (FQP)

15.4 General Arrangement Drawings for equipment offered

15.5 Catalogues of the equipment's offered

15.6 Detailed Bill of Material with make, model and quantity

15.7 Product life cycle document for all supplied equipment.

15.8 List of major relevant experiences of the Principal, Collaborator and the Product respectively.

15.9 Technical support facilities including qualified man-power, testing tools and instruments and integration facilities available within India.

15.10 Confirmation on lifetime, spares, manufacturing, onsite & Offsite technical support of the supplied equipment for the period of 10 years.

15.11 The Bidder shall give an undertaking to provide full range of local services (including hardware and software maintenance, modifications and upgrade support) for the life of the delivered system

15.12 All deviations from the specifications shall be set out by the Bidder, clause by clause, with due justifications along with the offer; failing which the offer shall be deemed to conform to Tata Power specifications in all respects

15.13 Bidder to submit all relevant test certificates of the offered equipment for technical evaluation

15.14 Bidder to submit Cyber security related test certificates (from accrediated Labs) of the offered equipment for technical evaluation

After Award of Contract

The following documents shall be submitted for Tata Power approval during detailed engineering:

15.15 Bidder to submit all datasheets, detailed GTP of the proposed BOM items during detailed engineering for the approval and finalization by Tata Power.

15.16 System Architecture Drawing. This drawing should show in detail of the following:

i. Network connections

ii. Protocol used

iii. Type of interconnecting cable

iv. Detailed architecture including the offered BOM placement along with detailing of line sections proposed to be monitored.

v. Network interconnection of the central system with the filed optical units and client work stations along with proposed IP schema.

15.17 Panel GA and Complete wiring diagram

15.18 Functional Design Specification document

15.19 Step by Step test procedures for Factory Acceptance Test (FAT) and Site Acceptance Test (SAT)

15.20 Interconnection Schedule (ICS) for DTS system (e.g. ICS for all field equipment, system.

15.21 Hardware, Software and Application manuals for all the equipment supplied including that of Third parties.

15.22 All Software Licenses (both own & third party), key for Hardware Locks

15.23 All interoperability tables

15.24 Guaranteed technical parameters & Guaranteed availability and reliability

15.25 Calculation for power supply dimensioning

15.26 Bill of Material listing equipment designation, make, type ratings, etc. of all the equipment's supplied

15.27 Logic Diagram (Hardware & Software)

15.28 Operator's Manual

15.29 Complete documentation of implemented protocols between various elements

15.30 Diagnostic and performance evaluation software and hardware tools

15.31 Details of software (Operating systems, application software, engineering tools, DTS systems management software, license details, I/O distribution protocol-wise etc.)

15.32 Final as built drawings of all system as final documents in AutoCAD & PDF format

15.33 Other documents as may be required / applicable during detailed engineering

15.34 All drawings and data shall be annotated in English.

Bidder shall furnish six (6) hardcopies and 3 soft copies on reliable media of all drawings, manuals (Administration, Operation & Maintenance, Troubleshooting and Installation), Technical catalogues, Test Certificates and Acceptance Test Reports.

Two copies of the internal test report, FAT and SAT documents with test protocol formats shall be submitted for approval at least 4 weeks before Factory Acceptance Test. Two copies of SAT protocol shall be submitted for approval at least two weeks before Site Acceptance Test.

Bidder shall also furnish Original plus one copy of all System Software (OS, Application and tools) along with delivery. Bidder shall submit two copies of all the configuration, application, display, database backup of all equipment on reliable secondary media.

ANNEXURES

Annexure 1

List of Preferred Vendor for Communication equipment

Sr. No.	Description	Make
1	DC to DC convertors	Cossel / Paramount
2	Armoured Cat6 cable, Make Systemax	Systemax
3	Single mode, 48 core single mode armoured FO-cable.	Finolex/ KEC/APAR/Birla Cables
4	HDPE conduit, pipe-size 40/33 mm, for laying FO-cable with accessories such as Couplers, elbows etc.	Kisan Mouldings / Texmo
5	Single mode, Fiber Termination Box	Raychem/AFS
6	12 core Multimode underground fiber cable	Finolex/ KEC/APAR/ Birla Cables
7	Simplex Fiber optic Single mode FC-LC type Patch cords	AFS/Raychem/ Tyco/3m
8	Simplex Fiber optic Single mode FC-LC type Patch cords	AFS/Raychem/ Tyco/3m
9	Simplex Fiber optic Single mode FC-LC type Patch cords	AFS/Raychem/ Tyco/3m
10	Simplex Fiber optic Single mode LC-LC type Patch cords	AFS/Raychem/ Tyco/3m
11	Simplex Fiber optic Single mode LC-LC type Patch cords1	AFS/Raychem/ Tyco/3m
12	Simplex Fiber optic Single mode LC-LC type Patch cords	AFS/Raychem/ Tyco/3m
13	Simplex Fiber optic Single mode LC-LC type Patch cords	AFS/Raychem/ Tyco/3m
14	Simplex Fiber optic single mode FC-SC type patch cords	AFS/Raychem/ Tyco/3m
15	Simplex Fiber Optic Single mode FC-SC type patch cords	AFS/Raychem/ Tyco/3m
16	Simplex Fiber Optic single mode SC-SC type patch cords	AFS/Raychem/ Tyco/3m
17	Simplex Fiber optic single mode FC-LC type patch cord	AFS/Raychem/ Tyco/3m
18	Simplex Fiber optic single mode SC-SC type patch cord	AFS/Raychem/ Tyco/3m
19	Simplex Fiber optic single mode FC-FC type patch cord	AFS/Raychem/ Tyco/3m

Sr. No.	Description	Make
20	PVC flexible conduit rodent proof design with steel wires embedded.	Reputed make.
21	42 U floor mounting type panel suitable for 19'' equipment mounting with width 800mm and depth 800mm having following accessories	Walrack
22	Simplex fiber optic Multimode fiber optic patch cord ST-ST type 20mtrs	AFS/Raychem/ Tyco/3m
23	Simplex fiber optic Multimode fiber optic patch cord ST-ST type 15mtrs	AFS/Raychem/Tyco/ 3m
24	Simplex fiber optic Multimode fiber optic patch cord ST-ST type 5mtrs	AFS/Raychem/ Tyco/3m
25	Simplex fiber optic Multimode fiber optic patch cord LC-ST type 5mtrs	AFS/Raychem/Tyco/ 3m
26	Simplex fiber optic Multimode fiber optic patch cord LC-ST type 2mtrs	AFS/Raychem/Tyco/ 3m
27	Simplex fiber optic Multimode fiber optic patch cord LC-ST type 20mtrs	AFS/Raychem/Tyco/ 3m
28	DTS Systems	Prisma Photonics / Bandweaver / AP Sensing / Silixa /
29	L2/L3 switches	Cisco/Allied telesis/Dell/HP.
30	Firewall	Checkpoint/ Paloalto/Cisco/Juniper.

Annexure - 2

Bill of Material (Indicative)

Supply				
SN	**Description**	**Unit**	**Qty.**	**Remarks**
1	Optical Gateway / Interrogator Systems with necessary Hardware, application Software, OS software, accessories, mounting arrangements and network communication accessories along with Pre-wired panel (size 42U 800x800x2300mm) and redundant Power supply DC to DC convertors	Set	1	Optical Gateway/ Interrogator quantities to be considered as per the EHV cable / transmission line lengths & station details given in specifications. Bidder to consider appropriate quantity required for satisfying the solution requirement considering suitable qty. of spare.
2	Underground Fiber Optic cable with minimum 12 fiber cores, inner and outer sheath of HDPE with glass yarn and 2 no. rip cord, fiber reinforced plastic (FRP) rod as strength member, 4 cores per tube, with core filling jelly as moisture barrier, polyester tape as core wrapping	meters	site +1kms	Multimode or single mode as suitable for DTS, protective cable coating a as per DTS sensing & cable protection requirements
3	Underground OFC cable termination units (LIU's) suitable for cable termination. Mounting Arrangement: To be mounted in Pre-wired panel as specified in line item number-1	Set	2	Qty. as per the OFC cables
4	CT / VT transducers or Multifunction meters, with ring CT's as required for DTS systems along with copper cables of appropriate sizes required for CT/VT outputs to transducers & transducer to DTS systems	Lot	1	Qty. as per DTS system requirements
5	Centralized Server Systems with necessary Hardware, application Software, OS software, accessories, mounting arrangements and network communication accessories. Server PC specifications: 19", rack mounted, core i7, 9th generation, windows 10 64 bit, 8GB RAM, 1TB hard disk. Mounting Arrangement: To be mounted in Pre-wired panel as specified in line item number-1	Set	1	
6	Client Workstation Systems with necessary Hardware, application Software, OS software, accessories, mounting arrangements and network communication accessories	Set	1	

7	Managed L3 Ethernet Switch for Interrogator & Centralized Server Integration Communication Ports: 24 PORT L2 W/100/1000 MBPS, Combination of FO & Copper Ports Mounting Arrangement: To be mounted in Pre-wired panel as specified in line item number-1	Set	1	L3 network switches quantities to be considered as per the proposed remote Interrogators, Central Servers and Client workstations. Qty. mentioned is tentative bidder to decide based on his offerings.
8	Configuration Laptop : Hardware: Laptop with latest processor, 500 GB HDD, 8 GB RAM, DVD RW, 4 USB Ports, 15" Display with 1 no. serial to USB converter Software: Microsoft Windows compatible with latest version of configuration software, latest Microsoft Office License pack, Antivirus Quick heal Total Security with three-year subscription, Configuration & maintenance software tools, Diagnostic tools for of DTS Interrogator, Server, Workstation, etc.	Set	1	
9	Firewall cum Router Mounting arrangement: To be mounted in Centralized Server panel	Set	1	make Fortigate 80F
10	Networking accessories like switches, LIU, patch panel, communication Ethernet / fiber cables of suitable length, Conduits for all non-armored cables, I/O boxes with Quad face plate, RJ45 connectors etc. required for SCADA integration	Set	1	As per site requirements
11	Fiber Cable joint box, pits, civil structures, handholds	Lot	1	Supply, civil work for site requirement

Services				
SN	**Description**	**Unit**	**Qty**	**Remarks**

1	a) Engineering b) Installation, commissioning, Inspection, supervision and testing of all supplied items. c) Cable termination, continuity check of all communication cables including fiber cable laying and termination from existing fiber panel to proposed equipment panel. d) Preparation of ICS and Signal List e) Configuration and Testing of Fiber sensor, Interrogator, transducers, Server, Client workstation etc. g) Time Synchronization of Interrogator, Server, Client workstation with GPS Receiver h) I/O testing, Pre- SAT testing of Hardware and Software functionality i) Integrated testing with Max view & SCADA System j) Integrated FAT & SAT for Hardware and Software k) Submission of as-built drawing in AutoCAD and PDF Format	LS	LS	
2	Services for FO cable laying, termination and testing	LS	LS	

Annexure - III- Data Sheet

Refer Technical Requirement sheet from the above specification section clause 12.0. Bidder shall provide their responses / confirm compliances accordingly

END

CONFIDENTIAL

Section D.2: Safety Procedures

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EXCAVATION (SHORING & SLOPING) SAFETY PROCEDURE

Rev No.	Reason for Revision	Prepared By	Checked By	Approval by
Rev 00	New procedure	R&P Sub-Committee	D Kamath	Vijay Chourey
Rev 01	Standardization of procedure	Prakash Sharma (Head - Mechanical Maint.- MPL)	Navendra Singh (Group Head – P & CB; Corp Safety.)	Vijay Chourey (Chief – Corp Safety)

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1. **OBJECTIVE:** This procedure is developed to cover the safe practices required for shoring and sloping in excavation and trenching jobs. This procedure is developed to establish mandatory requirements for practices to protect personnel, property and equipment from hazards associated with excavation activities.

   It covers role and duties of personnel associated with shoring and slopping in excavation jobs to discharge their duties effectively.

2. **SCOPE:** This procedure applies to all operating and project sites of Tata Power Group companies.

   Deep shaft excavations, tunnel excavation, pile boring and excavation by blasting are excluded from the scope of this procedure.

3. **EXPECTED RESULTS:**

   3.1. Manage Excavation jobs safely.
   3.2. Control of incidents related to excavation activities.
   3.3. Compliance to Regulatory requirements to make work place safety.

4. **ACCOUNTABILITY & RESPONSIBILITY:**

   4.1. ACCOUNTABILITY: Concerned Division's Heads / Assets Custodian.
   4.2. RESPONSIBILITY: Concerned Engineer/s

5. **GLOSSARY/ DEFINITIONS:**

   Angle of repose - The greatest angle above the horizontal plane at which the material lie without sliding.
   Benching – Method of protection to prevent cave-ins by excavating the sides of an excavation to form one or series of steps usually with vertical or near vertical surfaces between levels.
   Cave-in – Separation of mass of soil or rock material from the side of an excavation or loss of soil from under a trench shield or supporting system and its sudden movement into the excavation in quantity that it could entrap, bury, injure or immobilize a person(s).
   Competent Person – One who can identify existing or predictable hazards in the surroundings that are unsanitary, hazardous or dangerous to person. He also has authorization or authority by the nature of their position to take prompt corrective measures to eliminate them. The person shall be knowledgeable about the requirements of the standard.

Excavation- Any man-made cut, cavity, trench or depression in earth surface formed by earth removal. Relatively large volume of earth is involved. Generally have relatively equal dimensions of width and length. Depth will vary but usually is lesser than the smaller dimension. Used for basements, installation or maintenance of underground tanks and pipelines, piling, culverts, and larger spread footings. Size generally makes sloping of banks more economical than shoring.

Hazard: Source or situation with potential for harm, something that can cause body injury / occupational illness, damage company property.

Job: A piece of physical work defined by time or other limits and that has a clear start and end point

Qualified/person(s) - Those who by extensive knowledge, training, and experience have successfully demonstrated their ability to carry out sloping and shoring of an excavation.

Ramp – An inclined walking surface specifically provided to gain access from one point to another and is constructed from earth or from structural members such as steel or wood.

Risk: The likelihood (probability) which can lead to potential negative consequences.

Shoring- A structure that supports the sides of an excavation and protects against cave-in.

Shall: Mandatory requirement

Should: Optional requirement

Sloping – Cutting of the edge back in inclined manner that it will not slide in the trench or excavated area.

Task / Activity: A sequence of steps taken to conduct a job. A task is a sub element of a Job.

Trench -Generally long, narrow, and deeper than its width, but the width of a trench is not greater than 15 feet (4.5Mt). Relatively small volume of earth involved. Used for installation or maintenance of underground pipelines, conduit, cables, or footings for buildings without basement. Size generally makes shoring more economical than sloping of banks.

6. PROCEDURES

6.1. General Excavation:

6.1.1. All the Excavations, more than 5 feet (1.5Mt) deep shall require shoring or sloping.

6.1.2. Excavated material must be kept at least 3 feet (1Mt) away from the edge of the excavation.

6.1.3. Excavated material must not be permitted to accumulate in the work area or aisles. It should be shifted away.

6.1.4. Excavation bracing and shoring must be checked by qualified person, prior to starting the job, subsequently on daily basis and also after every rain and storm.

6.1.5. Power supply to all electrical equipment/lights should be through ELCB (Earth Leakage Circuit Breakers, Tripping timing of ELCB should be 30 Milliseconds. If tripping timing exceeds more than 50 Milliseconds at 30 Milliamp then ELCB shall be replaced immediately (For more detail refer TPSMS/GSP/ELCB/008 - Earth Leakage Circuit Breaker (ELCB) Testing Procedure)

6.1.6. No hot work shall be done in excavation without a valid hot work permit.

6.1.7. In locations where oxygen deficiency or gaseous conditions are possible, air in the excavation shall be tested. Controls, as set forth in TATA POWER Standard Confined Space Entry, shall be established to assure acceptable atmospheric conditions. When flammable gases are present, adequate ventilation shall be provided or sources of ignition shall be eliminated.

6.1.8. Confined space permit should be taken for excavations more than 6 feet depth (1.8Mt) which come under the purview of confined space.

6.2. Trench Excavation

6.2.1. Points no 1 to 6 of above 6.1 area applicable and in addition to that following points are to be complied,

6.2.2. If the trench is 4 feet (1.2Mt) or more deep it should be provided with standard ladder to facilitate safe entry and exit.

6.2.3. The Sides of trenches in hard or compact soil, including embankments, shall be shored or otherwise supported when the trench is more than 5 feet (1.5Mt) in depth. In lieu of shoring, the sides of the trench above the 5 feet (1.5Mt) level may be sloped to preclude collapse, but shall not be steeper than a 1 feet (0.3Mt) rise to each ½ feet (0.15Mt) horizontal. When the outside diameter of a pipe is greater than 6 feet (1.8Mt), a bench of 4 feet (1.2Mt) minimum shall be provided at the toe of the sloped portion.

6.3 Potential Hazards likely to be encountered during Excavation/Trenching

a. Falling of persons into excavated trench or pit
b. Collapse of excavation sides and falling of excavated material onto persons working within excavation trench or pit
c. Collapse of temporary arrangements (shoring etc) made to support sides of excavation.
d. Collapse of adjacent structure due to excavation.
e. Persons within excavation pit struck by fall of spoils from excavator buckets and other objects dropped on them.
f. Worker hit by reckless driving / operation of equipment.
g. Falling of workmen through bottom of excavation into abandoned empty bore of pile, disused shaft or disused sewer line or other cavities in the ground.
h. Persons within excavation struck by other objects falling due to work being done at higher elevation in the nearby vicinity.
i. Risk of electrocution from cables crossing or used for lighting purpose in vicinity
j. Risk of injury due to protruding nails, sharp edges in shoring.
k. Falling of persons while climbing or getting down into excavation
l. Spiking of underground electric cables with resulting flash burns and electric shock.
m. Flooding with risk of drowning.
n. Striking and breaking other underground utilities such as – gas (fire and explosive hazard), water (flooding), and sewage (toxic gases).
o. Fire and explosion from flammable gases heavier than air and vapors especially LPG, entering excavation.
p. Poisoning from gases entering from pipelines or outside.
q. Suffocation / Poisoning due to burning of torches, etc. used in excavation and insufficient ventilation, or from exhaust gases produced by plants and machinery used in connection with the excavation,
r. Toxic and radioactive hazards from the ground itself, usually resulting from its previous occupancy.
s. Accidental explosion through use of explosive in excavation.
t. Objects getting to eyes while chiseling rock, using jack hammers in hard strata, concrete.

6.3.2 Excavation clearance: Excavation clearance shall be taken as per Annexure I for all excavations more than 1 ft (0.3Mt) in depth. However, when excavation work is to be undertaken outside the Tata Power facilities, irrespective of the depth of excavation, all statutory clearances shall be obtained prior to commencing the work. The clearance shall be obtained as follows:

6.3.2.1 For New Projects – The Project Manager/Site In-Charge shall be responsible for the co-ordination with all the departments and obtaining excavation clearance.

6.3.2.2 For Minor Projects & maintenance jobs - Excavation & trenching jobs both inside and outside battery limit areas, the Plant/Site Head or his authorized representative, is responsible for co-ordination with all the departments and give the excavation clearance to the Site In-Charge/ Project/Maintenance engineer.

6.3.2 Risk Assessment: Risk assessment of the job shall be done to control hazards of site.

6.3.3 Work Permit: Ensure proper Pemit-To-Work is obtained as per the Permit-to-Work (TPSMS/CSP/PTW/008) procedures.

6.3.4 Safety Aspects: Following important safety aspects shall be implemented during execution of excavation activity at project site:

6.3.4.1 Safe access:

a. Safe access must be provided to excavations by means of ladders, stairs or ramps.

b. Provision of safe means of access & egress to workers. E.g. clear passage for entry and exit, ladder, stair case, slope, steps etc. shall be ensured.

c. If the excavation is more than 4 feet (1.2Mt) deep it should be provided with standard ladder to facilitate safe entry and exit.

d. The ladder must be provided at every 25 feet (8Mt) interval.

e. Trenches more than 4 feet (1.2Mt) in depth shall have ladders spaced so that employee's lateral travel to a ladder does not exceed 25 feet (8Mt). Such ladders must be installed in accordance with the ladder safety requirements. The height of the ladder to be extended up to 3.3 feet (1Mt) from the top of ground surface. The ladder must be secured.

f. Ensure proper passage over the excavation for by passers to move from one bank side to other with minimum 2 gratings Placed on horizontal members with guard rail.

6.3.4.2 Caution and Barrication:

a. Excavations should be barricaded to prevent employees and others falling into them-

b. Provide barricading of the area and display of warning signboard in Hindi / English / regional language at conspicuous locations.

c. Warning signs including Light signal to be provided.

d. No trench, ditch or other excavation shall be left overnight without barricades and warning lights.

e. Adequate illumination should be provided in the night and in day as per site condition so that the area will become visible.

f. If barricades or portions of barricades are removed for work, they shall be replaced as soon as practicable.

g. Suitable warning sign, such as fluorescent warning tapes, flashing lights, shall be provided to warn the persons in night.

h. The warning barricades must be 6feet away from the edge of the excavation (plastic tape & sign board). In operations area the plastic tape must be at two levels i.e. 21" and 42" height from the ground.

i. The barricades installed closer than 6 feet (1.8Mt) from the edge of the excavation, must be hard barricade which can withstand 100 kg load / thrust. Hard barricade shall have horizontal members at 21 inches and 42 inches respectively from the ground with adequate vertical supports.

6.3.4.3 Precautions against cave in, seepage etc

a. If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above and near an excavation, the side of the excavation shall be sheet-piled, shored, and braced as necessary to resist the extra pressure due to such superimposed loads.

b. When mobile equipment is utilized or allowed adjacent to excavations, substantial stop logs, or barricades shall be installed. If possible, the grade should be away from the excavation.

c. Care shall be taken during monsoon or during seepage of water from nearby area.

d. When under cut is required then shoring shall be designed by professional engineer.

e. If there is evidence of cave-ins or slides, all work in the excavation must cease until the necessary precautions have been taken to safeguard employees till further clearance is obtain.

f. Where vehicles or equipment operate near excavations, the sides must be shored or braced as necessary to withstand the force exerted by the superimposed load. Also stop-logs or other substantial barricades must be installed to protect the edge of such excavations.

g. Dewatering from the pit shall be done at remote location to avoid back flow to the pit resulting in soil collapse.

h. All major excavations shall be done after engineering study and ensure that validated excavation scheme shall be installed.

i. Ensure that there are no scaffolds or temporary structures adjacent to where trench or excavation is to be made unless adequate measures have been taken based on a formal risk assessment.

6.3.5 Preparation (to be done in consultation with a competent person)

a. Study the soil characteristics with reference to angle of repose for soil required etc. Please refer Sketch 1 for guidelines.

b. See that excavated area is not blocking the access to the site for man and material both or otherwise necessary sign shall be displayed at appropriate locations.

c. It should be ensured that there is no exposed live wire in working areas which are accessible to building workers other than those authorized to work on such live lines.

d. Alternate route for traffic should be provided (in case of road blockage). Ensure Road block procedures are followed.

e. Ensure that there are no vibrations from an external source which may impact the excavation.

f. Ensure that consideration has been given to proximity of adjacent structures while finalizing the method of excavation.

g. All efforts will be made to locate underground utilities that may reasonably be expected to be encountered during excavation work. A cable detector may be used before start of excavation. In the situation where a cable or utility is found to be existent, the engineer will judiciously after obtaining the excavation clearance, excavate a trial trench manually only. The depth of trial trench shall not exceed 1.5 meters in general 2.0 meters in special cases so as to ascertain the presence of any cable/gas pipeline/other utility. In case, no cable or other utility service lines detected in the trial trench, mechanical excavation upto 1.2 meters depth shall be undertaken. The whole process is repeated for the next 1.2 meters.

6.3.6 Supervision, workforce and Inspection

a. It should be ensured that all excavations are supervised by qualified person.

b. Give Tool Box Talks regarding safety measures to be observed to the workers involved before starting the job.

c. Confirm methodology to be adopted, explains Risk Assessment and plan of action in case of emergency.

d. Confirm PPEs provided, are as per the work permit.

e. If the depth of excavation is more than 7 feet (2.2 meters) than double lifeline full body harness must be used. The harness to should be secured to a suitable lifeline.

f. E I C shall ensure that check list as per Annexure- 1 has been filled and signed for excavations for excavation more than 1 ft.

g. Minimum person shall be kept inside pit. All idle workers should be removed from there.

h. Each excavation shall be inspected daily by the qualified persons, after heavy rains & Storms, or more often if conditions change rapidly.

6.3.7 Precautions during Job

a. If, during excavation, unexpected utilities are discovered, Contractor should stop excavation and immediately notify the PM and/or Plant Control room. Work shall be resumed only after obtaining further clearance in consultation with the competent person.

b. Hand tool excavation: Whenever the presence of underground pipes, cables, vessels, or structures is known, or suspected, they shall be exposed by hand tool digging before mechanical excavators are used. Hand tool excavation is required within 10 feet (3.0 meters) of the object.

c. Machine excavation: When the location of all utilities or structure have been established by surface markers or hand tool excavation, machine excavation may commence under close surveillance of the Contractor's supervisor.

d. Movement of vehicle and heavy cranes shall be 3 feet (1meter) away or 1.5 times the depth of excavation, whichever is greater.

e. Loose excavated material must be placed no closer than 3 feet from the edge of the excavations. In any case it shall be outside the excavation barricaded area. Precautions must be taken to prevent loose excavated material falling into the excavated area.

f. The disposal area should be defined, made safe for receiving the loose excavated material and manner of disposal is defined.

g. All equipment, electrical connection and machinery used for excavation shall be tested and validated by the Plant/site electrical department.

h. In case of excavation more than 15 feet (4.5 meters), ensure adequate means of communication and proper ventilation are provided.

i. Power supply to all electrical equipment/lights should be through ELCB (Tripping at 30mA current leakage to earth).

j. If there is evidence of cave-ins or slides, all work in the excavation must cease until the necessary precautions have been taken to safeguard employees.

6.3.8 Dewatering

a. Incase ground water is in entering excavated area, ensure continuous dewatering is done

b. Persons shall not work in excavations that contain or accumulating water unless precautions have been taken to protect persons from hazards posed by water accumulation. The precautions taken shall include support or sealed systems to

protect from cave-ins, water removal to control the level of accumulating water and use of safety harness and life lines.

c. Dewatering from the pit shall be done at remote location to avoid backflow to the pit , resulting in soil collapse .If water is controlled or prevented from accumulating by the use of water removal equipment , the water removal equipment & operation shall be monitored by a person trained in the use of the equipment.

d. If excavation work interrupts the natural drainage of surface water, diversion ditches, dikes, or other suitable means will be used to prevent surface water from entering the excavation. Precautions shall also be taken to provide adequate drainage of the area adjacent to the excavation.

6.3.9 Shoring

a. Bracing or shoring of trenches shall be carried along with the excavations.

b. Trenches 4 feet (1.2 meters) or deeper must be shored or sloped back to the angle of repose. Any excavation in unstable ground will require shoring or sloping.

c. An adequate supply of materials such as timbers, trench sheets & props with which to shore the sites of excavation must be delivered to the site before starting excavation.

d. Material used for sheeting, shoring or bracing must be of good condition. Timbers must be sound, free of large knots and of appropriate dimensions.

e. Shoring with GI sheets shall be firmly supported by steel/ scaffold pipes with spacing of 4 ft in horizontal & vertical direction with cross bracing & shall be suitable clamped.

f. Supporting systems; i.e., piling, cribbing, shoring, etc., shall be designed to meet accepted engineering requirements. When tie rods are used to restrain the top of sheeting or other retaining systems, the rods shall be securely anchored well back of the angle of repose.

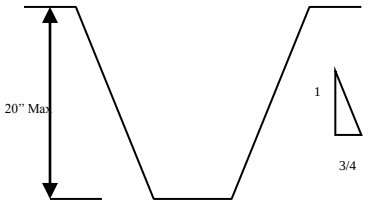
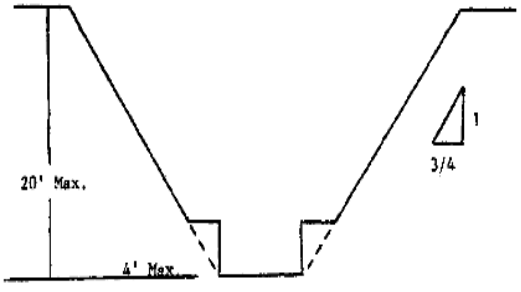
g. For shoring extending below the water table proper means of water drainage with the means of weep holes or other means shall be ensured.

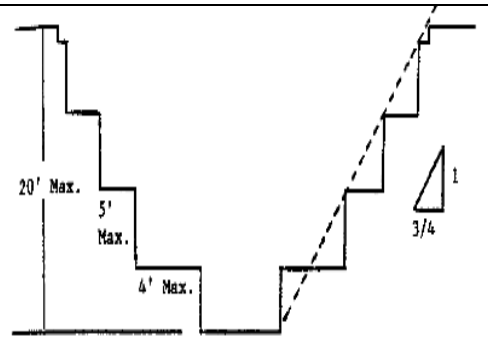
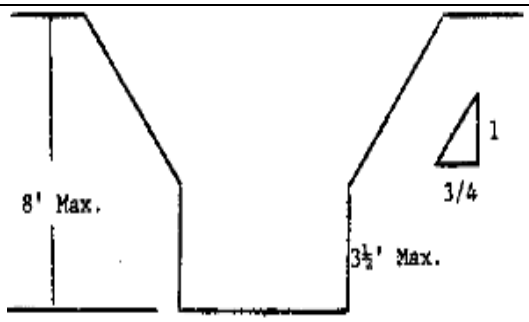
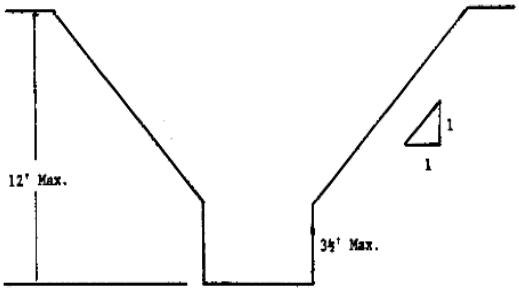
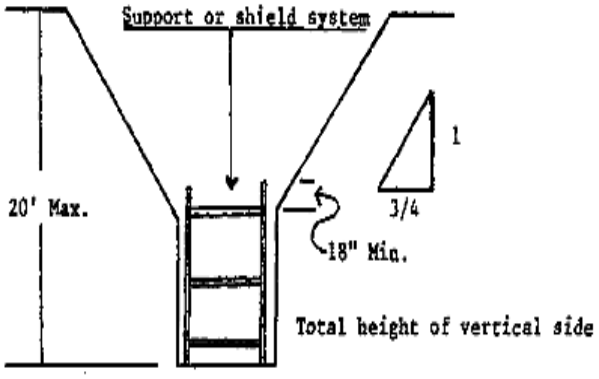
6.3.10 Sloping: For sloping of sides/angle of repose refer Table no1

Table no -1

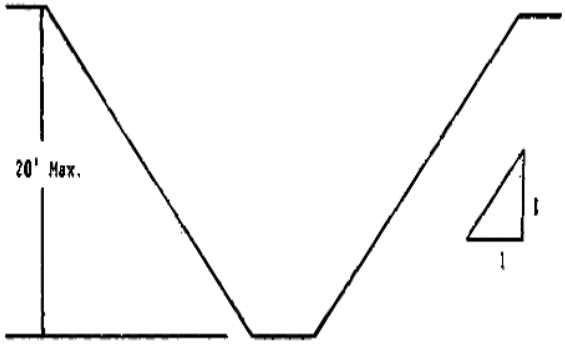
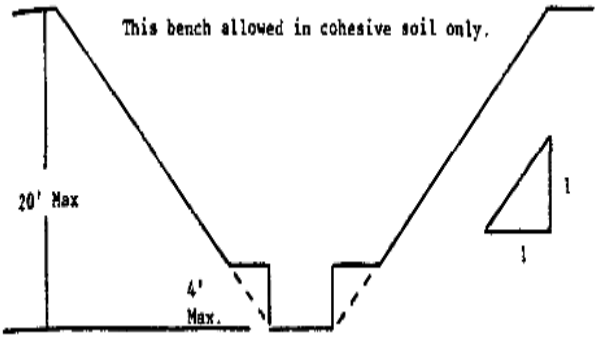
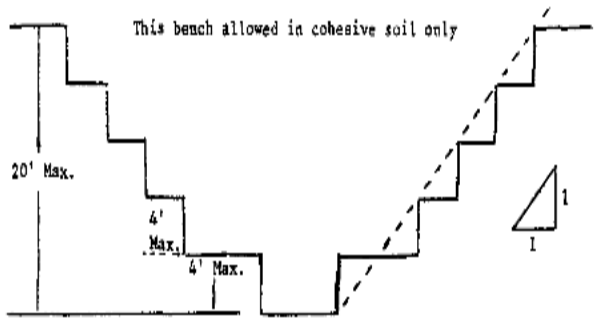
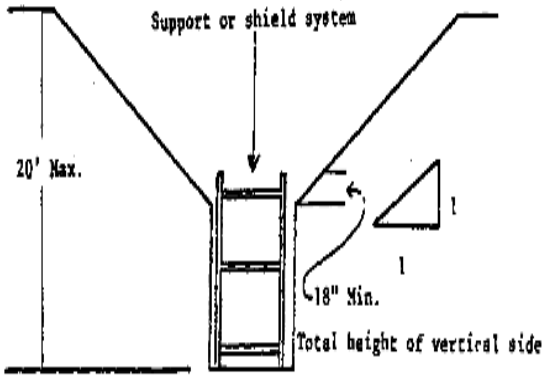
Soil or Rock Type	Type of strata	Soil bearing capacity in T/m^2	Maximum Slope (H:V)	Maximum Slope (Degrees)
Stable Rock	Solid rock, Shale or cemented	45 to 90	Vertical	90
Type A	Soft and hard murrum	20 to 45	0.75:1	53
Type B	Clay and cohesive soil	15 to 20	1:1	45
Type C	Sandy soil, broken rock, gravel and Black cotton soil	0 to 15	1.5:1	34
	Loose sand	0 to 4	2:1	26

Excavations made in type A Soil

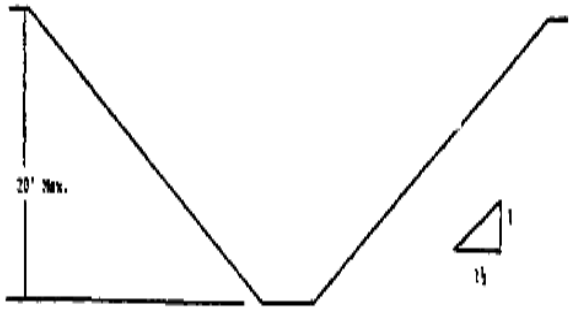
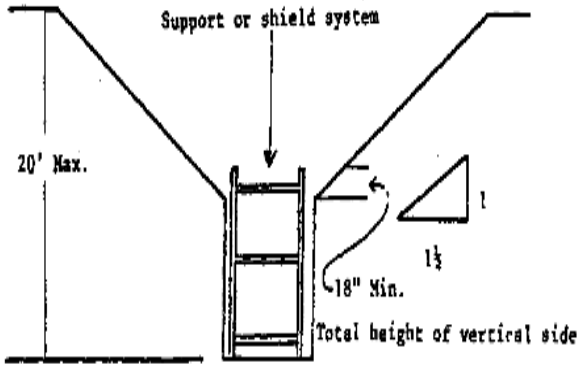
All simple slope excavations 20 feet (6Mt) or less in depth will have a maximum allowable slope of 3/4:1.	
All benched excavations 20 feet (6Mt) or less in depth will have a maximum allowable slope of 3/4 to 1 and maximum bench dimensions as indicated.	

	
All excavations 8 feet (2.5Mt) or less in depth which have unsupported vertically sided lower portions will have a maximum vertical side of 3 1/2 feet (1.1Mt).	
All excavations more than 8 feet (2.5Mt) but not more than 12 feet (4.5Mt) in depth with unsupported vertically sided lower portions will have a maximum allowable slope of 1:1 and a maximum vertical side of 3 1/2 feet (1.1Mt).	
All excavations 20 feet (6Mt) or less in depth which have vertically sided lower portions that are supported or shielded will have a maximum allowable slope of 3/4:1. The support or shield system shall extend at least 18 inches (0.5Mt) above the top of the vertical side.	

Excavations Made in Type B Soil

All simple slope excavations 20 feet (6Mt) or less in depth will have a maximum allowable slope of 1:1.	
All benched excavations 20 feet (6Mt) or less in depth will have a maximum allowable slope of 1:1 and maximum bench dimensions as indicated.	 
All excavations 20 feet (6Mt) or less in depth which have vertically sided lower portions will be shielded or supported to a height at least 18 inches (0.5Mt) above the top of the vertical side. All such excavations will have a maximum allowable slope of 1:1.	

Excavations Made in Type C Soil

All simple slope excavations 20 feet (6Mt) or less in depth will have a maximum allowable slope of 1 1/2:1.	
All excavations 20 feet (6Mt) or less in depth which have vertically sided lower portions will be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations will have a maximum allowable slope of 1 1/2:1.	

7. RECORDS :

7.1. Filled Excavation Checklist minimum three years

8. TRAINING & COMMUNICATION

8.1. Training of this procedure shall be covered as per Safety Training need identified across divisions.

8.2. Initial Communication to be done through Corporate Communication, Email and subsequently shall be made available at safety portal at Sangam.

9. VERIFICATION

9.1. Verification of implementation shall be done during Safety audit, field safety visit and site inspections.

10. EXEMPTION: Any Exception to this procedure shall only be done as per Document Control Procedure (TPSMS/GSP/DC/014).

11. REFERENCES

- National Building Code of India -2005; Part 7 – Construction Practices and safety
- Tata Power Confined Space entry procedure - TPSMS/CSP/CSE/003
- Tata Power Permit To Work Procedure - TPSMS/CSP/PTW/008

12. **REVIEW:** Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.
13. **ATTACHMENTS/APPENDIX :**

Annexure -1-Sample Format for Excavation Checklist

(TPSMS/CSP/EXS/002/FORM/001)

Annexure -2-Trench shoring –Minimum requirements

Annexure-1

TPSMS/CSP/EXS/002/FORM/001

EXCAVATION CHECKLIST

Site Name: _____ **DATE: _____**

Work Permit NO.

1. Description of work : Excavation/Piling /Road Cutting
   (Delete whichever not applicable)
2. Location/Area of the work : _____
   (Attach Drawing/sketch etc.) (Co-ordinates: _____
3. Size of the Excavation : Length_____ Breadth_____ Depth___
4. Date and Time of starting the work: Date_____Time_____

5. Expected duration of the work : _____ _ _ Days/Hours
6. Purpose of excavation : _____
7. Name of the acceptor : _____
8. Contractor's Name : _____

Clearances for Excavation - Check List

Sr. no	Type of Clearance		Description	Clearance Given by		
				Name	Sign	Date
1	Electrical Cables	a	Do not exist			
		b	Exist just below			
		c	Existing within 2 meters			
		d	Not known			
2	Fire Water pipeline	a	Do not exist			
		b	Exist just below			
		c	Existing within 2 meters			
		d	Not known			
3	Utilities pipeline	a	Do not exist			
		b	Exist just below			
		c	Existing within 2 meters			
		d	Not known			

Sr no.	Type of Clearance		Description	Clearance Given by		
				Name	Sign	Date
4	Telephone cables	a	Do not exist			
		b	Exist just below			
		c	Existing within 2 meters			
		d	Not known			
5	IT cables	a	Do not exist			
		b	Exist just below			
		c	Existing within 2 meters			
		d	Not known			
6	Control / inst. cables	a	Do not exist			
		b	Exist just below			
		c	Existing within 2 meters			
		d	Not known			
7	Plant pipelines	a	Do not exist			
		b	Exist just below			
		c	Existing within 2 meters			
		d	Not known			
8	Other clearances (specify)	a	Do not exist			
		b	Exist just below			
		c	Existing within 2 meters			
		d	Not known			

Following Precautions taken by acceptor

Road Barricading done	Yes	☐	Not required	☐
Warning signs incl. Light signal provided	Yes	☐	Not required	☐
Barrication of excavated area carried out	Yes	☐	Not required	☐
Shoring carried	Yes	☐	Not required	☐
Alternate route for traffic is as below or attached	Yes		Not required	
In case of road blockage, SI/PM is informed	Yes	☐	Not required	☐
Any other precautions taken (specify)	Yes	☐	Not required	☐
		☐		☐

Remarks (if any) :

Check by:

Signature & Name :

Annexure -2

Trench shoring – Minimum Requirements

		Size and spacing of members										
		Uprights		Stringers		Cross Braces						
Depth of trench	Kind of condition of earth	Minimum dimension	Maximum spacing	Minimum dimension	Maximum spacing	Width of trench					Maximum spacing	
						Up to 3 Ft	3 to 6 Ft	6 to 9 Ft	9 to 12 Ft	12 to 15 Ft	Vertical	Horizontal
Ft		In.	Ft.	In.	Ft	In.	In	In.	In.	In.	Ft.	Ft.
5-10	Hard, Compact	3 4 or 2 6	6	-	-	2 6	4 4	4 6	6 6	6 8	4	6
	Likely to crack	3 4 or 2 6	3	4 6	4	2 6	4 4	4 6	6 6	6 8	4	6
	Soft, sandy or filled	3 4 or 2 6	Close sheeting	4 6	4	4 4	4 6	6 6	6 8	8 8	4	6
	Hydrostatic pressure	3 4 or 2 6	Close sheeting	4 6	4	4 4	4 6	6 6	6 8	8 8	4	6
10-15	Hard, Compact	3 4 or 2 6	4	4 6	4	4 4	4 6	6 6	6 8	8 8	4	6
	Likely to crack	3 4 or 2 6	2	4 6	4	4 4	4 6	6 6	6 8	8 8	4	6
	Soft, sandy or filled	3 4 or 2 6	Close sheeting	4 6	4	4 6	6 6	6 8	8 8	8 10	4	6
	Hydrostatic pressure	3 4 or 2 6	Close sheeting	8 10	4	4 6	6 6	6 8	8 8	8 10	4	6
15-20	All kinds of conditions	3 6	Close sheeting	4 12	4	4 12	6 8	8 8	8 10	10 10	4	6

>20	All kinds of conditions	3 6	Close sheeting	6 8	4	4 12	8 8	8 10	10 10	10 12	4	6

Notes:

a. Trench jacks may be used in lieu, or in combination with, cross braces.
b. Shoring is not required in solid rock, hard shale or hard slag.
c. Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.

WORK AT HEIGHT PROCEDURE

Rev No.	Reason for Revision	Prepared By	Reviewed By	Approval by
Rev 00	Initial Release	Navendra Singh	Sanjay Kale	Shrinivas Katti
Rev 01	Standardization of Procedure	Anil Jain (Head – Operation – Trombay)	Navendra Singh (Group Head – P & CB; Corp Safety.)	Vijay Chourey (Chief – Corp Safety)

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1. **OBJECTIVE:** Objectives of this procedure is to provide rules and procedures to protect employees from the hazards of working at heights and to establish mandatory requirements for practices to protect personnel from hazards associated with Working at Heights

2. **SCOPE:** This procedure applies to all operating and project sites of Tata Power Group companies involving in Work at Height Jobs.

3. **EXPECTED RESULTS:**
   3.1. Manage Work at Height jobs being done under Permit-To-Work safely.
   3.2. Control of incidents related to Work at Height Jobs.
   3.3. Compliance to Regulatory requirements to make work place safety

4. **ACCOUNTABILITY & RESPONSIBILITY:**
   4.1. **ACCOUNTABILITY:** Concerned Division's Heads / Assets Custodian.
   4.2. **RESPONSIBILITY:** Concerned Engineer/s

5. **GLOSSARY/ DEFINITIONS:**

Anchor Point - A secure point of attachment for lifelines, lanyards, or retractable lifelines. Structural steel or process piping of 2" (5 cm) diameter or greater may be used as an anchor point. Sprinkler piping, instrument tubing, or conduit shall not be used as an anchor point.

Attendant—a person at the perimeter of the work area who is assigned the role of monitoring and communicating with the authorized workers, controlling access to the area, maintaining designated conditions as specified on the permit, and initiating the rescue plan.

Certification - A verification process, which documents that a person has the necessary training, skill, or experience and the ability to perform designated roles and tasks.

Continuous Tie-Off - The requirement that a person be tied off at all times when working in an elevated areas where the potential for falls exists. This is most commonly accomplished by using double lanyards, a vertical lifeline, or a retractable lifeline.

Double Lanyard - A system utilizing two lanyards connected in a "Y" configuration, which allows one lanyard to be attached to an anchor point while the second lanyard is being moved to a new anchor point, thus providing protection from falls at all times.

Double Action Locking Snap Hook - A device for securing lanyards that requires two separate locking pins be depressed before the snap will open.

Full Body Harness - A Class 3 body harness, heavy duty, with leg straps.

Hazard Identification & Risk Assessment: Hazard Identification & Risk Assessment is to identify and evaluate the hazards, Risk and put controls measures for safe execution of activities.

Hazard: Source or situation with potential for harm, something that can cause body injury / occupational illness, damage company property.

Job: A piece of physical work defined by time or other limits and that has a clear start and end point

Job Safety Analysis: Job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job. In a JSA, for each basic step of the job, it is to identify potential hazards and to recommend the safest way to do the job.

Lanyard - A flexible line to secure the wearer of a safety harness to a lifeline or fixed tie-off point.

Lifeline - A flexible cable, either horizontal or vertical, which is anchored at both ends and to which other personal fall prevention devices can be attached and which meets the minimum load specifications. OSHA requires lifeline integrity to withstand 5000 lbs. (2300kg) of force per man supported.

Non Routine Job / Task: Where an SOP / SMP is not available or the conditions of the SOP / SMP have changed

Permit-To-Work—the written or printed document that is issued to control working at heights.

Qualified Installer - Any professional, experienced Fall Protection Systems person who has been specifically trained in the installation of lifelines and fall protection systems. (SBU/Site Management and Project Management to provide qualified resources.)

Qualified Inspector - Any person who has been specifically trained to inspect and evaluate the condition of harnesses, lanyards, etc. Completion of the site training course for fall protection certifies an employee as a Qualified Inspector. (SBU/Site Management and Project Management to provide qualified resources.

Retractable Lifeline - A retracting lifeline which allows free travel without slack rope, but locks instantly when a fall begins. These devices must limit the force of deceleration to no more than 800 lbs. (365 kgs) and are only recommended for vertical descent.

Rope Grab - These are automatic lifeline devices which act by inertia to grab the vertical lifeline should a fall occur. Rope Grab shall be ¾" (19mm) synthetic rope or ½" (12mm) wire cable.

Risk: The likelihood (probability) which can lead to potential negative consequences.

Risk Assessment: A systematic and structured process whereby hazards present in a workplace, or arising from workplace activity, are identified, risks assessed / evaluated, and decisions prioritized in order to reduce risks to acceptable levels.

Severity: The level of consequence / harm of an event that could occur due to exposure to the hazard present

Shall: Mandatory requirement

Should: Optional requirement

Shock Absorber – A device used in combination with lanyards that is designed to reduce the force when fall is broken.

Task / Activity: A sequence of steps taken to conduct a job. A task is a sub element of a Job.

Working at Heights — Any work at height of 1.8 meter or more from the ground level or floor. Elevated working positions where the hazard of a fall exists and where there is no physical protection such as handrails. Types of work covered include working from all types of ladders, scaffolds, mechanical lifts, working on transmission towers and conductors, inside confined spaces, sloped roofs, areas where there are no overhead tie-off points, when working within 6 feet (1.8mt) of the edge of a flat roof, erecting steel or installing/replacing roofing and in pipe racks. This does not include normal work on low stepladders, loading platforms, or similar locations.

Work supervisor—a person who is authorized to verify that all conditions for working at heights have been met, to define ongoing precautions to maintain safe working conditions during the work, to authorize the work to occur, and to cancel the permit allowing the work; also known as proprietor, work group supervisor, or authorizing person.

6. PROCEDURES

6.1. General Requirements:

6.1.1. Proper scaffolds and/or temporary work platforms shall be provided for working at height at elevations 1.8 meters or more where no permanent work platform is available to work safely. The elevated work platforms shall have guardrails and provided with ladders for access/egress.

6.1.2. Where it is not feasible to erect scaffolds, suitable hydraulically elevated work platforms or portable platform with wheel locks / chokes and guardrails shall be used.

6.1.3. Ladders shall not be used as work platforms.

6.1.4. Employees or contractors working on unguarded surfaces, steep slopes and similar locations; temporary platform, during scaffold construction; or when otherwise exposed to the possibility of falls hazardous to life or limb, shall be secured by full body harness with double lanyard.

6.1.5. Full body harness with double lanyard shall be worn when work requires persons closer than 1.8 meters from roof edge without parapets, or floor opening.

6.1.6. Full body harness with double lanyard shall be used by persons where work requires persons to move or walk from one place to another for changing work locations at height and where it is not feasible to provide guarded platforms and scaffolds (e.g., pipe racks) so as to ensure one lifeline is always tied with a fixed support.

6.1.7. Persons shall always keep one lanyard anchored/tied with the fixed support while walking/moving on unguarded surface/edges or structures.

6.1.8. Where ever appropriate fixed support is not available to anchor lanyard of full body harness, lifelines certified by qualified inspector shall be used to anchor lanyard.

6.1.9. The intended load shall not exceed the maximum working load of portable work platforms.

6.1.10. Full body harness, lanyard and snap hook, which conform IS standard, (IS 3521: 1999) shall be used. Safety belts are prohibited.

6.1.11. Lanyard shall be attached to the D-ring on the back of the Full body harness between the shoulder straps.

6.1.12. Snap hooks shall be of double locking type.

6.1.13. Fall arresting devices may be used depending on the requirement of situation, i.e. Chimney painting, wall painting, working on the transmission towers, etc.

6.1.14. Anchor points for fall arresting systems must be capable of withstanding a 2300 kgf l per person attached.

6.1.15. Personal Fall Arrest System components shall be visually inspected before each use.

6.1.16. Proper area barricading to prevent people walking across below the working area shall be done before commencing any work at height. If such barricading is not possible, safety net shall be provided and “Work in Progress” boards shall be displayed.

6.1.17. A process shall be in place to ensures employees are medically fit to perform their duties and that their health is not adversely affected by occupational hazards

6.1.18. No working at height shall be carried out without supervision.

6.1.19. Job Safety Analysis (JSA) shall be conducted for Working at Height which includes access & egress from one anchorage point to another anchorage point.

6.1.20. Tata Power Permit-To-Work Procedure shall be followed for all Work at Height.

6.1.21. Working at Height after daylight hours shall be authorized by HOD / Project Head with appropriate control in place.

6.1.22. When performing man lift operations, all personnel in the personnel basket (platform) shall wear a full body double harness (class 3) with the lanyard attached to the man lift or permanent structure. Do not anchor a lanyard with personnel platforms (work baskets)

6.1.23. Temporary platforms and scaffolds should be provided with solid grating (free of openings) and standard guardrails with toe boards attached. Employees working from such completed temporary platforms and scaffolds are not required to wear fall arrest equipment as long as they stay inside the confines of the guardrail system. Scaffolding shall be erected as per Tata Power Scaffolding Procedure

6.1.24. In case of hazard of Honeybees, help from pest control, water spray, steam jet and PVC apron with hood shall be used. Hazard of bird hit and monkey attack is to be considered at high rise tower and prone areas Suitable net/arrangement shall be provided to avoid fall of coconut.

6.1.25. Installation of a Guardrail System around the work area is required for fall protection. Guardrail Systems shall meet the following minimum requirements:

6.1.25.1. Top rail (handrail) shall be 1200 mm from the working surface. Top rails must be capable of withstanding an expected force which may arise while working.

6.1.25.2. Mid rails shall be located midway 600 mm between the top rail and the working surface. The mid rail must be capable of withstanding a force of 70kg.

6.1.25.3. Toe boards should be provided to prevent persons falling off the working surface. Toe boards must be a minimum of 150 mm / 6 inches in vertical height and capable of withstanding 23.00 kg / 50 lbs. of outward force.

6.1.25.4. Screens or panelling from the toe board to the mid or top rail should be required when equipment or material is piled higher than the toe board and is capable of being ejected from the working surface to the level below.

6.1.26. Where gates or openings are required in the guardrail system to facilitate material movement, personal fall arrest or restraint systems shall be used.

6.1.27. All platform / walkway above 1.8 M from floor shall be provided with guardrail system.

6.1.28. Every floor opening into which any person can fall shall be guarded by a standard guardrail system or by a metallic grating duly fixed in position.

6.1.29. Any floor opening, for temporary maintenance work, shall be fixed with proper size cover having sufficient strength.

6.1.30. Fall arrest systems mitigate the consequences of a fall. The system consists of a proven anchor point, connectors, full body harness, and lanyard and deceleration device. The entire system shall be capable of withstanding impact forces involved in stopping or arresting the fall. Consideration must be given to what is below the area of work and what the person may strike during the fall.

6.1.31. Fall Protection system is full body harness with double line lanyard of 1.8 meters length out of which, one has to go to the fixed anchorage and another one for movement. Shock absorbers are preferred to ascertain adequacy of harness in case of sudden fall. Safety nets shall be provided for protecting from

human fall and material fall. Hand tools used while working at height should be securely tied to avoid free fall in case of accidental slippage.

6.1.32. Personal Fall Arrest System components shall be visually inspected before each use.

6.1.33. Whenever it is required to carry out work at height where scaffolding cannot be provided, use of safety net is must.

6.1.34. All safety net systems shall meet the requirements of Indian Standard (IS: 5175).

6.1.35. Safety net mesh openings shall have a maximum size of 6 inches x 6 inches and be secured at each crossing to prevent elongation of the opening. All nets must meet IS: 5175 standard.

6.1.36. Safety nets shall be installed as close as possible to the working level but in no case more than 25 feet below the working level.

6.1.37. The safety nets shall extend out at least 8 ft. from the side of the open edge.

6.1.38. Material, equipment and other items that fall into the net shall be promptly removed.

6.1.39. Safety nets are shall be inspected before use and then daily for wear or damage caused by falling materials.

6.1.40. Safety net installation shall be inspected by the concerned maintenance / construction supervisor.

6.1.41. Lifelines, if used, shallt be of sufficient strength to withstand the large forces involved in falls. Lifelines shall be installed or modified only by Qualified Installers.

6.1.42. When more than one person will be utilizing a lifeline simultaneously, the load allowance of the lifeline shall be increased so as to provide the same level of support as it did while one person was using it. This use has to be approved by qualified person. Requirement for capacity lifeline shall be 2300 kgf per person.

6.1.43. Warning lines should be constructed with rope, chain or wire and installed 30 inches above the working surface. The supporting stanchions (post, pillar, upright support etc.) must be capable of withstanding 7.3 kg of force applied horizontally.

6.1.44. The warning line should be flagged every 1.8 meters with highly visible material.

6.1.45. The warning line should be at a distance of a minimum of 1.8 meters from the roof's edge or fall hazard. Personnel working in the 1.8 meters area between the warning line and the edge shall use a personal fall protection system.

6.1.46. If working from a step ladder, with your feet less than 1.8 meters above the floor, use of fall protection equipment is not required, unless working backwards, then fall protection is required.

6.1.47. If working on a stepladder with your feet 1.8 meters or higher above the floor, fall protection equipment shall be used. If no tie-off point is available, the ladder shall be held by a second person to provide added stability.

6.1.48. Retractable fall arrester shall be used for climbing as well as coming down the ladder where ever it is required. First the retractable fall arrestor shall be fitted and attached while climbing.

6.1.49. Electrical hazard: Portable metal ladders, and wood ladders with metal reinforcements shall not be used for any electrical work or work in substations, switch yards, power plants, or in any area where contact can be made with energized circuits.

6.1.50. Maintenance: Provision shall be made for routine inspection and maintenance of all ladders. Broken or damaged ladders shall be promptly repaired or removed and destroyed. Ladders not found in good working condition shall be promptly removed from service until repaired and restored.

6.1.51. Securing ladders: All ladders shall be placed on firm ground, secured at top and intermediate positions to maintain them rigidly in place and to support the loads imposed upon them.

6.1.52. Restrictions: Ladders will not be used as work platforms or scaffolding or as structured members of scaffolds or walkways. Ladders shall not be used in horizontal position.

6.2. **Straight Ladders, Extension Ladders:**

6.2.1. Rung spacing shall not be more than 30 cm.

6.2.2. All metal parts or fittings of Ladders shall be made of steel, wrought iron, malleable cast iron or other equivalent material.

6.2.3. Landing platforms shall be provided every 9 m.

6.2.4. Monkey ladder to cage strip clear distance shall be more than 70 cm.

6.2.5. If monkey ladder length is more than 8' to 10', cage guard shall be provided.

6.2.6. Ladder shall rise 1 m above stepping point.

6.2.7. Snap chains shall be provided at the end of landing platform and the ladder.

6.2.8. If working with your feet 6 feet (1.8 meters) or more above the floor, harnesses shall be used whenever a suitable anchor point is available.

6.2.9. Straight Ladders and extension ladders will be tied off at the top. A co-worker shall always hold straight ladders and extension ladders while the ladder is being tied off. The person on the ladder shall attach their lanyard to the anchor point first before tying off the ladder itself.

6.2.10. If a straight ladder or extension ladder is being used for access to a work area (as opposed to working from the ladder) where frequent trips up the ladder will be made, consideration shall be given to providing fall protection such as a retractable lifeline or rope grab for those climbing the ladder.

6.2.11. Face the ladder when working from it. When it is not possible to work facing a ladder or when performing some task requiring both hands, fall protection should be worn and properly anchored.

6.2.12. Ladder shall be placed in such a way that it bottom should be away from wall equal to ¼ th of the working height. (At least 75 deg. to the floor).

6.2.13. Ladder shall extend 3 feet to 4 feet above the point of Landing and topmost 3 rungs shall not be used.

6.3. **Rope Ladders:**

6.3.1. The diameter of manila rope shall not be less than 25 mm.

6.3.2. Wooden planks forming steps shall not be less than 38 mm thick.

6.3.3. Rope ladder made of 12 mm nylon rope with 25 mm dia. fluted aluminum pipes and with the provision of stop hook at the free end are also available.

6.4. **Scaffolds:**

6.4.1. Fall protection is required whenever working from scaffolds 6 ft (1.8 meters) or higher above the ground or floor level that have incomplete standard handrails (42" high) or standard mid-rails (21" high) or is not completely decked.

6.4.2. Fall protection is required whenever working outside the plane of the handrails or if working against the handrails with awkward body position. Personnel shall not climb on, or work from, any scaffold handrail, mid-rail, or bracing member and shall use ladders to get into the scaffold.

6.4.3. On scaffolds of 12 feet (3.6Mt) or higher, fall protection shall be considered for those climbing the scaffold ladder (based on number of people on scaffold, number of climbs per day, etc). Consideration should be given to the amount of risk associated with installing the equipment versus the risk involved in climbing the ladder without fall protection

6.4.4. Fall protection may be required when climbing scaffolds of less than 12 feet if there is an unusual hazard, such as a scaffold next to the edge of an elevated work area.

6.4.5. Fall protection shall be used while building scaffolds. Where practical, a retractable lifeline should be used to protect those building scaffolds but is not permitted to be attached to the scaffolding due to the side force thrust hazard. Double lanyards should be used in this case so that the person may maintain continuous tie-off.

6.4.6. If tying off to scaffolds, the stability of the scaffold must be considered. If the scaffold does not have stability for anchorage, it should be tied off to a permanent structure or fitted with outriggers to increase stability.

6.4.7. Persons shall not be allowed to work on scaffolds during storms or high winds.

6.5. **Self-retractable Lifelines:**

6.5.1. Self-Retractable lifelines can be used as a method of providing vertical lifelines for ladders, scaffolds, etc. Self-retracting lifelines and lanyards that automatically limit free fall distance to 2 feet or less shall be capable of sustaining a minimum tensile load of 1360kg applied to the device with the lifeline or lanyard in the fully extended position.

6.6. **Flat roofs, slopping roofs, fragile roof:**

6.6.1. Flat roofs: All roofs in horizontal plane, not fragile in nature. For any job within six feet from the edge of the roof, use of lifeline on any fixed structure for anchoring the lanyard is must. Warning signboards shall be displayed all around. Access to the flat roof shall be provided if not existing in the absence of staircase

6.6.2. Fragile roofs: Crawling ladders must be used while working on the fragile roofs. Proper fall arrest system must be ensured

6.6.3. Slopping roofs: Before working on a slopping roof ensure anchor points are available for fixing of lifeline, if not provided at design stage.

6.7. **Structure Erection/ Special Structure:**

6.7.1. Fall protection is required whenever working in an elevated work area 6 ft or higher above the floor, where handrails do not exist.

6.7.2. Double lanyards should be used to provide continuous tie-off while moving along pipe racks, cable trays, etc.

6.7.3. Lanyard length should be kept as short as practical to limit the potential all distance. This is accomplished by utilizing a tie-off point overhead and not below the waistline

6.7.4. While working in pipe racks, etc., if no overhead tie-off point is available, the lanyard should be tied off at foot level and all movement must be done by crawling. "Walking the pipes" is not permitted if no overhead tie-off point exists. If "Walking the pipes" is utilized, the material of construction, diameter, wall thickness and integrity best be evaluated to assure pipes will support the load.

6.7.5. When working on roofs, fall protection equipment shall be used when working less than 6 feet (1.8Mt) from roof edges, unless roof edges are protected by a Protective Barricade. Additionally, any work on a sloped roof requires fall protection on Pipe racks and cable trays, tank roofs, lighting towers,Tank Roofs:

6.7.6. Standing, walking or working on the tops of tanks/vessels with standard handrails and toe boards are only allowed when the following conditions are met:

a. The tank/vessel inspection, inspection documentation is reviewed and is current.

b. The tank/vessel must be capable of supporting the intended load (personnel, tools, etc.) particularly Acid and Caustic storage tanks and corrosive tanks & vessels.

c. If it is necessary to stand, walk, or work on the top of a vessel or tank in order to build scaffolding or a working platform, all of the provisions in this section must be met before building it.

6.8. **Insulation and painting jobs at height:**

6.8.1. For work involving painting jobs on equipment, pipelines, structures, buildings, walls/ surfaces, roofs and insulation jobs on equipment / pipelines requiring persons to work from elevations 1.8 meters or more from ground having risk of injuries due to fall, proper scaffolds or portable hydraulically elevated work platforms shall be provided and used, if there is no permanent provision is available to work safely.

6.8.2. Nobody shall take any supports on small bore piping (less than 2 inch NB) and on Non-metallic piping/fixtures. Ladders and other make shift devices shall not be used for painting and insulation jobs.

6.9. **Confined space at height:**

6.9.1. While working in confined space at height use of rescue harness and self-retractable full body harness is must.

6.9.2. Painting outside the building more than 15 meters Addition communication system shall be established before start of work. Work and rescue plan shall be prepared before start of work.

6.10. **Loading and unloading of road tankers:**

6.10.1. Jacket with fall protection shall be used while working on tankers and trucks, Bucket trucks and lifts

6.10.2. When working from man lifts, scissor lifts, bucket trucks, or other similar equipment, tie-off is required. Most such devices have internal tie-off points and these should be used

6.10.3. A team (comprising line manager and operators) shall carry out structured risk assessment i.e. Job Safety Analysis (JSA) for all the specific and / or one-time jobs.

7. RECORDS :

7.1. Safety Harness And Lanyard Inspection Check List (TPSMS/CSP/WAH/004/FORM/001)- Retention period three years

7.2. Ladder Inspection checklist (TPSMS/CSP/WAH/004/FORM/002) – Retention period three years

8. TRAINING & COMMUNICATION

8.1. It is mandatory that all the The employee required to carry out any activities which includes, working, supervision, inspection, audit etc. shall go through the Working at Height training prior to commencement of activity.

8.2. Initial Communication to be done through Corporate Communication, Email and subsequently shall be made available at safety portal at Sangam.

9. VERIFICATION

9.1. Verification of implementation shall be done during Work at Height audit, field safety visit and site inspections.

10. EXCEPTIONS: Any Exception to this procedure shall only be done as per Document Control .Procedure (TPSMS/GSP/DC/014)**.**

11. REVIEW: Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

12. REFERENCES

- Tata Power Permit-To-Work (PTW) procedure
- IS: 3521 –1999- Industrial Safety Belts and Harnesses
- IS: 3696 (Part II) –1987 Safety Codes for Scaffold and Ladders
- IS: 5175 - Safety Net Systems.

13. ATTACHMENTS/APPENDIX :

13.1. Annexure - 1 : Sample format for full body Harness and Lanyard Inspection Check List (TPSMS/CSP/WAH/004/FORM/001)

13.2. Annexure- 2 : Sample Format Ladder Inspection Check List (TPSMS/CSP/WAH/004/FORM/002)

Annexure- 1

TPSMS/CSP/WAH/004/FORM/001

Inspection checklist – Full body Harness

Make/Model :		Manuf. Date/Year :		
Contractor name :		Date of Insp:		
Sr No	Description	OK	Not OK	NA
1	**VISUAL INSPECTION**			
	Harness belts and seams			
1.1	Manufacturer identification well readable			
1.2	Full body harness complete in all respect			
1.3	Harness having ISI or CE mark			
1.4	No fissures, wear or twisted straps, seams open			
1.5	Harness not soiled/damaged by chemical, paints etc			
1.6	No change in harness strap due to heat(eg welding heat)			
	Metal Fittings			
1.7	Waist buckle: No deformation corrosion.			
1.8	Both leg strap buckle: No deformation corrosion.			
1.9	Metal D ring at Back for lanyard , no damage , corrosion			
1.10	Check any other metal fitting provided			
1.11	Any other obs.:			
2	**FUNCTIONAL TEST**			
2.1	Check all buckle by inserting and pulling			
2.2	Harness shelf life not expired or manufacturing date within three years			
3	**INSPECTION RESULTS**			
3.1	Harness safe for use			
3.2	Harness rejected and destroyed beyond use			
Remarks :				
	Inspection By (Name & Signature)			
	General Instructions:			
1 2 3 4	Inspection checklist to be filled for each Harness by Authorized person Checking to be done every three month, Records shall be maintained for last 1 year Tick in appropriate column, mark NA for checks not applicable Provide appropriate inspection tag / Stickers			

Annexure- 1

TPSMS/CSP/WAH/004/FORM/001

Inspection Checklist – Full body Harness

Make/Model :			Manuf. Date/Year :	
Contractor name :			Date of Insp:	
Sr No	Description	OK	Not OK	NA
1	**VISUAL INSPECTION**			
	Lanyard Rope			
1.1	Manufacturer identification well readable			
1.2	Lanyard complete in all respect with two hooks			
1.3	Lanyard having ISI or CE mark			
1.4	No fissures wear or twisted straps.			
1.5	Lanyard not soiled/damaged by chemical, paints etc			
1.6	No change in rope strap due to heat(eg welding heat)			
1.7	End of ropes secured. Splices in place if provided.			
	Shock / Energy Absorber packet			
1.8	No fissures in the protective sleeve or in lanyard.			
1.9	Seams between shock absorber, lanyard and hooks intact. No sign of opening of stitches			
1.10	Shock absorber has not yet released			
	Snap hooks (all)			
1.11	No fissures, deformation or corrosion			
1.12	Scaffold hook mouth opening of 50 mm			
2	**FUNCTIONAL TEST**			
2.1	Snap hook can be only opened by pushing the safety lever. It automatically snaps when lever is released.			
2.2	Lanyard shelf life not expired or manufacturing date within three years.			
3	**INSPECTION RESULTS**			
3.1	Lanyard safe for use			
3.2	Lanyard rejected and destroyed beyond use			

Remarks :

	Inspection By (Name & Signature)
	General Instructions:
1 2 3 4	Inspection checklist to be filled for each Harness by Authorized person Checking to be done every three month, Records shall be maintained for last 1 year Tick in appropriate column, mark NA for checks not applicable Provide appropriate inspection tag / Stickers

Annexure- 2

TPSMS/CSP/WAH/004/FORM/002

Inspection Checklist for Ladder

Plant/ Location: _____

Ladder Tag No ……

Sr. No.	Checks	Remarks
1	Rail/strings Damaged (cracks, deformation etc.)	
2	Rung broken	
3	Rung missing	
4	Rungs clean	
5	Rung distance uneven	
6	Bottom non-skid pad damaged/missing	
7	Top hook damaged/missing	
8	Rungs loose	
9	Non-slip bases	
10	Any other, (specify).	

Inspected By:

Name: _____ Designation:_____ Sign:_____ Date: _____

Reviewed By:

Name : _____Designation: _____Sign: _____Date: _____

Heavy Equipment Movement Safety Procedure

Rev No.	Reason for Revision	Prepared By	Checked By	Approval by
Rev 00	First release	R&P Subcommittee	D Kamath	Vijay Chourey
Rev 01	Standardization of procedure	Arnav Mukherjee (Head - EMD & IMD Haldia)	Navendra Singh (Group Head – P & CB; Corp Safety.)	Vijay Chourey (Chief – Corp Safety)

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1. OBJECTIVE:

Objective of this procedure is to cover the safe practices required for heavy equipment lifting and movement. This procedure is developed to establish mandatory requirements for practices to protect personnel from hazards associated with heave equipment movement activities.

2. SCOPE:

This procedure applies to all operating plants and project sites of Tata Power Group companies.

3. EXPECTED RESULTS:

3.1. Manage jobs related to Heavy Equipment movement being done safely.
3.2. Control of incidents related to Heavy Equipment movements.
3.3. Compliance to Regulatory requirements related to Heavy Equipment Movement.

4. ACCOUNTABILITY & RESPONSIBILITY:

4.1. ACCOUNTABILITY: Concerned Division's Heads/Assets Custodian.
4.2. RESPONSIBILITY: Concerned Engineer/s

5. GLOSSARY/ DEFINITIONS:

Approver: Location Manager in charge of plant/dept. Authorized shall be as Per the permit to work procedure.

Attachment description - List type of slings; belts, wire ropes, chains, shackles etc. to be used to attach the load, if required make a simple sketch under lift description.

Anti-two-blocking device - a device that, when activated, disengages all crane functions whose movement can cause two-blocking.

Abnormal operating conditions—Environmental conditions that are unfavorable, Harmful, or detrimental to the operation of a mobile crane (e.g., excessively high or low ambient temperatures, exposure to weather, corrosive fumes, dust-laden or Moisture-laden atmospheres, and hazardous locations).

Competent Person - One who, by possession of a recognized degree, certificate, or professional standing and certified by government authority.

Critical lift—A lift using an Mobile crane where, because of the characteristics and properties or travel path of the load, a hoist failure or loss of control of the load could result in a serious personal injury, serious environmental incident, serious process safety incident, or significant disruption to operations.

Capacity loading - It will be calculated by dividing the total weight with the safe workload at lift radius. It shall not exceed 85%. For capacity loading above 85% a lifting plan is required. No capacity loading above 100% shall be allowed, equal to 90% of load test. If Safe Load Indicator is not installed the capacity loading shall not exceed **60%;** if above a lifting plan is required. For lifting personnel the capacity loading must be below 50%.

Eccentric Load - Load center of gravity does not correspond to the geometrical center, e.g. an unevenly loaded container. In case of eccentric load for heavy loads, say above 2 T, center of gravity should be calculated and lifting points defined accordingly. For light loads the most practical is to determine the center of gravity by trial and error without lifting the load completely off the ground.

Hazard Identification & Risk Assessment - Hazard Identification & Risk Assessment is to identify and evaluate the hazards, Risk and put controls measures for safe execution of activities.

Hazard - Source or situation with potential for harm, something that can cause body injury / occupational illness, damage company property.

HIRA - Hazard Identification and Risk Assessment

Intended load = Dead load + Live load + wind load + Dynamic load.

Job - A piece of physical work defined by time or other limits and that has a clear start and end point.

JSA - Job Safety Analysis

Job Safety Analysis: Job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job. In a JSA, for each basic step of the job, it is to identify potential hazards and to recommend the safest way to do the job.

LEL - Lower Explosive Limit

LOTO - Lock Out Tag out

Load - Weight of load can be from equipment data sheet, marking on packing, marking on pipe spool, calculation (add 15% allowance for inaccuracies) or weighing. Guessing the weight of the load is not allowed. Crane user shall maintain record of how the weight was derived until the lift is successfully completed.

Length x Width x Height (LxWxH) - Is required for bigger equipment for deciding lifting radius and lifting height. For bigger surface, say above 25 m2, also wind loads need to be considered. For small pipe spools, valves etc. this data is not required.

Lift Radius - Maximum horizontal distance between the point at which the center of crane rotation meets the ground and the vertical centerline passing through the load lifting attachment.

Lift Height - The height above the setting of the crane that the load must be lifted to. To derive at the boom height the length of hook, slings and load must be added as well as some free space above any equipment the load will be slew over.

Non Routine Job / Task: Where an SOP / SMP is not available or the conditions of the SOP / SMP have changed

PPE - Personal Protective Equipment

PTW - Permit to Work

Periodic Inspection - Detailed safety and maintenance inspection performed by a qualified person to verify compliance with the provisions of legal requirements.

Risk - The likelihood (probability) which can lead to potential negative consequences.

Risk Assessment - A systematic and structured process whereby hazards present in a workplace, or arising from workplace activity, are identified, risks assessed / evaluated, and decisions prioritized in order to reduce risks to acceptable levels.

Rated load (capacity) - the maximum load designated by the manufacturer for which an individual hoisting system component is designed and built.

Shall - Mandatory requirement

Should - Optional requirement

SHE - Safety, Health and Environment

Severity - The level of consequence / harm of an event that could occur due to exposure to the hazard present.

SWL - Safe working load

Safe Workload at lift radius - Will be derived from the selected Crane Load Chart for the calculated lift radius and boom length. Adjustment shall be done in relation to valid load test and only 85% of the load test value shall be considered as safe workload.

SLI - Safe Load Indicator, it is a system which cut-off all the unsafe crane operations if overloaded and anti two blocking comply.

Safe access route - to the place for the crane set up shall be checked with SS or SFE. Ensure that ground can carry the load of the crane. If soil is soaked with water the loading capability is significantly reduced. Check for underground cables and pipes as well as vicinity to any above ground obstructions like fire hydrants, firewater valves and pits. Ensure that trailer bringing the load also has a safe access, not blocked by the intended set up of the crane.

Standard lift - If load to be lifted weighs less than 15 ton, it is a standard lift. The crane user is required to complete “Mobile Crane Planning & Risk Assessment Checklist”.

Two-blocking - The condition in which the lower load block or hook assembly comes in contact with the upper load block or boom point sheave assembly. (Condition under which the load block or load suspended from the hook becomes jammed against the crane structure preventing further winding up of the hoist drum).

Total weight - It is the sum of the weight of the load and weight of hook block, slings and attachment.

Task / Activity - A sequence of steps taken to conduct a job. A task is a sub element of a Job.

Weight of hook block, slings and attachments shall be derived from crane load chart and tables for slings.

6. PROCEDURES:

6.1. Manual hoisting systems: This section describes the safety features for all new and existing manually powered chain hoists and lever-operated hoists.

6.1.1. New Manual Hoisting Systems Installation: All new manual hoisting systems shall meet the following mandatory requirements:

6.1.1.1. **Rated Load** - The rated load shall be marked on each hoist or lifting device and on the trolley if the hoist is hook-mounted (i.e. easily detached). These markings shall be clearly legible from the operating floor.

6.1.1.2. **Load Test** – The initial load test of manual hoisting systems will be 1.5 times the rated load. All subsequent tests of new hoisting systems and hoists with modified or altered load-suspension parts shall be load-tested before being placed in normal service. The load test shall not be less than 100 percent or more than 125 percent of the rated load unless recommended by the manufacturer or a competent person or regulatory requirements.

6.1.1.3. **Overload Limiting Devices** - Chain hoists and lever-operated hoists used for overhead lifting or drifting of loads shall be equipped with automatic overload devices to prevent lifting over capacity loads. The overload limiting device shall not exceed load test limit of the hoist's capacity. Lever-operated hoists shall have either a slip clutch overload limiting device or an overload-sensing lever handle.

6.1.1.4. **Load brakes** - Chain hoists and lever-operated hoists used for overhead lifting or drifting shall be equipped with an independent mechanical load brake to control the lowering of the load and to stop and hold a rated load. For lever-operated hoists, simple ratchet-and-pawl type brakes shall not be used for hoisting applications because of the risk of sudden or uncontrolled load drop if the ratchet-and-pawl mechanism fails.

6.1.1.5. **Trolley Safety lugs/rail sweeps** - Where hoists are mounted on trolleys, the trolley shall be equipped with safety lugs/rail sweeps, which protect against load drop in the event of wheel axle failure.

6.1.1.6. **Roller chain and wire rope hoists** - Roller chain hoists and wire rope lever-operated hoists shall not be used in overhead hoisting systems.

6.1.2. Existing manual hoisting systems, installation

6.1.2.1. With the exception of overload-limiting devices, all existing manual hoisting systems shall meet all mandatory requirements for new systems. Existing hand-operated chain hoists not equipped with an overload-limiting device shall only be used under the following conditions:

6.1.2.1.1. The hoist shall be used under strict administrative controls that prohibit the hoist from being placed in any over-capacity condition.

6.1.2.1.2. The hoist shall be labeled with a permanent tag to indicate the absence of an overload-limiting device.

6.1.2.1.3. The hoist shall not be used to conduct a critical lift.

6.2. Electrical and Air Powered Overhead Hoists and Cranes:

This section describes safety features for all new and existing, overhead-supported, Powered hoists.

6.2.1. New electrical and air-powered hoisting Systems Installation

6.2.1.1. All new electric and air-powered hoist and crane installations must meet the following mandatory requirements. For precise movement and control two speed hoists shall be used.

6.2.1.2. ***Rated load*****:** The rated load shall be marked on each hoist or lifting device and on the trolley if the hoist is hook-mounted (i.e., easily detached).These markings shall be clearly legible from the operating floor and markings shall be on both sides for top-running cranes.

6.2.1.3. ***Load test*****:** All new hoisting systems and hoists and cranes with modified or altered load-suspension parts shall be load tested. The initial load test of electric or air powered hoisting systems will be 1.5 times the rated load. All subsequent load tests shall not be less than 100 percent or more than 125 percent of the rated load unless otherwise recommended by the hoist manufacturer or a competent person or regulatory authorities.

6.2.1.4. ***Overload limiting device***: Powered hoists shall be equipped with an overload-limiting device to prevent the hoist from lifting over-capacity loads. The overload limiting device shall not exceed the test load limit of the hoist's rated load for electric/electronic load cell or mechanical devices. For air-powered hoists, this mandatory requirement for an overload-limiting device can be satisfied if the hoist is equipped with an air motor that shall not exceed of the rated load at standard operating pressure.

6.2.1.5. ***Dual braking system***: Powered hoists shall be equipped with dual braking systems. All hoists must be equipped with a primary brake. A second braking system shall be one of the following:

6.2.1.6. An independent mechanical load brake that controls the lowering of the load and stops and holds a rated load if the primary brake fails;

6.2.1.7. Self-locking worm gear (40:1 ratio), which acts as an additional braking system because the self-locking worm feature acts as a holding brake.

6.2.1.8. Trolley safety lugs/rail sweeps: Trolleys and crane end trucks shall be equipped with safety lugs/rail sweeps to prevent the load from dropping if the trolley or end truck wheel axle fails.

6.2.1.9. Roller chain: Roller chain hoists shall not be used for overhead hoisting systems.

6.2.1.10. "Dead man" controls: All powered hoists and cranes shall be equipped with "dead man"- style controls that, when released, return to the off position and stop powered motion.

6.2.1.11. Clearly marked control station device: All pushbuttons shall have clear, legible markings to indicate all control station equipment functions.

6.2.1.12. Upper final limit device: All wire rope hoists shall have an upper final limit device to stop the upward hoisting motion beyond safe limits. For electric powered wire rope hoists, this upper final limit device is typically a weight or paddle upper limit switch. This switch shall be connected to open the mainline contactor in the motor feed circuit. A reset button must bypass the limit switch contact to provide the means of re-closing the contactor. This reset button shall immobilize the upward motion and allow the load to be safely lowered. It is preferred that the reset button be located in the control enclosure.

6.2.1.13. Over-travel protection: All chain hoists shall be designed and constructed so that the load hook shall not exceed the upper limit of travel.

6.2.1.14. Geared limit device: All powered wire rope and chain hoists shall be equipped with geared limit devices that prevent over travel while either raising or lowering the hook or load.

6.2.1.15. If an air-powered chain-hoist is equipped with physical chain stops that prevent chain over travel and a load-limiting device, then geared limit devices are not required. A permanent tag indicating the absence of a geared limit device shall be attached to any hoist without geared limit devices.

6.2.1.16. Trolley and crane bridge travel limit devices: Motorized trolleys and motorized crane bridges shall be equipped with travel limit devices to stop travel motion before the trolley or bridge strikes the end stops.

6.2.1.17. Mainline contactor: Electric powered hoists and cranes shall be equipped with a magnetically operated mainline contactor that interrupts power to all motors and is energized from the pendant pushbutton station. Momentary pressure on the Push button shall de-energize the mainline contactor.

6.2.1.18. Electrical grounding conductor: Electric hoists shall have a dedicated electrical grounding conductor in the electrification and control system to positively ground or earth all equipment.

6.2.2. Existing electric and air-powered hoisting systems, installation

6.2.2.1. All existing electric and air-powered hoist and crane installations must meet either the mandatory requirements for new installations.

6.2.2.2. If an electric chain hoist has a defective or damaged mainline contactor or if an electric powered hoist has a defective or damaged geared limit device or if any.

6.2.2.3. hoist does not have operable dual brakes (e.g. one brake is defective or damaged), then the following steps must be done:

6.2.2.4. Operator or Field Engineer must notify the Site/Project Manager of the abnormal condition immediately.

6.2.2.5. The damaged or deficient hoist or crane shall not be used. The damaged or deficient hoist or crane must be repaired and verified by field engineer.

6.2.2.6. Mainline contactor (chain hoists) administrative controls – All existing electric chain hoists without slip clutch overload protection shall be retrofitted with a mainline contactor circuit. All electric chain hoists with slip clutch overload protection, but without a mainline contactor, shall be equipped with a permanent tag indicating the absence of the mainline contactor.

6.2.2.7. Any electric chain hoist with slip clutch overload protection, but without a magnetic mainline contactor circuit, shall have an electric powered manual disconnect switch that is within sight of the hoist and accessible to the operator.

6.2.2.8. Administrative controls shall be employed to help ensure that the operator knows the location of the manual disconnect switch.

6.2.2.9. Mainline Contactor: Electric powered hoists and cranes shall be equipped with a magnetically operated mainline contactor that interrupts power to all motors and is energized from the pendant pushbutton station. Momentary pressure on the Push button shall de-energize the mainline contactor.

6.2.2.10. Geared limit device administrative controls - All electric powered hoists without geared limit devices shall employ administrative controls to help ensure that the upper final limit device or over travel protection is not used as a routine upper travel limit. A permanent tag indicating the absence of a geared limit device shall be attached to the hoist.

6.2.2.11. Dual brake deficiency - All hoists without an approved secondary braking system shall employ administrative controls to prevent the hoists from being used in critical lifts in which an uncontrolled load drop could cause a serious injury or incident. These hoists shall be equipped with a permanent tag indicating the absence of a secondary braking system. The administrative procedures are meant to keep personnel away from the load during hoisting operations and prevent the hoist from being used for critical lifts.

6.3. Overhead Hoisting Monorails Installation:

Important safety features for overhead hoisting monorails include the following:

6.3.1. Monorail end stops - All monorails shall have permanent end stops provided at the extremes of hoisting equipment travel.

6.3.2. Switches, turnarounds, lift sections, and other monorail track ends shall be provided with automatic safety stops to prevent trolleys from rolling off open ends.

6.3.3. Where a section of track must be opened to allow for the closing of fire doors, automatic track openers shall be provided. These devices must be so constructed that the closing of the door (i.e., manually or because of a fusible link's parting) opens the track and allows the door to close tightly. Track safety stops shall be automatically placed and retracted as the track is opened and closed.

6.3.4. Monorail extension modification - Whenever a monorail is extended, it shall be designed to carry the design load of the original system. The track sections must be compatible to help ensure that the trolleys do not slip off the different track sections.

6.3.5. Rated load markings - The rated load shall be marked on the monorail, and the markings shall be clearly legible from the operating floor. For lifting lugs that support hoisting equipment, the rated load shall be marked on the lug or in close proximity to it and shall be clearly legible from the operating floor.

6.3.6. Load test - All new monorails and recently modified or altered monorails shall be load-tested before being placed in normal service. The initial load test of the monorail will be 1.5 times the rated load. All subsequent load tests shall not be less than 100 percent or not more than 125 percent of the rated load unless recommended by the manufacturer or a qualified person.

6.3.7. The load test must be in line with the requirements of the statutory agency.

6.3.8. Multiple hoists on a single monorail - If multiple hoists are used on a single monorail, the sum of the hoist capacities should not exceed the marked monorail rated load. Where this is impractical, strict administrative control and proper hoist operating instructions shall be provided to prevent overloading of the monorail.

6.4. Inspection:

6.4.1. Initial inspection: Prior to initial use, all new, reinstalled, altered, or modified overhead hoisting systems shall be inspected by the Competent person to verify compliance with the applicable provisions of this standard. Records of inspections shall be maintained.

6.4.2. Inspection procedure for overhead hoisting systems: The inspection frequency for overhead hoisting systems in regular service is divided into two general classifications based on the service frequency of the hoist or crane.

The service frequency affects the nature of the critical components of the hoisting system and the degree of their exposure to wear, deterioration, or malfunction.

6.4.3. Inspections shall be done by the operator at prior to use every day.

6.4.4. Inspections shall be done by competent person every year as per legal requirements.

6.4.5. Preventive Maintenance: A preventive maintenance program shall be established and based on the equipment manufacturer. Dated records should be kept. Replacement parts shall be, at least, equal to the original manufacturer's specifications.

6.4.6. Maintenance procedure: Before adjustments and repairs are started on a hoisting system, the following precautions shall be taken:

6.4.6.1. If a load is attached to the hoisting system, it shall be removed.

6.4.6.2. If the hoisting system is electrical- or air-powered, all controllers shall be placed in the "off" position.

6.4.6.3. If the hoisting system is electrical- or air-powered, a lockout/tag out procedure shall be performed.

6.4.6.4. Any crane or monorail carrier shall be moved to a location in which it causes the least interference with other cranes or carriers on the system and operations in the area.

6.4.6.5. Effective warning signs and barriers shall be used where the maintenance work creates a hazardous area on the floor below the hoisting system.

6.4.6.6. Where other cranes or carriers are in operation on the same runways or monorail track, rail stops or a signal person shall be provided to prevent contact with the idle equipment.

6.4.6.7. Where runways are adjacent to the crane runway of the crane being repaired, and the center runway or center repair platform, or both becomes a work area that is not protected by wire mesh or other suitable protection, or if any hazard from the adjacent operations exists, the adjacent runway must also be restricted.

6.4.6.8. When cranes must operate on adjacent runways and through the restricted area, a signal person shall be provided.

6.4.6.9. All cranes shall come to a full stop prior to entering the restricted area and then are permitted to proceed through this area on a signal from the signal person.

6.4.6.10. If the hoist is suspended from a trolley, provisions should be taken to prevent movement of the trolley.

6.4.6.11. After adjustments and repairs have been completed and before the hoist is restored to normal operation, the following steps shall be taken:

a. Guards shall be reinstalled.

b. Safety devices shall be reactivated.
c. Parts that have been replaced and loose material shall be removed.
d. Maintenance tools (including hand tools) and equipment shall be removed.
e. Warning signs and barriers, when used, shall be removed.
f. Warning signs and barriers, when used, shall be placed and removed only by designated persons.

6.5. Operation:

6.5.1. Operators of overhead hoisting systems: Hoisting systems shall be operated only by the following personnel:

a. Qualified operators,
b. Maintenance and test personnel, when hoist system operation is performed as part of their duties and they are qualified operators,
c. Inspectors of hoisting systems who are qualified operators.

6.5.2. Operators shall attend formal training or instructions on the operation of the specific hoisting device or crane. Attendance shall be recorded. Operators shall be required to pass a practical operating examination. The practical operating examination must include actual operation of the specific hoisting device or crane in the presence of an experienced supervisor or qualified person who will verify the competence of the operator under examination. Successful "pass" of the examination shall be recorded. Failure requires repeat training and re- examination until "passing" mark is obtained.

6.5.3. Qualifications shall be limited to the specific type of equipment for which the operator was examined and passed. If an operator has not operated a specific type of equipment in the previous 12 months, he or she shall be re-qualified.

6.5.4. Before operating a hoisting system

6.5.4.1. The operator shall be familiar with all operating controls including remote control unit of the hoisting system and be instructed in the operation(s) to be performed. Instructions shall include, as applicable, the warnings on the hoist, the hoisting practices listed in this section, and the operation instructions portion of the manufacturer's manual.

6.5.4.2. If adjustments or repairs are appropriate or any defects are known, the operator shall report this promptly to the designated person.

6.5.4.3. The following restrictions shall be observed:

6.5.4.3.1. The operator shall not operate a hoisting system that bears an out- of-order or "do not operate" sign.

6.5.4.3.2. The operator shall not adjust or repair a hoisting system unless qualified to perform maintenance on it. Only a qualified maintenance person from OEM (Original Equipment Manufacturer) shall perform repairs to a hoisting or crane system.

6.5.4.3.3. The chain or rope shall not be used as a ground for welding.

6.5.4.3.4. A welding electrode shall not be touched to the chain or rope.

6.5.4.3.5. Hand-chain-operated hoists shall only be operated with hand power with no more than one operator operating each hand chain.

6.5.4.3.6. Manually operated lever hoists shall not be operated with an extension on the handle.

6.5.5. Applying the load: The following mandatory requirements shall be in effect when the load is applied:

6.5.5.1. The hoist rope or chain shall not be wrapped around the load.

6.5.5.2. The load shall be attached to the load hook by suitable means.

6.5.5.3. The sling or other device shall be properly seated in the base (i.e., bowl or saddle) of the hook. The hook latch shall not be allowed to support any part of the load.

6.5.5.4. The load shall not be applied to the point of the hook.

6.5.5.5. Before moving the load, the operator shall ascertain that chains or wire rope are not kinked or twisted or that multiple part chains or ropes are not twisted about each other.

6.5.5.6. The hoist shall not be operated unless the rope or chain is seated properly on the drum, sheaves, or sprockets.

6.5.5.7. Hoisting systems shall not be operated unless the hoist unit is centered over the load, except when authorized by a qualified person who has determined that the components of the hoist and its mounting would not be overstressed. If a load that is not centered under the hoist unit is to be picked up, precautions shall be taken to control the swing of the load when it is picked clear of its supports.

6.5.5.8. The operator shall not pick up a load in excess of the rated load for any of the individual hoisting system components (hoist, trolley, monorail, crane, lifting lug). A hoist overload-limiting device shall not be used to measure the maximum load to be lifted.

6.5.5.9. Specific attention should be given to balancing of the load and hitching or slinging to prevent slipping of the load.

6.5.6. Moving the load: The following mandatory requirements shall be observed when moving a load.

6.5.6.1. The operator shall not engage in any activity that diverts the operator's attention while operating the hoist. The operator shall be focused only on proper lifting operation.

6.5.6.2. The operator shall respond to signals from the designated person only.

6.5.6.3. However, the operator shall obey a stop signal at all times, no matter who gives it.

6.5.6.4. The operator shall not lift or lower a load with the hoist until the operator and all other personnel are clear of the load.

6.5.6.5. The operator shall be very clear about the path of the load to be travelled .Any obstruction in the path shall be identified and removed before starting movement of the load

6.5.6.6. The operator shall determine that there is adequate clearance between the load and hoisting system and all obstacles before moving or rotating the load.

6.5.6.7. The operator shall inch powered hoists slowly into engagement with a load. The operator should minimize inching and avoid quick reversals of direction.

6.5.6.8. A load shall not be lifted more than a few inches until it is well balanced in the sling or lifting device.

6.5.6.9. The place where the load is going to park should be checked for its levelness and strength in order to avoid imbalance while parking either in the vehicle or ground.

6.5.6.10. Each time a load approaching rated load is handled, the operator shall check hoist brake action by lifting the load clear of supports and continuing only after verifying that the brake system is operating properly.

6.5.6.11. On rope hoists, the load shall not be lowered below the point where less than two wraps of rope remain on each anchorage point of the hoist drum, unless a lower limit device is provided. In this case, no less than one wrap should remain on each anchorage point of the hoist drum.

6.5.6.12. The operator shall not carry loads over people at any time.

6.5.6.13. Personnel shall not be carried on the hook or the load at any time.

6.5.6.14. The operator shall avoid swinging the load or load hook when traveling the hoist.

6.5.6.15. On trolley mounted hoists contact between trolleys or between trolleys and stops should be avoided.

6.5.6.16. The operator shall not use the upper (or lower, if provided) limit device(s) as a normal means of stopping the hoist. These are emergency devices only.

6.5.7. Parking the load:

6.5.7.1. The operator shall not leave a suspended load unattended.

6.5.7.2. The load block should be positioned above head level for storage when not in use.

6.5.7.3. Care shall be exercised when removing a sling from under a landed and blocked load. The person who is removing the sling shall protect himself with appropriate PPE and position himself to avoid being struck or pinched by the sling.

6.5.8. Limitations on Lifts: Lifts in excess of the rated load shall not to be performed at any time.

6.5.9. Critical lifts: Every critical lift shall have a completed critical lift plan. Critical lift best practice for overhead crane equipment is attached in Annexure - 1.

7. Records:

7.1. Daily/Periodic Hoist/Monorail Inspection Forms (TPSMS/CSP/HEMS/005/FORM001, 002 & 003) - Retention - One (1) years

7.2. Annual Checklist / Form filled by competent person as per Factory Act - Retention – Three (3) years

8. Training & Communication:

8.1. Training of Heavy Equipment Movement Safety procedure shall be carried out to cover for following-

a) Operator
b) Rigger & Signalman

8.2. Initial Communication to be done through Corporate Communication, Email and subsequently shall be made available at safety portal at Sangam.

9. VERIFICATION

9.1. Verification of implementation shall be done during Heavy Equipment Movement Safety procedure audit, field safety visit and site inspections.

10. Exceptions: Any Exception to this procedure shall only be done as per Document Control .Procedure (TPSMS/GSP/DC/014)**.**

11. REFERENCES

- Indian Factory Act 1948 and State Factory Rules
- Permit-To-Work Procedure : (TPSMS/CSP/PTW/008)
- Job Safety Analysis (JSA) Procedure : (TPSMS/CSP/JSA/009)
- Hazard Identification & Risk Assessment (HIRA) Procedure : (TPSMS/GSP/HIRA/005)
- Lockout/Tag out Standard and Procedure : (TPSMS/CSP/LOTO/001)
- American Society of Mechanical Engineers (ASME) B30.2-2001, Overhead and Gantry
  Cranes—Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist
- ASME B30.11-1998, Monorails and Underhung Cranes
- ASME B30.16-1998, Overhead Hoists (Underhung)

- ASME B30.17-1999, Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Under hung Hoist)
- ASME B30.21-1999, Manually Lever-Operated Hoists

12. **Review:** Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

13. **ATTACHMENTS/APPENDIX :**

13.1. Annexure 1- Critical lift best practice for overhead crane equipment.
13.2. Annexure 2- Overhead Crane pre-operational checklist (TPSMS/CSP/HEMS/005/FORM001)
13.3. Annexure 3- Crane Periodic inspection report format – Mechanical Items (TPSMS/CSP/HEMS/005/FORM002)
13.4. Annexure 4- Overhead crane Periodic inspection report format – Electrical Items (TPSMS/CSP/HEMS/005/FORM003)

Annexure – 1

Critical Lift best Practice for Overhead Crane Equipment

Purpose

The purpose of this best practice is to provide guidance to help ensure safe lifting of loads over critical equipment.

References

Heavy Equipment Movement

Principles

Live service lines and process equipment are vulnerable to damage if suspended loads are dropped on them. Use of proper hoisting equipment, and correct rigging and lifting practices to maintain control of the hoisted load will ensure the load is not dropped.

Definitions

Critical lift - a critical lift is a lift where a load suspended from an overhead lifting device travels over live equipment containing high hazard process and the potential exists to cause a release of the process and/or significant downtime, if the load were to become uncontrollable and drop.

Competent person - one by way of training and/or experience, is knowledgeable of applicable standards, is capable of identifying workplace hazards relating to the specific operation, is designated by the employer, and has the authority to take appropriate actions.

Designated person - one selected or assigned by the employer or employer's representative as being competent to perform specific duties.

Frequent inspection - visual examinations of hoisting equipment by the operator or other designated person with records not required.

Periodic inspection - visual inspection of hoisting equipment by a designated person who makes records of external conditions to provide the basis for a continuing evaluation.

High hazardous process – any process that falls within the definition of HHP (High Hazard Process) as defined in TATA POWER Safety manual.

Equipment requirements

Manual and powered hoisting units must be in compliance with all requirements of TATA POWER Standard for new hoisting equipment. The exceptions allowable for existing equipment are not allowable for hoisting equipment performing critical lifts.

If the powered and manual hoisting equipment does not meet all the requirements for new hoisting equipment (Tata Power Standard for Heavy Equipment Movement), then the live equipment which the hoisted load will be traveled over shall be protected with adequate dunnage to protect the live equipment against a dropped load.

One of the most important requirements for both powered and manual overhead hoisting equipment is a back up load brake to hold the load in case of failure of the primary brake. On manual hoists the ability of the hoist operator to stop and hold the load using the hand chain serves as the second back up braking means, if the primary brake were to fail.

Equipment inspection

All hoisting equipment including the rigging hardware must have a thorough visual and functional inspection by a competent person immediately before the critical lift.

In addition, prior to the critical lift, a competent person must ensure the periodic inspection is up to date and all discrepancies have been corrected. This inspection should comply with the periodic inspection procedures as indicated in the “Maintenance Inspection Procedures for Rigging and Hoisting Equipment “.

Critical lift plan

A written, dated and signed critical lift plan should be prepared by the lead designated person responsible and doing the work. The critical lift plan shall be reviewed and signed by all those directly involved in making the lift, and those potentially affected, including those required to secure the plant should a hoisted load fall and cause a process disruption. If the lifting plan is required to go beyond the end of the shift, the designated person responsible for the lift must coordinate with the new shift workers to make sure the conditions are understood and have not changed. If the conditions have changed, a new critical lift plan should be provided.

It is recommended that the “Overhead Hoisting Equipment Critical Lift Plan document be use to document the critical lift.

Operator qualifications

Floor operated cranes – Operators of floor operated top running and under hung cranes, shall have passed a practical operating examination, specific to the crane being operated.

Hoists – Operator must be familiar with all operating controls and be instructed in the operation(s) to be performed.

Procedures

All site, corporate, and plant procedures must be followed for the critical lift.

TPSMS/CSP/HEMS/005/FORM/001 Annexure-2

OVERHEAD CRANE PRE-OPERATIONAL CHECKLIST

Area / Location : **Date :**

CRANE NO.	CAPACITY	TYPE	LOCATION	SHIFT 1 2 3

OPERATORS NAME:	INSTRUCTIONS: Check all items. Inspect and indicate as: Satisfactory – S, Unsatisfactory – U, or Not Applicable – NA

	1. WALK AROUND INSPECTION	S/U/ NA		2. MACHINERY INSPECTION	S/U/ NA
a	Foundations		a	Holding Brake *	
b	Access		b	Load Control Brake	
c	Secured Items		c	Covers Secured	
d	Walkways/Handrails		d	Upper Sheaves *	
e	Bridge, Drive Motor		e	Wire Rope *	
f	Bridge Brake *		f	Hooks: Cracks, Wear, Deformation Throat Opening, Latch Operation *	
g	Hydraulics		g	Fluid Leaks	
h	Couplers/Connection Rods		h	Batteries	
i	End Trucks *		i	Electric Motors	
j	Rail Sweeps		j	Electric Panels	
k	Windlocks/Chock/Stops		k	Runway/Bridge Conductors	
l	Housekeeping		l	Runway/Bridge Collectors	
			m	Electrical Guards	
			n	Festoon System	
			o	Warning Tags/Signs	
			p	Exposed Electrical Hazards	
			q	Trolley Stops *	

TPSMS/CSP/HEMS/005/FORM/001 Annexure-2

OVERHEAD CRANE PRE-OPERATIONAL CHECKLIST
Contd.

	3. OPERATOR CAB INSPECTION	S/U/ NA		4. OPERATION INSPECTION	S/U/ NA
a	Housekeeping		a	Power Supply Relay *	
b	Warning Tags *		b	Manual Reset	
c	Cab Door(s)		c	Stop Button/Control *	
d	Fire Extinguisher		d	Pendant Buttons *	
e	Controls Identification		e	Upper Limit/Main *	
f	Electrical Enclosures		f	Upper Limit/Auxiliary *	
g	Pendant Strain Relief		g	Lower Limit/Main	
h	Visibility/Windows		h	Lower Limit/Auxiliary	
i	Safety Devices		i	Bridge Controls *	
j	Warning/Indicator Light		j	Bridge Brake *	
k	Alarms		k	Trolley Control *	
			l	Main Hook *	
			m	Auxiliary Hook *	
			n	Work Area	
			o	Runway Stops *	
			p	Travel Limit Relays *	

INSTRUCTIONS: Inspect all applicable items each shift of operation. Suspend all operations immediately when observing an unsatisfactory condition for asterisked (*) items. In addition, suspend operation when any unsafe condition is observed and immediately notify supervisor. Other conditions not affecting safety shall be noted under "Remarks" and reported to supervisor.

REMARKS:

Inspected By (Name & Signature) :

Page 2 of 2

TPSMS/CSP/HEMS/005/FORM/002

Annexure-3

OVERHEAD CRANE PERIODIC INSPECTION REPORT -FORMAT

Area / Location : **Date :**

MECHANICAL ITEMS						
MAKE:		**CAPACITY:**		**LOCATION:**		
STATUS CODE:	**SR** – Should be Replaced **NR** – Needs Repair **R** – Repaired **SN** – See Notes **N/A** – Not Applicable					
ITEM	**OK**	**CODE**		**ITEM**	**OK**	**CODE**
Bridge				- Cam Followers/Guide*		
- Alignment				- Runway End-Stops		
- Girders (camber)				- Railway Sweeps/Safety Lugs		
- Rails				- Energy Absorbing Bumpers		
- Walks, Ladders, Railings				**Mono Rail**		
- Trucks to Girder Connection				- Girders		
- Trucks				- Girder Supports		
- Wheels, Driver*				- Sway Braces		
- Wheels, Idler*				**Misc.**		
- Wheels, Bearings*				- Clearances Overhead (3")		
- Axles & Coupling*				- Clearances Lateral (2")		
- Squaring Shaft				Rated Load Markings:		
- Squaring Shaft Bearings				- Each Side of Crane Bridge		
- Squaring Shaft Couplings				- Each Hoist/Load Block		
- Motor Coupling				**Trolley Drive**		
- Gear Reducer				- Wheels, Driver*		
- Gear Reducer Oil Seals				- Wheels, Idler*		
- Axle Pinion				- Wheels, Bearings*		
- Axle Gear				- Axles & Couplings		
- Runway Alignment				- Motor Couplings*		

TPSMS/CSP/HEMS/005/FORM/002 Annexure-3

OVERHEAD CRANE PERIODIC INSPECTION REPORT - FORMAT

Contd.

ITEM	OK	CODE		ITEM	OK	CODE
- Gear Reducer				- Drum Grooving		
- Gear Reducer Oil Seals				- Drum Shafts		
- Axle Pinion				- Motor Pinion		
- Axle Gear				- Motor Gear		
- Cam Followers/Guides*				- Intermediate Pinion		
- Energy Absorbing Bumpers				- Intermediate Gear		
- End Stops				- Drum Pinion		
Hoist (M – Main) (A – Auxiliary)				- Drum Gear		
- Hook				- Hoist Case Bearing		
- Hook Bearing				- Mechanical Load Brake*		
- Sheaves*				- Friction Disc*		
- Sheave Bearings*				- Pawl*		
- Equalizer Sheave*				- Pawl Shifter		
- Rope/Chain				- Ratchet or Band		
- Rope Anchors				- Motor Coupling*		
				- Hoist Case Coupling*		

Needs Immediate Action:

Notes:

Circle One: **PASS** **FAIL**

INSPECTOR: (Name) _____ SIGNATURE: _____ DATE: _____

Items with * to be inspected prior to use as part of the Pre-Operational check and lubricated as needed. All other items to be inspected and lubricated annually.

TPSMS/CSP/HEMS/005/FORM/003 Annexure-4

OVERHEAD CRANE PERIODIC INSPECTION REPORT - FORMAT

Area / Location : **Date :**

ELECTRICAL ITEMS						
MAKE:		**CAPACITY:**		**LOCATION:**		
STATUS CODE:	**SR** – Should be Replaced **NR** – Needs Repair **R** – Repaired **SN** – See Notes **N/A** – Not Applicable					
ITEM	**OK**	**CODE**		**ITEM**	**OK**	**CODE**
Brakes				- Trolley Motor Rings		
- M.H. Brake Shoes & Disc				- M.H. Motor Bearings		
- M.H. Brake Linings*				- M.H. Motor Brushes*		
- M.H. Brake Linkage				- M.H. Motor Rings		
- M.H. Brake Coil				**Misc.**		
- A.H. Brake Shoes & Discs						
- A.H. Brake Lining*						
- A.H. Brake Linkage						
- A.H. Brake Coil						
- Trolley Brake Shoes & Disc						
- Trolley Brake Lining*				**Controls**		
- Trolley Brake Linkage				*- For Magnetic Control*		
- Trolley Brake Coils				- Master Switches		
- Hydraulic Brake Bleeder*				- Push-button Station		
Motors				- M.H. Contactors		
- Bridge Motor Bearings				- A.H. Contactors		
- Bridge Motor Brushes*				- Trolley Contactors		
- Bridge Motor Rings				- Bridge Contactors		
- Trolley Motor Bearings				- M.H. Overhead Relays		
- Trolley Motor Brushes*				- A.H. Overhead Relays		

TPSMS/CSP/HEMS/005/FORM/003 Annexure-4

OVERHEAD CRANE PERIODIC INSPECTION REPORT - FORMAT

Contd.

ITEM	OK	CODE		ITEM	OK	CODE
Controls (continued)				**Resistors**		
- Trolley Overhead Relays				- M.H. Resistors		
- Bridge Overhead Relays				- A.H. Resistors		
- M.H. Limit Switch Contacts				- Trolley Resistors		
- A.H. Limit Switch Contacts				- Bridge Resistors		
For Manual Drum Control				**Mainline**		
- M.H. Finger Tips*				- Mainline Switch		
- M.H. Segments*				- Fuses (Sizes.....)		
- A.H. Finger Tips*				- Power Wiring		
- A.H. Segments*				- Control Wiring		
- Trolley Finger Tips*				- Trolley Collectors*		
- Trolley Segments*				- Runway Collectors*		
- Bridge Finger Tips*				- Bridge Conductors		
- Bridge Segments*				- Runway Conductors		

Needs Immediate Action:
Notes:
Circle One: **PASS** **FAIL**

Inspected By :(Name)_____ Signature:_____ Date :_____

Items with * to be inspected prior to use as part of the Pre-Operational check and lubricated as needed. All other items to be inspected and lubricated annually.

TATA POWER

Mobile Crane Safety Procedure

Rev No.	Reason for Revision	Prepared By	Checked By	Approval by
Rev 00	First release	R&P Sub Committee	D Kamath	Vijay Chourey
Rev 01	Standardization of procedure	Sambit Kumar Sahoo (Group Head (Mechanical)-Core Technology)	Navendra Singh (Group Head – P & CB; Corp Safety.)	Vijay Chourey (Chief – Corp Safety)

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1. **OBJECTIVE:**

Objective of this procedure is to provide minimum requirements for safe operation of mobile cranes and to establish mandatory requirements and practices to protect personnel & property from hazards associated with mobile crane related jobs.

2. **SCOPE:**

This procedure applies to all operating and project sites of Tata Power Group companies.

3. **EXPECTED RESULTS:**

3.1. Manage jobs related to Mobile Crane safely.

3.2. Control of incidents related to Mobile Crane operation.

3.3. Compliance to Regulatory requirements related to Mobile Crane & Lifting tools.

4. **ACCOUNTABILITY & RESPONSIBILITY:**

4.1. ACCOUNTABILITY: Concerned Division's Heads/Assets Custodian.

4.2. RESPONSIBILITY:

4.2.1. Lift Engineer/ Supervisor:

4.2.1.1. Shall check suitability of crane referring Load chart & raise the request in prescribed format including all details. Load Chart will be provided by the crane supplier / contractor.

4.2.1.2. Completion of mandatory requirements such as vehicle entry permit, Risk assessment.

4.2.1.3. Use tested lifting tool-tackles of appropriate capacity (sling / synthetic belt / D-shackle / tailing hook etc.)

4.2.1.4. Shall prepare Lifting plan for all critical lifts.

4.2.1.5. Ensure Area/ground preparation will be done wherever required. It will be done with consultation of SBU/Site - Civil Engineer if crane is required to position on soft soil.(For supporting crane outriggers sufficient wooden blocks/thick metal sheets will be placed on soft soil)

4.2.1.6. Ensure tool box talk of all movements & rigging operations.

4.2.1.7. He shall discuss rigging plan with rigger, signal man & crane operator for safe execution of job.

4.2.1.8. Ensure operating locations are far enough away from shoring, excavations, trenches, buried utilities, foundations, etc. to eliminate the risk of collapse.

4.2.2. Signalman & Riggers:

4.2.2.1. Shall follow procedure to use mobile crane, best rigging practice for safe operation of crane.

4.2.2.2. Shall use only lifting tools which are tested & of appropriate capacity.

4.2.2.3. Rigging foreman/signal man shall identify himself by wearing reflective jacket.

4.2.3. Crane Operators responsibilities:

4.2.3.1. Check ground condition & position the crane.

4.2.3.2. Crane Operator shall check all interlock & safety devices are in working condition. He will inform his supervisor & concern plant engineer if anyone is not in working condition. (i.e. Anti two blocking, Safe Load Indicator)

4.2.3.3. The operator must understand its functions and limitations as well as its particular operating characteristics.

4.2.3.4. Having a thorough knowledge of the information contained in the crane's operating manual.

4.2.3.5. Familiar with the crane's load chart. The operator must understand the correct meaning of all notes and warnings and be able to calculate or determine the crane's actual net capacity for every possible configuration of the machine.

4.2.3.6. Inspecting and maintaining the crane regularly as prescribed by both the owner and manufacturer.

4.2.3.7. Informing the owner of any problems, needed maintenance, or necessary repairs to the machine. This should be done in writing, preferably in the machine's logbook or inspection report.

4.2.3.8. Recording in the log or report the details of all inspections, maintenance, and other work done on the crane while in the field.

4.2.3.9. Supervising and training the apprentice if one is present.

4.2.3.10. Being aware of any site conditions that could affect the crane operation. Be particularly cautious around power lines. The operator must refuse to operate if the crane, hoist rope, or load will come closer to a power line than the absolute limit of approach specified in law.

4.2.3.11. Checking that the site is adequately prepared for the crane.

4.2.3.12. Reviewing the planned operation and requirements with the site supervision.

4.2.3.13. Finding out the load and rigging weight and determining where the load is to be placed. Although the operator is not responsible for determining the weight of the load, if the operator lifts it without checking the weight with site supervision, then the operator becomes fully responsible for the lift and any consequences that result.

4.2.3.14. Checking the load chart to ensure that the crane has sufficient net lifting capacity for every lift.

4.2.3.15. Selecting (from the range diagram) the best boom, jib, and crane configuration to suit the load, site and lift conditions.

4.2.3.16. Assembling, setting up and rigging the crane properly.

4.2.3.17. Following the manufacturer's operating instructions in accordance with the load chart.

4.2.3.18. Considering all factors that might reduce crane lift capacity and adjusting the load weight to suit. This will include such factors as weather conditions and ground conditions.

4.2.3.19. Knowing basics of rigging procedures and ensuring that they are applied (this is possible only when the load is visible to the operator).

4.2.3.20. Maintaining communication with signalman & riggers.

4.2.3.21. Operating mobile crane in a smooth, controlled, and safe manner.

4.2.3.22. Shutting down and securing the machine properly when it is unattended.

4.2.3.23. Exercising the right to refuse to operate the crane if there is cause to suspect the lift might be unsafe.
4.2.3.24. Holding Vehicle Fitness Certificate / copy of valid license / safety card document.
4.2.3.25. Equipment handing checklist should available with operator prior to lift if the load above two MT.
4.2.3.26. Conduct functional tests prior to using the equipment.
4.2.3.27. At the beginning of each operator's shift, the upper limit switch (anti-two-block) of each hoist shall be tried out under no load. Extreme care shall be exercised; the block protection shall be kept in line.
4.2.3.28. While any employee is touching the load or hook, there shall be no hoisting, lowering, or traveling.

5. GLOSSARY/ DEFINITIONS:

Attachment description - List type of slings; belts, wire ropes, chains, shackles etc. to be used to attach the load, if required make a simple sketch under lift description.

Anti-two-blocking device - a device that, when activated, disengages all crane functions whose movement can cause two-blocking.

Abnormal operating conditions—Environmental conditions that are unfavorable, Harmful, or detrimental to the operation of a mobile crane (e.g., excessively high or low ambient temperatures, exposure to weather, corrosive fumes, dust-laden or Moisture-laden atmospheres, and hazardous locations).

Approver: Location Manager in charge of plant/dept. Authorized shall be as per the permit to work procedure.

Competent person - one who is capable of identifying existing and predictable deficiencies in mobile cranes and boom trucks.

Critical lift—A lift using an Mobile crane where, because of the characteristics and properties or travel path of the load, a hoist failure or loss of control of the load could result in a serious personal injury, serious environmental incident, serious process safety incident, or significant disruption to operations. Critical Lift shall contain one or more of following criteria –

a. Tandem Lift (use of two or more cranes simultaneously)
b. Capacity utilization of crane exceeding over 85%.
c. lifting of man using crane boom
d. Travel path crossing over process plant/process pipelines
e. Cost of load exceeding one Million Rupees.

Capacity loading - It will be calculated by dividing the total weight with the safe workload at lift radius. It shall not exceed 85% of mobile crane. For capacity loading above 85% a lifting plan is required. No capacity loading above 100% shall be allowed, equal to 90% of load test. If Safe Load Indicator is not installed the capacity loading shall not exceed **60%;** if above a lifting plan is required. For lifting personnel the capacity loading must be below 50%.

Emergency operations - operations that include fire, power line contact, loss of stability, or control malfunction.

Eccentric Load - Load center of gravity does not correspond to the geometrical center, e.g. an unevenly loaded container. In case of eccentric load for heavy loads, say above 2 Tons, center of gravity should be calculated and lifting points defined accordingly. For light loads the most practical is to determine the center of gravity by trial and error without lifting the load completely off the ground.

Ground for crane set up safe - Can the ground support the point load from outriggers or crawlers? Ground loading capability must be established. Underground cables and pipes exposed to the load of the crane shall be identified and if required protected by spreading the load by e.g. applying spreaders under the outriggers. Experiences at site and elsewhere have shown that paved areas are not necessarily having the loading capability as per design.

Hazard Identification & Risk Assessment: Hazard Identification & Risk Assessment is to identify and evaluate the hazards, Risk and put controls measures for safe execution of activities.

Hazard: Source or situation with potential for harm, something that can cause body injury / occupational illness, damage company property.

HIRA: Hazard Identification and Risk Assessment

JSA: Job Safety Analysis

Job: A piece of physical work defined by time or other limits and that has a clear start and end point.

Job Safety Analysis: Job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job. In a JSA, for each basic step of the job, it is to identify potential hazards and to recommend the safest way to do the job.

LEL: Lower explosive limit

LOTO: Lock out Tag out

Load: Weight of load can be from equipment data sheet, marking on packing, marking on pipe spool, calculation (add 15% allowance for inaccuracies) or weighing. Guessing the weight of the load is not allowed. Crane user shall maintain record of how the weight was derived until the lift is successfully completed.

Length x Width x Height (LxWxH): Is required for bigger equipment for deciding lifting radius and lifting height. For bigger surface, say above 25 m2, also wind loads need to be considered. For small pipe spools, valves etc. this data is not required.

Lift Radius: Maximum horizontal distance between the point at which the center of crane rotation meets the ground and the vertical centerline passing through the load lifting attachment.

Lift Height: The height above the setting of the crane that the load must be lifted to. To derive at the boom height the length of hook, slings and load must be added as well as some free space above any equipment the load will be slew over.

Mobile Crane: A Crane that is self-propelled. This includes crawler cranes, wheel-mounted cranes, Hydra and any variations thereof. Overhead cranes, gantry cranes, side boom tractors, trolley boom cranes, and cranes with a rated capacity of one ton or less are specifically excluded and relevant Standard Operating Procedure (SOP) for the same may be followed.

Non Routine Job / Task: Where an SOP / SMP is not available or the conditions of the SOP / SMP have changed

PPE: Personal Protective Equipment

PTW: Permit to Work

Periodic Inspection: Detailed safety and maintenance inspection performed by a qualified person to verify compliance with the provisions of legal requirements.

Risk: The likelihood (probability) which can lead to potential negative consequences.

Risk Assessment: A systematic and structured process whereby hazards present in a workplace, or arising from workplace activity, are identified, risks assessed / evaluated, and decisions prioritized in order to reduce risks to acceptable levels.

Safe Access Route: To the place for the crane set up shall be checked with SS or SFE. Ensure that ground can carry the load of the crane. If soil is soaked with water the loading capability is significantly reduced. Check for underground cables and pipes as well as vicinity to any above ground obstructions like fire hydrants, firewater valves and pits. Ensure that trailer bringing the load also has a safe access, not blocked by the intended set up of the crane.

Safe Workload at lift radius: Will be derived from the selected Crane Load Chart for the calculated lift radius and boom length. Adjustment shall be done in relation to valid load test and only 85% of the load test value shall be considered as safe workload.

Shall: Mandatory requirement

Should: Optional requirement

Severity: The level of consequence / harm of an event that could occur due to exposure to the hazard present

SWL: Safe working load

SLI: Safe Load Indicator, it is a system which cut-off all the unsafe crane operations if overloaded and anti two blocking comply.

SHE: Safety, Health and Environment

Standard lift - If load to be lifted weighs less than 15 ton, it is a standard lift. The crane user is required to complete “Mobile Crane Planning & Risk Assessment Checklist”.

Two-blocking: The condition in which the lower load block or hook assembly comes in contact with the upper load block or boom point sheave assembly. (Condition under which the load block or load suspended from the hook becomes jammed against the crane structure preventing further winding up of the hoist drum)

Total weight - It is the sum of the weight of the load and weight of hook block, slings and attachment.

Task / Activity: A sequence of steps taken to conduct a job. A task is a sub element of a Job.

Weight of hook block, slings and attachments shall be derived from crane load chart and tables for slings.

6. PROCEDURES:

6.1. GENERAL PRECAUTIONS : Observe the following precautions when operating a mobile crane:

6.1.1 Do not leave a crane unattended even for a short time, unless all loads have been removed, lowered to the ground or the engine shut down and brakes applied.

6.1.2 Do not operate a crane beyond 35 KMPH wind speed that may put the load or personnel at risk. Always use the cranes load rating charts for guidance, these have wind and weather factors built into them.

6.1.3 Faulty slings shall be tagged for destruction with an “Out of Service” Tag and returned to store as scrap material.

6.1.4 Discard any wire rope used on a crane, when the visible number of broken wires in any length of rope diameter exceeds 5% of the total number of wires in the wire rope.

6.1.5 Check that there are no loose objects on a load that could fall during lifting.

6.1.6 All mobile cranes fitted with outriggers shall have the outriggers during lifting operation.

6.1.7 No slewing of these cranes is to take place unless outriggers are fully extended and in place.

6.1.8 Do not use the crane to drag the load along the ground, this may result in severe overloading.

6.1.9 The work area, equivalent to that of the extended jib, should be barricaded to ensure un-authorized personnel do not enter the area.

6.1.10 A signalman shall walk alongside a load using tag lines attached to the load, slung from a crane while the load is being transported form one area to another.

6.1.11 Use tag lines to prevent loads from turning or swaying while the crane is in motion of lifting a load.

6.1.12 Avoid sudden braking and fast hoisting, luffing and slewing.

6.1.13 Do not under any circumstances, use a crane to lift a load over personnel, or allow anyone to ride the load.

6.1.14 Keep personnel well clear of the suspended loads.

6.1.15 The crane shall only be operated minimum 6 M away from live electrical lines or away from safe arching zone whichever is higher.

6.2. PLANT AREA PRECAUTIONS:

6.2.1. Do not operate a crane over live process equipment. If such an operation is unavoidable, Risk Assessment shall be prepared with specific scope for working over live process equipment and the risk assessment will include a lift assessment from experienced crane supervisors/operators that operate the hired machines, a Work Permit must be obtained from the area responsible.

6.2.2. When cranes enter into plant areas there is always a chance of the crane being an ignition source and as such will be required to have all necessary permits and certification relating to access criteria as well as a gas test carried out were applicable.

6.2.3. Where people not involved in the lifting operation but could otherwise come into the area steps to prevent that from happening will be required, barriers shall be provided at ground and all levels to prevent this occurring. Appropriate warning signs shall be displayed on the barriers.

6.2.4. All communication devices shall be rated to prevent ignition sources, if working in a plant that has hazardous areas with an ignition risk.

6.3. PRECAUTIONS WHEN OPERATING NEAR LIVE ELECTRICAL LINES:

6.3.1. All electrical lines shall be treated as live unless the crane operator has received, from the electricity distributor or transmission line operator, documentary evidence that the conductors have been positively de-energized, isolated and earthed. Where such documentary evidence has been made available, it shall state the date and time frame of isolation and any special conditions and precautions.

6.3.2. The crane shall only be operated minimum 6 M away from live electrical lines or away from safe arching zone whichever is higher.

6.4. AERIAL CONDUCTOR (OVERHEAD POWERLINE) CONTACT PRECAUTIONS:

If the crane or load contacts live electrical line, concerned department/agency shall be immediately notified of the situation and, until assistance is received, a competent person shall remain in a prominent position to warn of the danger of electrocution.

In such an event the crane operator should act as follows:

6.4.1. Remain inside the cabin or on the crane.

6.4.2. Warn all other personnel to keep away from the crane and not to touch any part of the crane, rope or load.

6.4.3. Without anyone approaching the crane, operate the crane in such a manner to break contact, where possible.

6.4.4. When unable to move or disentangle the crane from the aerial conductors, remain inside the cabin or on the crane and take no further action until it is confirmed that conditions are safe.

6.4.5. When it is essential to leave the cabin or crane because of fire or some other reason then, to avoid being electrocuted, jump clear as far away from the crane as possible and avoid touching the crane and the ground at the same time. When

moving away from the crane, shuffle or hop slowly across the affected area to avoid a simultaneous contact with areas of high potential difference

6.5. Inspection of Mobile Crane: There are three levels of crane inspections used at sites. These inspections are conducted by three categories of inspectors. In addition to the mandatory requirements and advisory guidance covered below. Sites should be aware that local regulations may impose additional mandatory inspection requirements beyond those listed in this standard.

6.5.1. Inspection Prior to use on sites (Internal) :

6.5.1.1. Mobile cranes shall be inspected by Operator prior to use on sites.

6.5.1.2. A checklist shall be used to document the inspection. (Annexure - 1)

6.5.1.3. The inspection shall cover the general condition of the crane and the availability of required safety equipment in accordance with manufacturer's recommendations and site requirements.

6.5.1.4. If a mobile crane is removed from a site and then returned, it shall be re-inspected before it is used again on the site.

6.5.2. Frequent Inspection (Internal: daily and monthly – Annexure- 1)

6.5.2.1. Mobile crane operators shall inspect all controls and safety devices including safe travel limit alarms & fill daily checklist before beginning of work in each shift.

6.5.2.2. Crane operator's inspection shall be documented and records maintained.

6.5.2.3. Crane operator shall inspect mobile cranes at least once in a month following the same inspection methodology used in the prior-to-use inspection as per Annexure - 1.

6.5.3. Periodic Inspection (External):

6.5.3.1. Mobile crane equipment shall receive periodic inspection by a competent person (third party) at least annually.

6.5.3.2. This competent person may be supplied by an independent agency.

6.5.3.3. For company-owned mobile cranes, the annual inspection records shall be available on site.

6.5.3.4. For equipment owned, leased, or rented by a contractor, the periodic inspection record shall be reviewed prior to use.

6.5.3.5. Cranes that remain on site and are idle for more than one month shall receive a prior-to-use inspection by Operator before being returned to service.

6.5.3.6. Cranes that are idle for more than six months shall receive a periodic inspection by a competent person before being returned to service.

6.6. Maintenance, Repairs and Modifications:

6.6.1. All maintenance and repairs shall be in accordance with manufacturer's Recommendations.

6.6.2. Preventive maintenance of crane shall be done as per manufacturer's Recommendations.

6.6.3. All minor repair requirement shall fulfilled at the earliest if found while daily check.

6.6.4. For all major repair/maintenance use detailed SOPs which are made based on manufacturer's Recommendations.

6.6.5. Modifications or major repair affecting capacity or safe operation shall have the manufacturer's written approval.

6.6.6. Records of maintenance, repairs, and modifications shall be maintained.

6.6.7. After major repairs/modification the crane shall be thoroughly examined and tested to its maximum capacity and re-certified by competent person.

6.7. Rope Safety & Replacement:

6.7.1. Rope must be secured to drum.

6.7.2. No less than three wraps of rope shall remain on the drum when the hook is in its extreme low position.

6.7.3. Rope end shall be anchored by a clamp securely attached to the drum, or by a socket arrangement approved by the crane or rope manufacturer.

6.7.4. Rope clips attached with U-bolts shall have the U-bolts on the dead or short end of the rope.

6.7.5. Spacing and number of all types of clips shall be in accordance with the clip manufacturer's recommendation or relevant Indian standard.

6.7.6. Clips shall be drop-forged steel in all sizes manufactured commercially. When a newly installed rope has been in operation for an hour, all nuts on the clip bolts shall be retightened

6.7.7. Replacement rope shall be the same size, grade, and construction as the original rope furnished by the crane manufacturer, unless otherwise recommended by a wire rope manufacturer due to actual working condition requirements with test certificate.

6.8. Crane Operations

6.8.1. General Safety Instructions:

6.8.1.1. During hoisting, sudden acceleration or deceleration of the moving load shall not to be permitted.

6.8.1.2. When hoisting, make sure the load does not come in contact with any obstructions primarily electrical. While operating the crane, it should be ensured that the high tension power line is dead/ safe working distance maintained as per voltage level.

6.8.1.3. Cranes should not be used for side pulls. Only freely suspended load may be side pulled.

6.8.1.4. At all times the operator must avoid carrying loads over people. Positive barricading with display board shall be provided around the crane & unauthorized entry shall be restricted inside barricading.

6.8.1.5. The load must not be lowered below the point where less than three full wraps of rope remain on the hoisting drum.

6.8.1.6. Make sure hook have safety latch. The load is well balanced. Avoid tip loading, and loading on hook latch.

6.8.1.7. Never lift the load over the rated capacity (refer load chart only to decide Safe Working Load)

6.8.1.8. Do not operate with kinked, twisted or damaged rope

6.8.1.9. Never leave the suspended load unattended. If it is required because of any failure, high wind condition or specific requirement by plant, additional support under all four outriggers shall be applied. Support below the suspended load also to be provided if possible.

6.8.1.10. Holding brakes on hoists shall be applied automatically when power is removed

6.8.1.11. A drag brake (a brake which provides retarding force without external control) may be applied to hold the trolley in a desired position on the bridge and to eliminate creep with the power off

6.8.1.12. If a load is supported by more than one part of rope, the tension in the parts shall be equalized.

6.8.1.13. Hooks shall meet the manufacturer's recommendations and shall not be over loaded. Hook testing shall be carried out every year with annual inspection of crane.

6.8.1.14. Sufficient barricading around crane shall be made to protect people working near mobile crane before slewing operation check clearance for counter weight.

6.8.1.15. Crane operator should strictly follow the instructions/signals given by site supervisor on job.

6.8.1.16. Special permission to be obtained from site in-charge after considering following guidelines for travelling with suspended load

- Load may need to be secured during travel
- Swing lock and/or other interlocks may need to be engaged
- Consider routes of travel and ground conditions
- Additional signalperson assistance needed
- Speed limit restriction shall be mentioned in Job Safety Analysis (JSA)

6.8.2. Stability function of load charts:

6.8.2.1. Dynamic factors caused by the crane motion and the load (e.g. for boom movement, application of brakes, swaying of the load) and wind effects on the load and boom.

6.8.2.2. Mobile cranes requires that the stability factor of mobile cranes shall be based on 75% of tipping for stationary mode, and 66.6% for pick-and-carry mode.

6.8.2.3. Strong winds impose additional loads on a crane and affect the crane’s stability. Maximum permissible wind speed of 36 km/hour shall be for mobile crane operation.

6.8.3. Ground conditions and crane support

6.8.3.1. Where the ground is compact the distance of any part of the crane support timbers from the excavation should be at least equal to the depth of the excavation (1:1 rule).For example, for a three meter deep trench in compact ground, the outrigger timbers or pads should be a horizontal distance of at least three meters away from the closest edge of the trench wall.

6.8.3.2. Where the ground is loose or backfilled the distance of any part of the crane support timbers from the excavation should be at least twice the depth of the excavation (2:1 rule). For example, for a three meter deep trench in backfilled ground, the outrigger timbers or pads should be a horizontal distance of at least six meters away from the closest face of the trench wall.

6.8.4. Timbers pads under outriggers of crane:

6.8.4.1. Size of timber pads required under outriggers should be chosen as per sample example calculation mentioned Annexure –2.

6.8.5. Loading capacity of crane

6.8.5.1. **Capacity loading** will be calculated by dividing the total weight with the safe workload at lift radius. It shall not exceed 85%. For capacity loading above 85% a lifting plan is required. No capacity loading above 100% shall be allowed, equal to 90% of load test.

6.8.5.2. If Safe Load Indicator is not installed the capacity loading shall not exceed 60%; if above a lifting plan is required.

6.8.5.3. Lifting of personnel shall not be allowed using mobile crane.

6.8.6. Multi Crane Lift Considerations (Safety measures for multiple crane lifts):

6.8.6.1. Lifting a load with two or more cranes requires greater attention to planning and supervision, because the effects of the relative motion between the cranes may create additional loadings on the cranes, the load and the lifting gear in place. Where possible, avoid hoisting a load with more than one crane. However, where it is necessary to lift a load using more than one crane, the following steps should be taken:

6.8.6.1.1. A person certificated to work as an intermediate rigger should be in overall control of the lift.

6.8.6.1.2. Make an accurate assessment of:

a. The share of the load which is to be carried by each crane;
b. How the load sharing is to be proportioned; and
c. How the proportioning is to be maintained.

6.8.6.2. Lifting plan shall be made by Lift engineer/Supervisor for critical lifts. The following factors are to be considered when planning for critical lifts:

a. Mass of the load;
b. Position of the center of gravity;
c. Mass of the lifting gear;
d. Safe working capacity of the lifting gear; and

e. Synchronization of crane motions.

6.8.6.2.1. Make sure the instructions to each crane operator and other persons involved are clear, and rehearse the operation wherever possible.

6.8.6.2.2. Use cranes of equal capacity and similar characteristics, where practicable.

6.8.6.2.3. Make sure that both cranes are aligned in the same direction when using non slewing type cranes in the pick-and-carry mode.

6.8.6.2.4. Tandem lifts are not to be undertaken unless all cranes are fitted with a load indicator. Where multiple hoisting operations are carried out, the following minimum capacity requirements for each crane will apply:

(i) For two (2) cranes—20% greater than the calculated share of the load;

(ii) For three (3) cranes—33% greater than the calculated share of the load;

(iii) For four (4) or more cranes—50% greater than the calculated share of the load.

6.8.6.3. If it is not possible to comply with the minimum capacity requirements stated above, then the Lifting engineer must check and certify the lifting plan.

6.8.7. Rigging Safety Tips:

a. Determine the weight of the load. Do not guess.
b. Determine the proper size for certified slings and components.
c. Do not use manila rope for rigging
d. Do not use slings, eye bolts, shackles, or hooks that have been cut, welded, or brazed.
e. Use two guy ropes (one on top & two at the bottom) to avoid swing during lift.
f. Determine the center of gravity and balance the load before moving it
g. Initially lift the load only a few inches to test the rigging and balance
h. Loads should be well secured.
i. Slings should be adequate to the task. Slings should be un-kinked and load balanced and secured.
j. No sudden stops.
k. No loose items on load or crane before lift.
l. Bumping into runway stops is prohibited.
m. Rigger should have knowledge of rigging plan, slings & belt fixing methods.
n. Hoist line must be vertical prior to the lift (remove slack in the hoist slowly).

6.8.8. Handling the Load:

6.8.8.1. **Size of load** - The crane shall not be loaded beyond its rated load except for test purposes as provided in the Rated Load Test section

6.8.8.2. **Attaching the load**

a. The hoist chain or hoist rope shall be free from kinks or twists and shall not be wrapped around the load.

b. The load shall be attached to the load block hook by means of slings or other approved devices
c. Care shall be taken to make certain that the sling clears all obstacles
d. Care shall be taken to ensure that hook lock is in healthy condition & also the slings resting on hook to be tied by a rope to prevent the slings from coming out of the hook.

6.8.8.3. **Moving the load**:

a. The load shall be well secured and properly balanced in the slings on lifting device before it is lifted more than a few inches
b. Before starting to hoist, the following conditions shall be noted:
c. Hoist rope shall not be kinked
d. Multiple part lines shall not be twisted around each other
e. The hook shall be brought over the load in such a manner as to prevent swinging

6.8.8.4. **Care During hoisting:**

a. There is no sudden acceleration or deceleration of the moving load
b. The load does not contact any obstructions.
c. While any employee is touching the load or hook, there shall be no hoisting, lowering, or traveling.
d. Operators shall avoid carrying loads over people.
e. The operator shall test the brakes each time a load is approaching the rated load handled. The brakes shall be tested by raising the load a few inches and applying the brakes
f. The load shall not be lowered below the point where less than two full wraps of rope remain on the hoisting drum.
g. The supervisor shall ensure that the operator does not leave his position at the controls while the load is suspended.
h. when the load or hook approaches near or over persons, the warning signal should be sounded
i. Control excess swing by providing guy ropes (one on top & two at the bottom) from opposite side of load.
j. The hoist limit switch which controls the upper limit of travel of the load block shall never be used as an operating control

6.8.8.5. **Common Hazards Associated with Mobile Crane:** Assessment of hazards shall be made before movement & use of mobile crane. Examples of hazards to be considered include the following:

a. Electrocution, principally due to proximity of crane boom to overhead/ nearby power lines & underground cables.
b. Ground condition, soft soil, nearby trench etc.
c. The presence and activity of other people and equipment in the vicinity of the work.
d. Toppling of crane, caused by instability or overloading

e. Being struck by swinging, lifting, lowering or falling load. (Due to failure of slings, D-shackles, crane rope, other lifting tool-tackles or mechanical/hydraulic system of crane.)
f. Low illumination
g. Wrong signaling
h. Noise
i. Smoke.
j. Heavy wind.

7. Records:

7.1. Daily/Periodic Mobile Crane Check list (TPSMS/CSP/MCS/006/FORM/001) –Retention – 12 Months

7.2. Annual Checklist/Form filled by competent person as per Factory Act – retention – three years.

8. Training & Communication:

8.1. Training of this procedure shall be covered as per Safety Training need identified across divisions.

8.2. Initial Communication to be done through Corporate Communication, Email and subsequently shall be made available at safety portal at Sangam.

9. VERIFICATION

9.1. Verification of implementation shall be done during Mobile crane procedure audit, field safety visit and site inspections.

10. Exceptions: Any Exception to this procedure shall only be done as per Document Control .Procedure (TPSMS/GSP/DC/014).

11. REFERENCES

- Indian Factory Act 1948 and State Factory Rules
- Permit-To-Work Procedure
- Job Safety Analysis (JSA) Procedure
- Hazard Identification & Risk Assessment (HIRA) Procedure
- Heavy Equipment Movement Safety Procedure

12. Review: Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

13. ATTACHMENTS/APPENDIX :

Refer Sample formats as Annexures attached in next page of this document:

Annexure 1: Daily/Periodic Mobile Crane Check list (TPSMS/CSP/MCS/006/FORM/001)
Annexure 2: Timber pads required under Outriggers- Examples
Annexure 3: Checks & Maintenance for Crane rope & hook
Annexure 4: Mobile Crane Planning & Risk Assessment guidelines

TPSMS/CSP/MCS/006/FORM/001 **Annexure-1**

Mobile Crane Daily Check List

Operator:			**Company:**		
Crane type:			**Model:**		
Location:			**Unit no.:**		
Date:			**Shift:**		
1 – Pre Start-up Walk-around	**Status OK**	**NO**	**3 – Start-up**	**Status OK**	**NO**
Cab – glass/doors/2nd exit	□	□	Instrumentation – warning	□	□
Steps/ladder – secure/clean	□	□	Oil pressure	□	□
Wheels & tires – rims/lug nuts/tire condition/ inflation	□	□	Air (brake) pressure	□	□
Boom – angle indicator/jib/condition	□	□	Coolant temperature	□	□
Main/auxiliary hoist(s) – hook/attachment/block/sheaves/wire rope	□	□	Battery charge rate/level	□	□
Hydraulics – cylinders/hosing/pins/fittings/fluid level	□	□	Fuel level	□	□
Turntable – ring & pinion condition	□	□	Noises – engine sounds normal	□	□
Engine – fluids/belts/hoses/leaks/debris	□	□	Lights	□	□
Battery/batteries – secure/electrolyte level/ connections clean & tight	□	□	Horn	□	□
Counterweight – secure/condition	□	□	Accessories – wipers/heater/fan/radio	□	□
Drum(s) – condition/line spooled properly	□	□	LMI – functions/calibrated properly	□	□
Air (brake) tanks – condition/water drained/ petcock closed	□	□	House lock-pin – disengaged (as applicable)	□	□
Outriggers/stabilizers – condition/leaks	□	□	Other:		
Lights/strobes – condition	□	□			
Warning decals – in place/ condition/ legible	□	□			
2 – Interior Cab Checks	**Status OK**	**NO**	**4 - Function Checks**	**Status OK**	**NO**
Housekeeping	□	□	Boom – lift/lower/extend/retract	□	□
Fire extinguisher	□	□	Hoist(s) – raise/lower	□	□
Manufacturer's operating manual	□	□	Turntable swing	□	□
Log book	□	□	Outriggers/stabilizers	□	□
Inspection Certificate	□	□	Steering	□	□
External Certification	□	□	Transmission – gear & direction	□	□
Load charts/range diagrams	□	□	Brakes	□	□
Level indicator	□	□	Other:	□	□
Seat belt	□	□		□	□
Comments					
Operator Name & Sign:					

Annexure - 2

Timber pads required under Outriggers- Examples

Sample Example 1 – for a 40 MT crane

A mobile crane is to be set up on its outriggers on asphalt or dry clay/sand. The crane has a total mass of 32 tonnes and is to lift a 21.65-tonne load—21.65 tonnes is the maximum the crane can lift in the stability range of the load chart at 6 mtr radius. The lift plan requires the load to be slewed above each outrigger foot. Calculate the minimum required area of the timbers to be placed under each outrigger when lifting directly above an outrigger foot.
Lifted load (L) = 21.65 tonnes
Total crane mass (CM) = 32 tonnes
Maximum allowable ground pressure (PMAX) for Asphalt/dry sand/clay = 20 tonnes per m2
area = 0.65 x (CM + L) / PMAX
area = 0.65 x (32 tonnes + 21.65 tonnes) / 20 tonnes per m2
area = 22.75 tonnes / 20 tonnes per m2
area = 1.74 m2
Dimensions of outrigger timbers: √1.74 m2 = 1.32 m
Therefore, length x width of timbers required = 1320 mm x 1320 mm.

Sample Example 2 - for 30 Mt crane

A mobile crane is to be set up on its outriggers on asphalt or dry clay/sand. The crane has a total mass of 29 tonnes and is to lift a 15-tonne load—15 tonnes is the maximum the crane can lift in the stability range of the load chart at 6 mtr radius. The lift plan requires the load to be slewed above each outrigger foot. Calculate the minimum required area of the timbers to be placed under each outrigger when lifting directly above an outrigger foot.
Lifted load (L) = 15 tonnes
Total crane mass (CM) = 29 tonnes
Maximum allowable ground pressure (PMAX)) for Asphalt/dry sand/clay = 20 tonnes per m2
area = 0.65 x (CM + L) / PMAX
area = 0.65 x (29 tonnes + 15 tonnes) / 20 tonnes per m2
area = 22.75 tonnes / 20 tonnes per m2
area = 1.43 m2
Dimensions of outrigger timbers: √1.43 m2 = 1.2 m
Therefore, length x width of timbers required = 1200 mm x 1200 mm.

Sample Example 3 - for 125 Mt crane AMK-125

A mobile crane is to be set up on its outriggers on asphalt or dry clay/sand. The crane has a total mass of 86 tonnes and is to lift a 68-tonne load - 68 tonnes is the maximum the crane can lift in the stability range of the load chart at 6 mtr radius. The lift plan requires the load to be

slewed above each outrigger foot. Calculate the minimum required area of the timbers to be placed under each outrigger when lifting directly above an outrigger foot.
Lifted load (L) = 86 tonnes
Total crane mass (CM) = 68 tonnes
Maximum allowable ground pressure (PMAX)) for Asphalt/dry sand/clay = 20 tonnes per m2
area = 0.65 x (CM + L) / PMAX
area = 0.65 x (86 tonnes + 68 tonnes) / 20 tonnes per m2
area = 100 tonnes / 20 tonnes per m2
area = 5.00 m2
Dimensions of outrigger timbers: √5.00 m2 = 2.23 m
Therefore, length x width of timbers required = 2230 mm x 2230 mm.

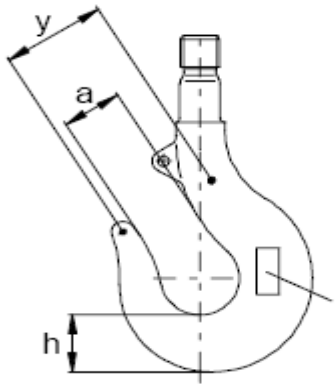
Maximum permissible ground pressure is shown for reference in below table.

Ground type	Maximum permissible ground pressure, P_{MAX} (Tonnes per m^2)
Hard rock	200
Shale rock and sandstone	80
Compacted gravel (with up to 20% sand)	40
Asphalt	20
Compacted sand	20
Stiff clay (dry)	20
Soft clay (dry)	10
Loose sand	10
Wet clay	Less than 10

Annexure - 3

Checks & Maintenance for Crane rope & hook

Checks and Maintenance: Crane ropes, rope pulleys, load hooks and rope end fittings



Load hook sizes

Load hooks can be identified by the designation LAH .... on the type plate or by the designation RSN .... or RFN .... on the hook itself.

all dimensions in mm

Load hook	Hook no.	a	h	y	Threads
Lah 010 ...	RSN 08	38	37	-	M 24
Lah 020 ...	RSN 1.6	45	48	-	M 30
Lah 030 ...	RSN 2.5	50	58	-	M 36
Lah 050 ...	RSN 4	56	67	-	M 42
Lah 063 ...	RSN 5	63	75	-	M 45
Lah 080 ...	RSN 6	71	85	115	Rd 50 ◊ 6
Lah 100 ...	RSN 8	80	95	125	Rd 56 ◊ 6
Lah 125 ...	RFN 10	90	106	175	Rd 64 ◊ 8
Lah 160 ...	RFN 12	100	118	200	Rd 72 ◊ 8
Lah 200 ...	RFN 16	112	132	220	Rd 80 ◊ 10
Lah 250 ...	RFN 20	125	150	240	Rd 90 ◊ 10
Lah 320 ...	RFN 25	140	170	250	Rd 100 ◊ 12
Lah 400 ...	RFN 32	160	190	320	Rd 110 ◊ 12
Lah 500 ...	RFN 40	180	212	350	Rd 125 ◊ 14
Lah 630 ...	RFN 50	200	236	400	Rd 140 ◊ 16
Lah 800 ...	RFN 80	224	265	400	Rd 160 ◊ 18

Dimension "y" may differ from the value specified in the table (forging tolerance). Either the value in the table or a different value is engraved in the hook shank.

Monitoring and checking: Load hook

What to check:

Deformation

Load hooks according to DIN 15 401 and 15 402 up to load hook no. 5:

Hook opening and deformation, **dimensions "y" and "a" + max. 10%**

If the opening has widened by more than 10% of the maximum permissible limit, replace the load hook !

Surface fissures

If deformations are apparent: **Check surface for fissures** using an appropriate method **- or - replace the load hook !**

Damage and surface fissures may be removed notch-less, provided that the permissible tolerance levels are not exceeded.

If it is not possible to check the installed load hook, dismantle it !
Before making checks, ensure that the surfaces are put into a condition permitting the definite identification of surface fissures !

Wear

Wear on single or twin-hooks **may not be greater than 5% of the height "h"** according to DIN 15 401 and DIN 15 402.

It is **not permitted** to carry out welding work on load hooks, e.g. to compensate for wear !

Annexure - 3

Checks and Maintenance: Crane ropes, rope pulleys, load hooks and rope end fittings

Figure 1

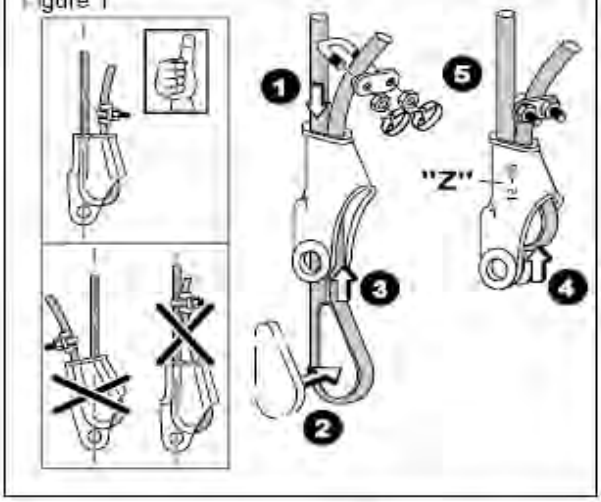
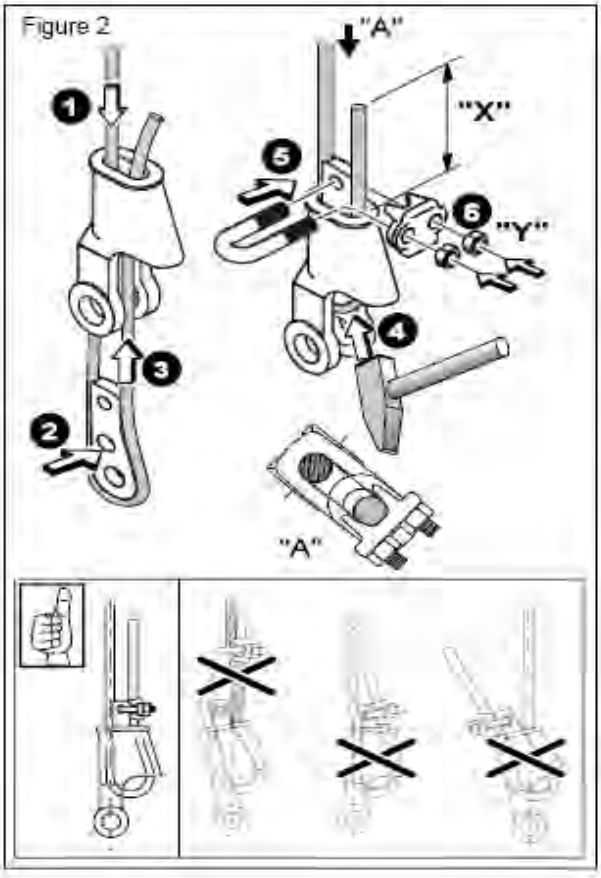


Figure 2



Installation, inspection and maintenance of wedge sockets !

Page 1 of 2

If the wedge socket is not properly installed:

- **Loads / crane parts may fall down. A falling load can seriously injure or kill.**
- **Do not side load the wedge socket.**

Maintenance and Inspection:

Always inspect the wedge socket, the wedge and the pin before using.

Do not use parts showing cracks.

Do not use modified or substitute parts.

Repair minor nicks or gouges to socket or pin by lightly grinding until surfaces are smooth. Do not reduce the original dimensions by more than 10% ! Damage must not be repaired by welding.

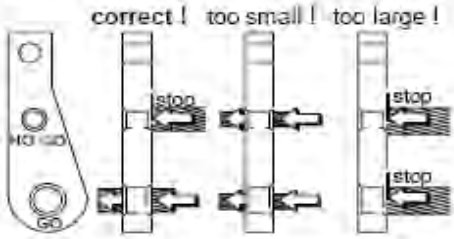
Inspect permanent connections once a year, or more often in severe operating conditions.

Installation:

See figures 1 and 2 for the installation process. These instructions must be followed.

The permissible rope diameter can be seen on the wedge socket body (**"Z"**). **Alternatively** it can be determined by the holes in the wedge.

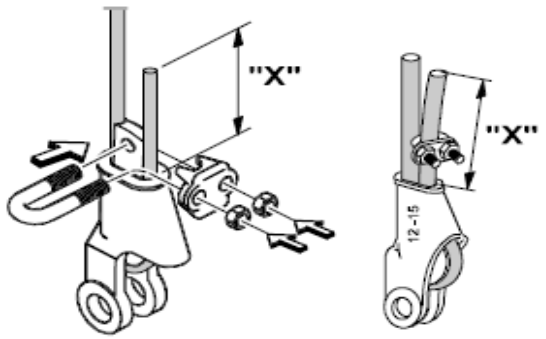
Example: The rope diameter for the following wedge socket size is:



Annexure - 3

Checks and Maintenance: Crane ropes, rope pulleys, load hooks and rope end fittings

Figure 3



Installation, inspection and maintenance of wedge sockets !

Page 2 of 2

Tail length of the dead end: "X"

Standard 6 to 8 strand wire ropes:
minimum of 6 rope diameters,
but not less than 150 mm

Rotation resistant wire ropes:
minimum of 20 rope diameters,
but not less than 150 mm
Ensure that the dead end is welded.

Annexure – 4

Mobile Crane Planning & Risk Assessment Guidelines

These checks should be done for each new set up even if the same crane is deployed in different set ups.

- **Does lift radius and boom length check with the planned**: With the crane set up measure the lift radius and check the boom length required. For hydraulic cranes the boom length can be read on the SLI and the lift radius measured checked against the SLI reading for lift radius. For crawler cranes boom length is fixed and can be taken from the load chart using the relevant configuration. If lift radius or/and boom length is bigger than planned, the capacity loading must be recalculated to check that the loading still is within prescribed limit; 85% for cranes with SLI, 60% for cranes without SLI or for crane used for lifting personnel.
- **Are outriggers fully extended, placed on load spreaders and crane leveled:** Check that all 4 outriggers are fully extended to the marking on each of the outriggers. **It is not allowed to proceed with the lift if any of the outriggers cannot fully be extended.** If possible always use the spreaders provided with the crane under the outriggers. Is the crane leveled as per spirit level installed in the crane? If the crane will move free on wheels (hydras) or on crawler with the load suspended ensure it will stay leveled.
- **Are out riggers set on solid ground free from water logging/soaking and on safe distance from any excavation, storm-water channel, pit, trench etc.:** Do not allow the crane setting on ground with water logging or soil soaked with water as the ground loading capability might be much lower than expected. The distance of any outrigger to an excavation, storm-water channel, pit (not RCC pit), trench must at least be equal to the depth of the cavity. Outriggers should not be placed above storm-water culverts without spreading the load.
- **crane boom:** When crane boom, fully extended, is pointed towards the overhead line the distance must be at least 6 meters away from the line. If required the line must be made dead and permit given by authorized electrical person.
- **Is crane slewing/movement free from any obstruction with at least 0.6 m:** Check that the crane can slew with the prescribed safety margin of 0.6 m, if not possible barricade the area to stop personnel access.
- **Is the crane free of any oil leakage:** When walking around the crane check for any oil leakage from the hydraulic system especially on the outriggers.
- **Is weather condition safe for lift:** High wind speed will have a significant impact on loads with high wind areas, say above 25 m^2. The wind might cause the lift line to get out of plumb and cause the crane to topple. If wind speed is above **35 km/hr** or 19.4 knots the lift shall be stopped. For lift of personnel the wind speed limit is 14 knots**.** Call MFS, ext. 11191, to get actual wind speed. Do not permit the lift if visibility is limited by e.g.heavy rain or fog. Avoid lift during not daylight hours**.** Do not lift during thunderstorm.

- **Are slings marked with safe load, valid color-coding and without any visual damage. Is capacity loading below 50%:** All slings, belts, shackles shall be visual inspected for wear and tear, cuts before any lift. ***No damage shall be accepted.*** The load on slings/belts shackles should not exceed 50% of the marked safe load. When lifting plan available higher sling loading is acceptable. Account for sling angles when more than one sling is used. A sling angle of 60 degree towards the load will increase the load in the sling with 15%, 45 degree with 41% and 30 degree with 100%. Slings used for lifting personnel shall only be loaded to 20%.
- **Are slings protected from sharp edges on the load:** A couple of incidences at site have happened when sharp edges have cut through the belts and caused the load to drop. Ensure that the slings are protected by e.g. fitting wooden beams between load and slings.
- **Is angle between sling and load more than 60 degree:** A small angle will cause high load on the sling and load, see above. If possible keep the angle above 60 degree and the extra load will be limited to 15%.
- **Are shackles used if more than 2 slings are attached to the hook:** To avoid undue load on the slings from each other, the slings shall be connected to the hook by help of shackles if more than 2 slings are used.
- **Is the load free from adhesion:** Ensure that the load is free from adhesion by e.g. use of a jack. If it is not possible to conclude that the load is free, e.g. during dismantling operation, add 100% to the load and check capacity loading.
- **Are lifting lugs free from visual defects:** Visual inspect lifting lugs for any defects.
- **Is load center of gravity known:** For eccentric load with unknown center of gravity always determine center of gravity by trial and error without lifting the load completely off the ground.
- **Is lift line plumb:** It is not allowed to use the crane for dragging the load as this could cause the crane to topple. The lift line shall hang vertical free from any obstruction above the center of gravity of the load.
- **Is the lift area free from any other conflicting activities:** During the lift other activities in the direct vicinity and especially under the load must temporarily be stopped. A crane operation is a hot job and no draining of hydrocarbon shall be allowed in the vicinity as long as the crane engine is running.
- **Is signaler in high visibility vest:** Ensure that the person signaling to the crane operator is in high visibility vest.
- **Is lift area barricaded? Are the slinger and signaler clear of the lifted load by use of guide ropes:** This is the ultimate precaution for all lifts. No person shall be allowed under suspended load. If it is not practical to barricade the area other means to keep people away must be used.

Scaffold Safety Procedure

Rev No.	Reason for Revision	Prepared By	Checked By	Approval by
Rev 00	First release	R&P Sub committee	D Kamath	Vijay Chourey
Rev 01	Standardization of procedure	Uday Jha (Head - Contracts & Materials Jojobera)	Navendra Singh (Group Head – P & CB; Corp Safety.)	Vijay Chourey (Chief – Corp Safety)

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1. OBJECTIVE:

Objective of this procedure is to provide the mandatory requirements and safe practices required for scaffold erection, modification, dismantling, use and storage. This Procedure should be used in conjunction with local regulations, consensus standards which help to achieve safe scaffold erection and use.

2. SCOPE:

This procedure applies to all operating and project sites of Tata Power Group companies.

3. EXPECTED RESULTS:

3.1. Manage scaffold erection, use and dismantling job safely.
3.2. Control of incidents related to scaffold erection, use and dismantling work.
3.3. Compliance to Regulatory requirements related to Scaffolds.
3.4. To provide safe scaffolding platform for jobs to be done at height.

4. ACCOUNTABILITY & RESPONSIBILITY:

4.1. **ACCOUNTABILITY**: Concerned Division's Heads/Assets Custodian.
4.2. **RESPONSIBILITY**: Concerned Engineer

5. GLOSSARY/ DEFINITIONS:

Brace: A member fixed diagonally across two or more members in a scaffold to afford stability.

Bracing: Bracing is a system of braces or ties that prevent distortion of a scaffold.

Base Plate: It is a Mild Steel (MS) square plate of 100 mm x 100 mm x 6 mm thick with 38 mm diameter and 75 mm long spigot supporting at bottom to the standard at ground.

Competent person: one who through training and/or experience a) is knowledgeable of applicable scaffolding regulations; b) is capable of identifying existing and predictable hazards related to the erection, alteration, dismantlement, storage, and inspection of scaffolding; and c) has the authority to take prompt corrective actions to eliminate such hazards.

Fabricated-frame scaffold: A scaffold consisting of a platform(s) supported on fabricated end frames with integral posts, horizontal bearers, and intermediate members (also known as welded-frame scaffold and sectional scaffold).

Guard rail: A horizontal rail secured to standards and erected along the exposed edges of scaffolds to prevent workmen from falling.

HIRA: Hazard Identification and Risk Assessment
Hazard Identification & Risk Assessment: Hazard Identification & Risk Assessment is to identify and evaluate the hazards, Risk and put controls measures for safe execution of activities.

Hazard: Source or situation with potential for harm, something that can cause body injury / occupational illness, damage company property.
IDLH: Immediate Danger to Life and Health
Job: A piece of physical work defined by time or other limits and that has a clear start and end point.
Job Safety Analysis: Job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job. In a JSA, for each basic step of the job, it is to identify potential hazards and to recommend the safest way to do the job.
Job: A piece of physical work defined by time or other limits and that has a clear start and end point

Kicker Lift: The vertical distance measured from ground to the center of first ledger, normally this distance is 150 mm from ground and provided when scaffold is more than 6.0M height or scaffold carrying heavy load.

Ledger: A horizontal member which ties the standard at right angles and which may support putlogs and transoms.

Lift Height: The vertical distance measured between center of two ledgers. Normal lift height is 2.2 M.

Mobile (rolling) scaffold: A castor-mounted sections of tubular metal scaffolds and are used for work on street lighting, plant etc.

Non Routine Job / Task: Where an SOP / SMP is not available or the conditions of the SOP / SMP have changed
PPE: Personal Protective Equipment
PTW: Permit to Work

Putlog: A scaffold member spanning from ledger to ledger or from ledger/standard to a building and upon which platform rests.

Racker: An inclined load bearing tube that braces the scaffold against ground.

Risk: The likelihood (probability) which can lead to potential negative consequences.
Risk Assessment: A systematic and structured process whereby hazards present in a workplace, or arising from workplace activity, are identified, risks assessed / evaluated, and decisions prioritized in order to reduce risks to acceptable levels.
SHE: Safety, Health and Environment
Sole Plate: It is a Mild Steel plate of 300 mm x 300 mm x 6 mm thick, provided below the base plate in unpaved area.
Severity: The level of consequence / harm of an event that could occur due to exposure to the hazard present
Shall: Mandatory requirement
Should: Optional requirement

Scaffolding Supervisor: A competent person who through training and/or experience a) is knowledgeable of applicable scaffolding regulations; b) is capable of identifying existing and predictable hazards related to the erection, alteration, use, dismantling, storage, and inspection of scaffolding; and c) has the authority to take prompt corrective actions to eliminate such hazards.

Scaffolder: A person who through training and/or experience is capable of erecting, moving, modifying and dismantling scaffold

Scaffold: Any temporary elevated platform (suspended or supported) and its supporting structure (including points of anchorage) used for supporting man, material or both.

Supported scaffold: One or more platforms supported by outrigger beams, brackets, poles, legs, uprights, posts, frames, casters, or similar rigid support. Examples include fabricated-frame scaffold, system scaffold, tube-and-coupler scaffold, and manually propelled mobile scaffold.

Suspension (suspended) scaffold: One or more platforms suspended by ropes or other non rigid means from an overhead structure(s).

System scaffold: A scaffold consisting of posts with fixed connection points that accept runners, bearers, and diagonals that can be interconnected at predetermined levels.

Standard: A vertical or near vertical member used in the construction of scaffold for transmitting the load to the foundation.

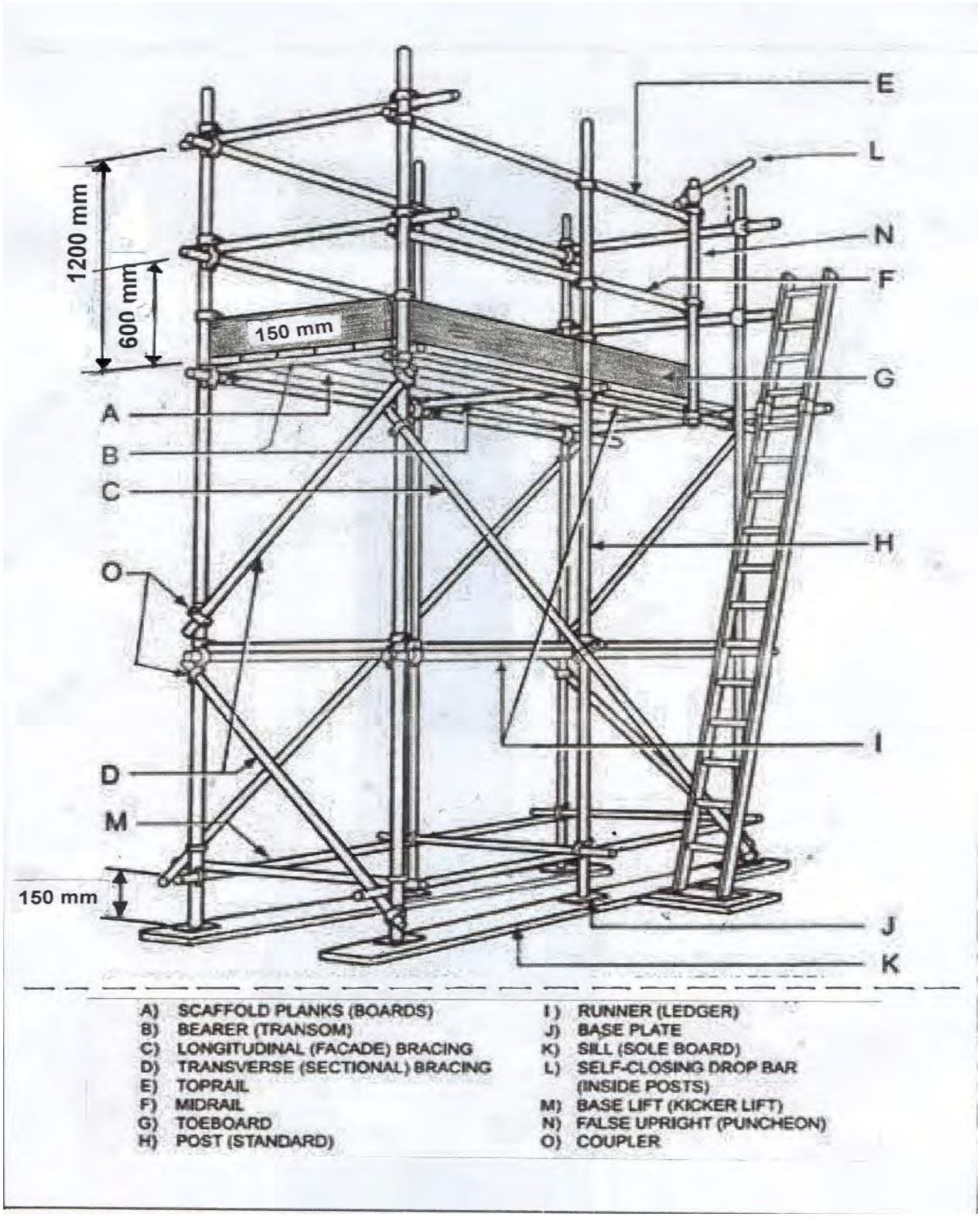
Tube-and-coupler scaffold: A supported or suspended scaffold consisting of a platform(s) supported by tubing, erected with coupling devices connecting uprights, braces, bearers, and runners (also known as tube-and-clamp scaffold).

Transom: A member spanning across ledgers/standards to tie a scaffold transversely and which may also support a working platform.

Toe Board: A barrier placed along the edge of scaffold platform and secured there to guard against the falling of material and equipment.

Task / Activity: A sequence of steps taken to conduct a job. A task is a sub element of a Job.

Note: Some of the common definitions, used in conjunction with scaffold, are illustrated in the diagram (as depicted) for the ease of understanding.



Illustrative Diagram – Scaffold Terminology

6. PROCEDURES:

6.1 General Information

6.1.1 Erection, dismantlement, movement, and modification

Approved Permit-To-Work and Job Safety Analysis (JSA) shall be made available before erecting, dismantling, moving, or modifying scaffolding. Examples of hazards to consider include, but not limited to the following:

- Working from heights
- The presence of nearby electrical lines or process equipment
- Hazardous area classification
- The condition of working surfaces
- The presence and activity of other people in the vicinity of the work
- The weather (Heavy rain, high wind velocity-more than 36 Km/Hr, etc)

6.1.2 Scaffolding shall be erected, dismantled, moved, and modified only under the direction of a competent person and by employees who have received appropriate and specific training for the work they are to perform. Determination and designation of competent persons for scaffold work are the responsibility of the site except where local regulations set other criteria.

6.1.3 Categories and Classification:

Most scaffolds fall into one of the four primary categories:

- Tube and coupler scaffold/Coup lock scaffold
- Suspended scaffold
- Mobile scaffold
- System scaffold
- Supported scaffold
- Scaffolds are classified according to their intended use as:
- Light duty
- Medium duty
- Heavy duty

Load duty	Light		Medium	Heavy/Special		
Maximum Safe load in Kg	75	150	225	300	450	600
Maximum bay length / width, m meter iininMeter	2.7	2.2	1.8	1.4	1.0	0.8

6.1.4 Specifications of Scaffolds applicable to all Scaffolds:

6.1.4.1 All elevated structures/ working platform areas shall be guarded on all sides.

6.1.4.2 Railings and toe boards shall be provided on the platform.

6.1.4.3 Scaffolds shall be designed to support at least 4 times the anticipated weight of Men and material.

6.1.4.4 Make certain that all scaffolds are in plumb and level at all times.

6.1.4.5 Scaffolds shall be secured from tipping when the scaffold height exceeds four times its minimum base dimension.

6.1.4.6 Scaffolds shall be constructed at least 2 planks wide unless location makes this physically impossible.

6.1.4.7 Landing platform shall be provided at every 9 meter of height.

6.1.4.8 The members of scaffolds shall overhang not less than 6" on either ends but not more than 12". They shall be fastened on both ends and laid tight by scaffolds and clamps.

6.1.5 Specifications of Scaffolds applicable to Tube-and-Coupler Scaffold:

6.1.5.1 Minimum height of first horizontal member (Ledger) of scaffolds from the Ground/Kicker lift member shall be 2.2 meters. When scaffold is more than 6 meter height or carrying heavy load, kicker lift should be provided.

6.1.5.2 The mid rail and Top rail shall be at height 600 mm and 1200 mm respectively and toe boards (150mm) shall be securely attached to the platform.

6.1.5.3 Wall scaffoldings shall be secured between structure and scaffolding, at least every 10 meters of length and 8 meters of height.

6.1.5.4 Minimum overlap of vertical members (standards) and/ or horizontal members (Ledgers) shall be 600 mm with at least two couplers.

6.1.5.5 Base plate 100 x 100 x 3 mm shall be used to support all vertical pipes of Scaffolds.

6.1.5.6 Sole plate of 300 x 300 x 6 mm shall be used at all unpaved area to support base plate.

6.1.6 Precautions applicable to Mobile Scaffold:

6.1.6.1 Attach castors with plain stems to the panel or adjustment screw by pins or other suitable means. Mid rail and Top rail shall be at height 600mm and 1200 mm respectively.

6.1.6.2 Apply castor brakes at all times when a scaffold is not being moved.

6.1.6.3 Do not ride rolling scaffoldings.

6.1.6.4 Remove all material and equipment from platform before moving scaffolding.

6.1.6.5 Do not try to move rolling scaffolding without sufficient help. Watch out for holes in the floor and for overhead obstructions.

6.1.6.6 Do not use brackets on rolling scaffoldings without first considering the overturning effect.

6.1.6.7 Mobile Scaffolds shall be designed to restrict maximum height verses length to 4:1.

6.1.7 Safety Requirements

6.1.7.1 Appropriate barricades shall be installed to protect people in the vicinity during scaffold erection, use, modification and dismantling. As far as practicable, barricades shall be provided by keeping a clear distance of 1.0 meter from scaffold structure.

6.1.7.2 Fall protection when erecting, dismantling, and modifying scaffolds shall be under the direction of a competent person (Scaffold Supervisor).

6.1.7.3 Scaffold erectors (Scaffolders) shall use personal fall-arrest systems that provide continuous fall protection while erecting, dismantling or modifying scaffolds unless the determination is made by a competent person that fall protection is not feasible or it creates a greater hazard.

6.1.7.4 Fall protection can be accomplished through the use of adequate anchorages that are independent of the scaffold or by using scaffold systems and components that are approved by the manufacturer as adequate anchorages.

6.1.7.5 Employees shall use appropriate fall-arrest equipment in accordance with Engineering Standard on “Full body Harness and fall protection system”.

6.1.7.6 The footing for supported scaffolds shall be sound, rigid, and capable of supporting the maximum intended load, including the weight of the scaffold.

6.1.7.7 Manufacturer’s guidelines for proprietary scaffolds (e.g. Cup & lock, H frame, Insulating modular scaffolds) shall be followed with applicable regulations.

6.1.7.8 There shall be firm foundation for all scaffoldings. All scaffolding shall be made of sound (free from deformation, cracks, corrosion) material.

6.1.7.9 Scaffolding material shall be inspected and used, only if found in good condition. Avoid using equipment whose strength is not known.

6.1.7.10 Provide adequate sills for scaffolding posts. Metal base plate is used under all upright or standard scaffoldings. Correct type of couplers shall be used for all connections.

6.1.7.11 Plumb and level scaffoldings as erection proceeds, so that braces will fit without forcing. Fasten all braces securely.

6.1.7.12 Where scaffoldings are erected above walkways or work areas, the space between toe board and railing should be covered with net / screens.

6.1.7.13 Whenever work is being done above the scaffolding under erection, overhead protection should be provided to the scarfolders.

6.1.7.14 A safe and convenient means of access shall be provided to the platform level. Means of access may be a portable ladder, fixed ladder, ramp or runway or stairway. The ladder shall be so installed that there supporting member (pipe) is just below ladder rung. This is to avoid tripping hazard, especially while using the ladder.

6.1.7.15 During erection, the ladder shall be installed as early as practicable, but not later than first two horizontal members (Ledgers). This is to facilitate Scaffolder while erecting the scaffold.

6.1.7.16 Ladder should be provided with tie rods/studs at top and bottom rungs.

6.1.7.17 Do not cantilever or extend putlogs / trusses as side brackets, without thoroughly considering the loads to be applied.

6.1.7.18 Do not climb cross braces.

6.1.7.19 Do not use ladders or makeshift devices on top of scaffoldings to increase the height.

6.1.7.20 Have at least 12” overlap and 6” extension beyond centerline of support or cleat both ends to prevent sliding.

6.1.7.21 Do not allow unsupported ends of planking to extend an unsafe distance beyond supports.

6.1.7.22 Planks shall be non-greasy and free from defects.

6.1.7.23 Access to working platform shall be suitably protected against inadvertent fall by providing swing members/ swing gate or chains.

6.1.7.24 When scaffolding is no longer required, request for dismantling of scaffold shall be sent to scaffolding supervisor through work permit.

6.1.7.25 Scaffold shall be removed from top bracings. Ties, ledgers etc. should not be removed from section lower than the one which is being dismantled.

6.1.7.26 Do not throw or allow falling to ground any scaffold member, board or fittings.

6.1.7.27 Dismantled scaffold material shall be neatly stacked, away from the site until whole of scaffold has been dismantled.

6.1.7.28 During the erection stage of a scaffold, warning notices with the wording “scaffold incomplete, Do not use” (Annexure - 3) shall be fixed to the scaffold at all access points. This warning will be in the form of a painted board. It is a good practice to have the authorized (competent) person(s) sign the boards.

6.1.7.29 In NO circumstances, incomplete scaffolding shall be allowed to carry out any job.

6.1.7.30 The status board with the wording “Scaffold Complete, Safe for Use" (Annexure - 3) shall be displayed when the scaffolding is ready for use.

6.1.7.31 After erection, but before first use of a scaffold, the erected scaffolding shall be inspected (Using scaffold check list as per Part 2 in Annexure-2) and approved by the competent person. The certification of the scaffolding shall be as per Part 3 in Annexure-2.

6.1.7.32 Once erected the scaffolding shall be inspected “Every Week” and recorded in Part 4 in Annexure-2. Scaffold after due date of inspections shall not be permitted for Use without Re-inspection by the Competent person.

6.1.7.33 When the completed scaffold is handed over for use, it is the responsibility of user to ensure its correct and safe use.

6.1.7.34 In the event of any doubt concerning the integrity of a particular scaffold, “Scaffold Incomplete – Do not Use” (Annexure-3) boards shall be displayed. These boards will be put up after removing "Scaffold Complete- Ready for Use" boards.

6.1.7.35 If any changes or alternation to the original scaffold are found, inform the scaffolding supervisor and prevents others from using the scaffold by do not use boards until it is re-inspected by the scaffolding supervisor.

6.1.7.36 Removal of scaffold shall be done through Permit-To-Work.

6.1.8 Use of scaffold:

6.1.8.1 Person who use scaffolds shall be trained. The scope of the training shall include the appropriate safe working practices for the work to be performed and guidance on assessing hazards and selecting the proper protective measures.

6.1.8.2 Personnel working below and passersby shall be protected from overhead hazards.

6.1.8.3 Safe access shall be provided for scaffold users. Cross-bracing shall not be used for access. End frames shall not be used for access unless they were designed for use as access.

6.1.8.4 Person who use scaffolds shall assess the hazards posed by working on them and take appropriate precautions to mitigate the hazards.

6.1.8.5 No scaffold shall be loaded beyond the working load for which it is intended.

6.1.8.6 Person shall use appropriate fall-arrest equipment in accordance with Standard on “Full body harness and fall protection system” on scaffolds not equipped with standard top rail, mid rail, toe guard and complete decking.

6.1.9 Storage and inspection of Scaffold materials

6.1.9.1 All scaffolding material shall be stored at designated location to protect them from adverse environment conditions such as corrosion, weather according the manufacturer’s recommendations and /or as per instructions of scaffolding supervisor.

6.1.9.2 Storage racks/ Locations/ areas shall be clearly identified. Long term storage of scaffolding material may be at a single location.

6.1.9.3 From designated storage, the requisite material should be moved to the location, as transit storage, for immediate use for erection of scaffolding.

6.1.9.4 The dismantled scaffolding material should not be allowed to pile up in the plant area. Storage facility of scaffold material shall be properly constructed for its stability and load bearing capability.

6.1.9.5 Scaffolding material such as tubular, planks, clamps etc. shall be inspected annually by the user department as per Annexure 5 to ensure they are free from defects. The visual inspection shall cover 100% scaffold materials. The inspected lot of material should be suitably painted, clearly indicating due date for the next inspection.

6.1.9.6 Information on inspecting scaffold components and testing scaffolds planking can be found in the manufacturer's literature.

7. Records:

Following records shall be retained in compliance with the Corporate Records.

7.1. Scaffolding request, inspection, certificate and Weekly re-certificate (TPSMS/CSP/SCAF/007/FORM/001) – Retention -12 months

7.2. Scaffolding Audit check list (TPSMS/CSP/SCAF/007/FORM/002) - Retention –Three Years

7.3. Scaffold pipe, Ladder, Plank/Jali, Clamps, Base Plate Check-list (TPSMS/CSP/SCAF/007/FORM/003)- Retention –Three Years

8. Training & Communication:

8.1. Training on Scaffold Safety Procedure shall be carried out to cover for following-

a. Competent Person,
b. Scaffolding Supervisor,
c. Scaffolder

8.2. Initial Communication to be done through Corporate Communication, Email and subsequently shall be made available at safety portal at Sangam.

9. VERIFICATION

9.1. Verification of implementation shall be done during Scaffold Safety procedure audit, field safety visit and site inspections.

10. REFERENCES

- Indian Factory Act 1948 and State Factory Rules
- Tata Power Permit-To-Work Procedure(TPSMS/CSP/PTW/008)
- Tata Power Job Safety Analysis (JSA) Procedure (TPSMS/CSP/JSA/009)
- Tata Power Hazard Identification & Risk Assessment (HIRA) Procedure (TPSMS/GSP/HIRA/005)
- Tata Power Working at Height Procedure (TPSMS/CSP/WAH/004)

Other references

IS : 3696 (Part 1) – 1987 (Scaffolds) Safety code of scaffolds and ladders
IS : 3696 (Part 2) – 1987 (Ladders) Safety code of scaffolds and ladders
IS : 4014 – 1967 Code of practice for steel tubular scaffoldings
IS : 3521 – 1999 Industrial safety belts and harnesses

- Provision on scaffold under the building and other construction workers. (Regulation on employment and conditions of service) central rules, 1998.

11. Exceptions: Any Exception to this procedure shall only be done as per Document Control .Procedure (TPSMS/GSP/DC/014)**.**

12. Review: Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident

Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

13. ATTACHMENTS/APPENDIX :

Refer Sample formats as Annexures attached in next page of this document:

13.1 Annexure-1: Scaffold erection, use and removal process flow Chart

13.2 Annexure-2: Scaffolding request, inspection, certificate and Weekly re-certificate (TPSMS/CSP/SCAF/007/FORM/001)

Pat-1: Requesting for Scaffolding

Part-2: Inspection Check List for Scaffolding

Part-3: Certificate of Fitness of Scaffolding

Part-4: Weekly Re-Certification for Fitness of Scaffolding

13.3 Annexure-3: Safety Boards.

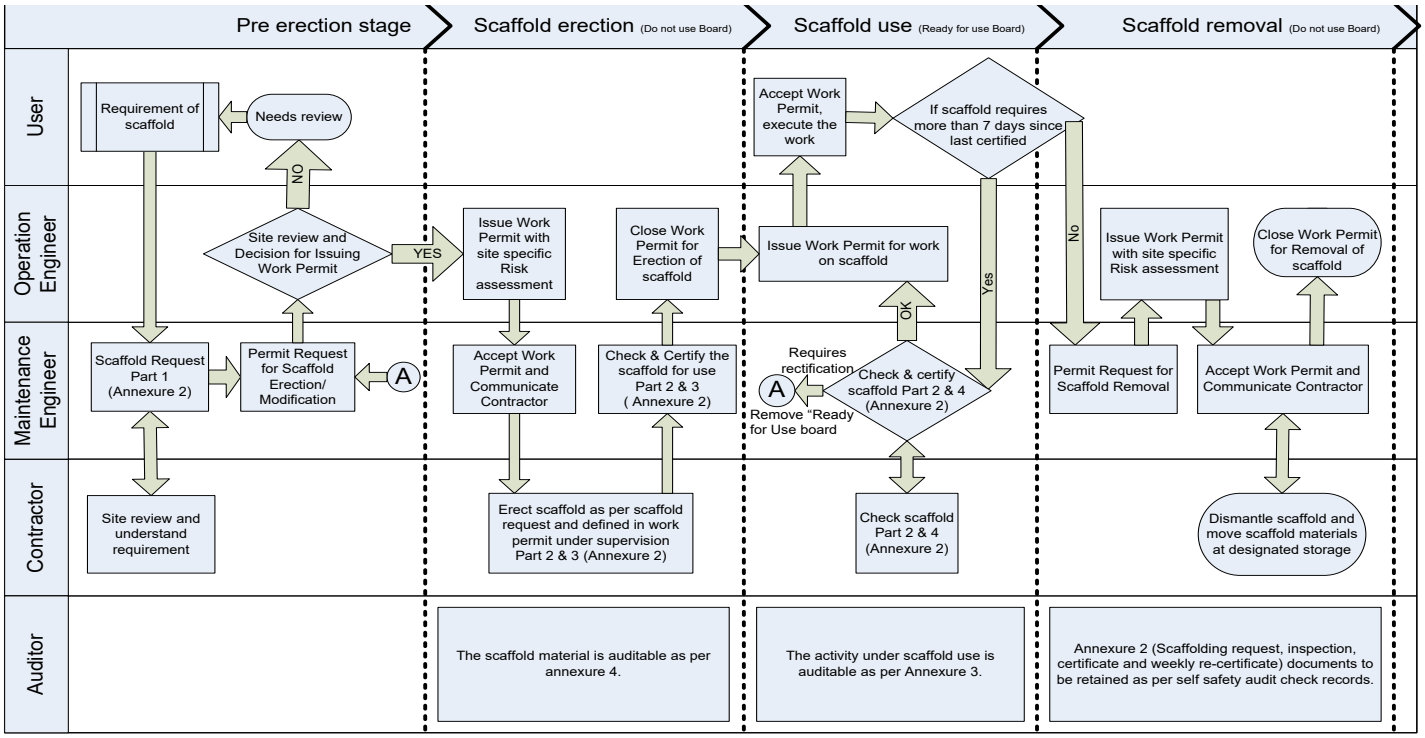
13.4 Annexure-4: Scaffolding Audit check list (TPSMS/CSP/SCAF/007/FORM/002)

13.5 Annexure-5: Scaffold pipe, Ladder, Plank/Jali, Clamps, Base Plate Check-list (TPSMS/CSP/SCAF/007/FORM/003)

13.6 Annexure 6: Do’s and Don’ts for Scaffold Safety

Annexure - 1

Scaffold erection, use and removal process flow Chart



Annexure - 2

TPSMS/CSP/SCAF/007/FORM/001

(Part: 1 of 4)

Part 1

Scaffolding request, Inspection, Certificate and Weekly re-certificate

REQUEST FOR SCAFFOLDING

I hereby request that the scaffolding for purpose of …….. be erected for the duty (select from load table as given below) and height…….. Meter.

Load duty	Light		Medium	Heavy/Special		
Maximum Safe load in Kg	75	150	225	300	450	600
Maximum bay length / width in Meter	2.7	2.2	1.8	1.4	1.0	0.8
Tick whichever applicable						

Remarks (If any) :

(Name & Signature of Maintenance Engineer)

M/s _____ **Date:**

(Scaffolding Contractor)

Annexure - 2

TPSMS/CSP/SCAF/007/FORM/001

(Part: 2 of 4)

Part 2

INSPECTION CHECK LIST - SCAFFOLDING

S. No	Checks Points	Yes/ No/ NA	Remarks
1.	Are the scaffoldings erected as per the load duty requested?		
2.	Is every work platform fitted with handrail (top rail 1200 mm and mid rail at 600 mm high) and a toe board (150 mm) secured to the platform sides?		
3.	Are the scaffolding in plumb and level?		
4.	Are the planks/gratings placed in order without undue gaps and anchored?		
5.	Are the footing / anchorage for scaffolds sound and the bay lengths maintained as per the maximum Intended load (duty)?		
6.	Are the poles, legs or uprights of scaffolding are securely braced to prevent swaying / displacement?		
7.	Are the base plates (100 x 100 x 3 mm) provided for scaffolding posts?		
8.	Are the base plates are supported by sole plate (300 x 300 x 6 mm) at unpaved area?		
9.	Is kicker lift (at distance 150 mm from ground/base) provided for scaffold of height more than 6.0 meter?		
10.	If the scaffolding is erected above walkways or work areas, are the space between toe boards and railings screened?		
11.	If work is done over men who are working on scaffolding, is overhead protection provided?		
12.	Has the scaffolding area suitably barricaded during erection / usage / dismantling? As far as practicable, barricades shall be provided by keeping a clear distance of 1.0 meter from scaffold structure.		
13.	Is free standing scaffolding tower protected from tipping by guying or other means?		

S. No	Checks Points	Yes/ No/ NA	Remarks
14.	Is there a safe and convenient means of access? If a ladder is used, is it rising at least 1050mm above the platform?		
15.	Are relevant status boards (tags) attached to the scaffolding completed / under erection as applicable?		
16.	Is safe access to equipment or emergency egress restricted by scaffolds?		
17.	Are wall scaffolding anchored every 10 m of length and 8 m of height?		
18.	Are landing platforms provided for access ladders more than 9 meters height?		
19.	If two pipes are connected, are they overlapped at least 600 mm and at least two clamps used?		

Checked by (Scaffolding Inspector/Supervisor):

Annexure - 2

TPSMS/CSP/SCAF/007/FORM/001

(Part: 3 of 4)

Part 3

CERTIFICATES OF FITNESS OF SCAFFOLDING

I hereby certify that the scaffolding erected for work permit no. ---------- is ready and fit for use. I further certify that it is intended for light duty/ General purpose (Medium duty)/ Heavy duty or special duty (tick whatever applicable) service and fit for a load of …….. Kg and should not be overloaded.

Name and signature of
Competent Person

(Dept……..)

Name and signature of
Scaffolding Supervisor

M/s _____
(Scaffolding Contractor)

Date: _____

Annexure - 2

TPSMS/CSP/SCAF/007/FORM/001

(Part: 4 of 4)

Part 4

WEEKLY RE-CERTIFICATION FOR FITNESS OF SCAFFOLDING

Certification for	Date	Scaffolding is inspected as per part 2 (any new observation)	Scaffolding is safe for use (Yes/ No)	Name and sign of scaffolding supervisor	Name & sign of Competent Person
2nd week					
3rd week					
4th week					
5th week					
6th week					
7th week					
8th week					
9th week					
10th week					

Annexure - 3

Safety Boards

Scaffold No:_____

SCAFFOLDING

INCOMPLETE

DO NOT USE

Name of Contractor :

Scaffold No:_____

SCAFFOLDING

COMPLETE

READY FOR USE

Name of Contractor :

Date of Inspection :

Name of Scaffold Insector:

Annexure – 4

TPSMS/CSP/SCAF/007/FORM/002

Scaffolding Audit Check List

S. No	Checks Points	Yes/ NO/ NA	Remarks
1.	Has the request for scaffolding been signed by authorized person?		
2.	Has the 'certificate of fitness of scaffolding' been signed by a scaffolding supervisor and maintenance engineer?		
3.	Are the scaffoldings erected as per the load duty requested?		
4.	Is every work platform fitted with handrail (top rail 1200mm and mid rail at 600 mm high) and a toe board (150mm) secured to the platform sides?		
5.	Are the scaffolding in plumb and level?		
6.	Are the gratings placed in order without undue gaps and anchored?		
7.	Are the footing / anchorage for scaffolds sound and the bay lengths maintained as per the maximum intended load?		
8.	Are the poles, legs or uprights of scaffolding are securely braced to prevent swaying / displacement?		
9.	Are the base plates (100 x 100 x 3 mm) provided for scaffolding posts?		
10.	Are the base plates are supported by sole plate (300 x 300 x 6 mm) at unpaved area?		
11.	Is kicker lift (at distance 150mm from ground/base) provided for scaffold of height more than 6.0 meter?		
12.	If the scaffolding is erected above walkways or work areas, are the space between toe boards and railings screened?		
13.	If work is done over men who are working on scaffolding, is overhead protection provided?		
14.	Has the scaffolding area suitably barricaded during erection / usage / dismantling? As far as practicable, barricades shall be provided by keeping a clear distance of 1.0 meter from scaffold structure.		
15.	Is free standing scaffolding tower protected from tipping by guying or other means?		
16.	Is there a safe and convenient means of access? If a ladder is used, is it rising at least 1050mm above the platform		
17.	Are relevant status boards (tags) attached to the scaffolding completed / under erection as applicable?		

Annexure – 4

TPSMS/CSP/SCAF/007/FORM/002

S. No	Checks Points	Yes/ NO/ NA	Remarks
18.	Is safe access to equipment or emergency egress restricted by scaffolds?		
19.	Are wall scaffolding anchored every 10 m of length and 8 m of height?		
20.	Are landing platforms provided for access ladders more than 9 meters height?		
21.	If two pipes are connected, Are they overlapped at least 600 mm and at least two clamps are used?		

Remarks (If any) :

Inspected By (Name & Signature of Scaffolding inspector/supervisor) :

Reviewed By (Name & Signature) :

Annexure – 5

TPSMS/CSP/SCAF/007/FORM/003

Scaffold pipe, Ladder, Plank/Jali, Clamps, Base Plate - Check-list

Material	Check List	Observation
Pipes	- Rust Free Pipes - No Bends, Cuts, Holes - No Sharp edge, pipe end condition - Pipe thickness minimum 2 mm - Painted / galvanized pipes - Any other(Specify)	
Ladder	- Rail Damaged (cracks, deformation etc.) - Rust free & Properly Painted Ladder. - No Cut, Hole or any Physical damage. - Equal spacing between rungs (max 30 cm). - Ladder width greater than = 30 cm. - No Bent, Broken, loose Rungs. - No Sharp edge. - No Oil, Grease and other slippery items - Bottom non-skid pad damaged/missing - Top and bottom rung tie rod provided - Any other(Specify)	
Plank/Jalli	- Jalli spacing maximum 1.5” to 2”. - Plank all 4 hooks not damaged. - No Cut or any other Physical damage. - Not depressed beyond 15 mm. - Rust free and properly painted. - Flat Thickness 3mm internal and 5mm outer boundary. - Any other(Specify)	
Clamps	- Rust free and properly painted. - No cut/cracks or physical damage. - No lubrication. - No Eyebolts bent. - Thread condition/Nut condition. - No welding / local repair - Any other(Specify)	
Base Plate & Sole plate	- Rust free and properly painted. - No bend. - No Cut, Hole or physical damage. - Flat Bottom portion. - Any other(Specify)	

Inspected By: Name: _____Designation:_____ Sign: _____Date:_____

Reviewed By: Name: _____Designation:_____ Sign: _____Date:_____

Annexure – 6

Do's and Don'ts for Scaffold Safety

Do's

- Use only certified scaffolding, tagged with "Scaffolding Complete, Ready for Use"
- Maintain three-point-contact while climbing up or down the ladder.
- Use rope or container or other suitable means for carrying material from or to ground.
- Maintain good housekeeping, especially at elevated working platform and near the access.
- Do take special precautions while working in vicinity of mobile cranes or electrical overhead lines.
- Wear full body safety harness with double lanyard/ personal fall arrest system or other equally effective means while ascending or descending the ladder or scaffolding working platform is not fully guarded.
- Do check for emergency approach/ evacuation, especially adequacy means of egress.
- Use safe material handling ways while shifting the material.
- Do report "At-risk conditions" e.g. missing ladder, incomplete decking, improper guarding, no landing platform, loosely clamped ladder, etc. to your supervisor.
- Do check weekly certification of scaffold at random

Don'ts

- Do not use any part of operational line or pressurized piping as a support, or tie point for scaffolds or staging.
  Do not permit mixing of scaffold types in any one structure (e.g., steel/aluminum couplers, wooden boards/metal grid boards).
- During the possibility of a thunderstorm, no work shall be executed at a height where a person can be exposed to lightning.
- Never keep loose tools, materials etc at height in a way it may roll off and fall from height.
- Do not use cross-bracing or end-frame (unless specially designed) for access.
- Avoid overloading and impact loading
- Never alter or modify or dismantle any part of the scaffold without permission from scaffolding supervisor or Tata Power personnel.
- Do not throw tools or scaffolding materials from height.
- Do not use "Incomplete Scaffold".

Permit-To-Work (PTW) Procedure

Rev No.	Reason for Revision	Prepared By	Checked By	Approval by
Rev 00	First Release	-	-	-
Rev 01	Standardization of Procedure	Sunil Bartakke (Head-Biogas & Lavasa Project)	Navendra Singh (Group Head – P & CB; Corp Safety.)	Vijay Chourey (Chief – Corp Safety)

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1. OBJECTIVE:

Objective of this procedure is to define the minimum Permit – To -Work requirements to carry out job related to Hot work, Confined Space Entry, Excavation, Working at heights etc safely.

2. SCOPE:

This procedure applies to all operating and project sites of Tata Power Group companies.

3. EXPECTED RESULTS:

3.1. Manage jobs being done under permit-to-work safely.

3.2. Control of incidents in Jobs related to Permit-To-Work.

3.3. Compliance to Regulatory requirements related to Permit-To-Work.

4. ACCOUNTABILITY & RESPONSIBILITY:

4.1. ACCOUNTABILITY: Concerned Division's Heads / Assets Custodian.

4.2. RESPONSIBILITY: As covered subsequently in procedure

Table 1: Summary of appropriate people to fill each role

	Can Be a contractor	Issue Permits to others	Self Permit?	Appoint Permit Issuers	Stop Work on site if Necessary	Audit System
Site Manager	No	No	No	Yes	Yes	Yes
Permit Approver	No	No	No	Yes	Yes	Yes
Permit Issuer	No	Yes	No	No	Yes	No
Permit Acceptor	No	No	No	No	Yes	Yes
Permit Holder	Yes	No	No	No	Yes	No
Area Operator	Yes	No	No	No	Yes	No

Rows 2 and 3 are interchanged to maintain hierarchy.

Table 2: Roles and Responsibilities in Permit to Work (PTW)

Sr No	Name / Designation	Site Manager	Permit Approver	Permit Issuer	Permit Acceptor	Permit Holder	Area Operator
1	PTW System Manager	✔	✔				
2	Plant Manager (HOD Operations) Unit-in-charge Trombay / Station in-charge Rec. station		✔				
3	Plant Engineers			✔			
4	Chief Project Manager	✔					
5	Project Managers		✔				
6	Construction Manager/Engineer			✔			
7	Shift In-Charge		✔	✔			
8	Shift Engineer			✔			✔
9	Shift Operator/Technician						✔
10	Maintenance Supervisor				✔	✔	
11	Maintenance Contractor					✔	

5. GLOSSARY/ DEFINITIONS:

Approver – Location Manager in charge of plant/dept. Authorized shall be as per the permit to work procedure.

Confined Space: A confined space is defined as a space, which may or may not be enclosed.

- It is large enough and a person can bodily enter and perform assigned work.
- It is not designed for continuous human occupancy.
- It has got limited or restricted means for entry and exit.

CSEP : Confined Space Entry Permit

ELCB : Earth Leakage Circuit Breaker

Hot Work: Work activity capable of supplying ignition energy for flammable mixtures. Examples include but not limited to: 1) the process of joining together two pieces of metal (welding), 2) the breaking apart of metal into two pieces (cutting) by means of extreme heat, 3) metal grinding or other operation which produces heat, flame, and/or sparks that could provide a possible source of ignition. Other examples of hot work include: use of non-electrically rated tools in an area which has been classified as a hazardous area, operation of internal combustion engines in electrically classified areas, and sandblasting.

Hot Work Permit: Written authorization to perform operations that could provide a source of ignition such as riveting, welding, cutting, burning, heating, etc.

Hazard: Source or situation with potential for harm, something that can cause body injury / occupational illness, damage company property.

Hazard Identification & Risk Assessment (HIRA): Hazard Identification & Risk Assessment is to identify and evaluate the hazards, Risk and put controls measures for safe execution of activities.

IDLH: Immediate Danger to Life and Health

Inspection: Checking the work permit controls in practice using a prepared checklist.

Isolation: A physical barrier between a source of energy (mechanical, electrical, hydraulic or static head) or process materials and a place of work.

Job: A piece of physical work defined by time or other limits and that has a clear start and end point

Job Safety Analysis (JSA): Job safety analysis is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job. In a JSA, for each basic step of the job, it is to identify potential hazards and to recommend the safest way to do the job.

Live Permit: A work permit that is active and ongoing.

Lockout: Placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the

equipment or material being controlled cannot be operated or moved until the lockout device is removed.

Lockout device: A device that utilizes a positive means such as a lock, either key or combination type, to hold an Electrical energy isolating device in a safe position and prevent the energizing of a machine or equipment.

LCS : Local control station

LEL : Lower explosive limit

LOTO : Lock out Tag out

Maintenance Work: Any work for mechanical, electrical, instrumentation, civil repairs, welding, excavation, Radiography, civil construction, Confined space entry, entry of mobile equipment in the operating plants, working with spark producing equipment in the operating plants, working on equipment under pressure and installation of new or repaired equipment is referred to as a maintenance work.

Monitoring: Routine checking of permits and controls in the course of the work.

Method Statement: A breakdown of an activity into individual tasks.

Non Routine Job / Task: Where an SOP / SMP is not available or the conditions of the SOP / SMP have changed

PPE : Personal Protective Equipment

PTW : Permit to Work (same at WP (Work permit) System)

Permit Holder (Person who executes work): A person, who has been designated by management as being trained, qualified and certified to carry out the job under the permit. The person responsible for carrying out the work in accordance with the conditions on the permit.

Permit Acceptor (Person in Charge of execution of work*):* A person, who has been designated by management as being trained, qualified and certified to accept the permit. The person responsible for ensuring that the work is done as per the conditions on the permit and in accordance with the procedure.

Permit Issuer*:* An Employee, who has been designated by management as being trained, qualified and certified to issue a Work permit.

Permit Approver: As above, but of suitable experience level (usually a person at least one level above Permit Issuer)

Permit Receiver: An employee/contractor supervisor who has been designated by management as being trained, qualified and certified to receive a Work permit.

Risk: The likelihood (probability) which can lead to potential negative consequences.

RAM: Risk Assessment Matrix

Review: Examining the fundamental design of the system to see whether it should be changed in the light of experience.

Risk: The likelihood (probability) which can lead to potential negative consequences.

Risk Assessment: A systematic and structured process whereby hazards present in a workplace, or arising from workplace activity, are identified, risks assessed / evaluated, and decisions prioritized in order to reduce risks to acceptable levels.

Revalidation: Reassessing the work site and WP controls to determine if work can continue safely for another set period of time.

Shall: Mandatory requirement

Should: Optional requirement

SCBA : Self Contained Breathing Apparatus

SHE : Safety, Health and Environment

Shift Handover: Process of transferring responsibility for controlling and monitoring of the process and work from the present Operations shift to the incoming shift.

Supporting Certificate Signatory: The person responsible for confirming that the hazards have been (Validated, Authorised Safety correctly identified and assessed and, that the proposed controls area inspector, Fire Permit Signatory) adequate.

Suspension of Work Permit: Temporary invalidation of a Work permit for a period during which the work may not proceed.

Severity: The level of consequence / harm of an event that could occur due to exposure to the hazard present

Tagout: Placement of a tagout device (Danger Tag) on an energy isolating device, in accordance with the applicable sections of this procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed. Tagout devices are placed in the same location as lockout devices.

Tagout device: A prominent Danger Tag, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device or source of systems containing hazardous materials in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed. The tag is used only when the equipment is incapable of being locked out and the equipment is disconnected from its source of energy.

Task / Activity: A sequence of steps taken to conduct a job. A task is a sub element of a Job.

TLV-TWA: Threshold Limit Value – Time Weighted Average

The Threshold Limit Value (TLV) of a chemical substance is a level to which it is believed a worker can be exposed day after day for a working lifetime without adverse health effects.

Time Weighted Average (TWA) is the average exposure over a specified period of time, usually a nominal eight (8) hours.

Validity Period: The period from the time of issue of the work permit to its closure after the job is complete is called the validity period.

Worker: A member of the work party, working to the instruction of the Permit Holder - Work supervisor at site.

6. PROCEDURES:

6.1. The PTW system shall be followed if the activity is assessed as being high or medium risk in accordance with the Risk Assessment Matrix (RAM). The PTW system shall be applied to all activities listed within the area mapped as per Annexure-2

6.2. **The Permit to Work system has the following elements:**

a. A list of the activities and types of work that are to be controlled through the Permit to Work system.
b. A specification of the permits to be issued for various types of work.
c. A process for deciding which hazardous work requires additional control measures.
d. A list of the persons who are authorized to issue permits, accept permits and to specify additional controls.
e. A process for ensuring the competence of permit signatories (issuer and acceptor) and others playing an active role in the Permit to Work system.
f. Procedures of issuing permits, precautions during the work and close out of permits.

6.3. The combination of the Activity Schedule and the RAM enables a decision to be made regarding the need for a permit and any additional controls that may be required. Typical outcomes of this assessment are as follows:

a. Permit with JSA.
b. Permit with a HIRA.
c. Permit plus a JSA/HIRA and supporting procedures.

6.4. **Procedures include the following**:

a. Hot Work
b. Work at Height
c. Confined Space
d. Gas Test (toxic gases, oxygen)
e. Isolation (electrical, steam/hot water/hot air/compressed air, hazardous materials etc.)

A Process Flow diagram that includes identifying the need for a Work Permit through the Work Clearance process is attached in Annexure-3 sheet 1& 2.

6.5. **Work Permit System Documents**: The primary PTW System documents are:

a. Permit-To-Work
b. JSA/HIRA
c. Supporting checklist based upon nature of job

Hazard Identification and Risk Assessment (HIRA)

HIRA is a process of breaking down each task into its sub-activities or steps, identifying hazards in each step and related risk in these steps of the task and then determining appropriate controls to eliminate, isolate or minimize the risk due to the identified hazards to an acceptable level.

The steps in completing a HIRA are:

- Completing a Method Statement e.g. break down of activities into tasks.
- Complete a Hazard Identification and Risk Assessment for all tasks.
- Identify controls (eliminate, isolate, minimize) against the identified hazards.

The Permit Issuer should review the HIRA prior to issuing the WP and document on the WP any additional controls that the permit acceptor own employee must undertake to manage hazards and associated risks present on the site.

The WP should therefore align with and compliment the HIRA.

Work completion

Work completion is a process used to ensure that all activities on site are undertaken with the knowledge and consent of the Shift In-charge who also is the permit Approver. The permit acceptor is responsible to check the site conditions and ensure the task to be done and the tools to be used safely integrate with the daily operations of the site and any other activity that is scheduled to take place. The permit acceptor is also responsible to identify and address all the kinds of hazards in the execution of the job.
The final payment to the contractor shall be linked to satisfactory work completion including housekeeping.

6.6. **Medium and High Risk Works**

Most work activities undertaken on a TATA POWER process/activities/storage area when assessed using the Risk Assessment Matrix will be categorized medium to high risk due to the inherent hazards associated with the tasks/activities involving:

- Electrical works,
- Working at heights,
- Hot work involving in storage & dispensing flammable, combustible materials in operational areas,
- Confined spaces,
- Toxic and corrosive materials (particularly gases and liquids).

- Excavation, Demolition, Dismantling, Painting etc. done either as part of a project or routine activity.

6.7. **Electrical Work**

The following examples are considered Hazardous Electrical Work (for the purpose of this procedure):

- The task of adding a de-energized insulated jumper to an energized terminal (24 V AC / DC or more) while wearing proper PPE.
- Similar task of removing an insulated jumpers from an energized terminal (24 V AC / DC or more); if the removed jumper is de-energized as it is unplugged.
- Use of approved fuse pullers and test equipment such as voltmeters, clip-on ammeters, hot sticks, and non-contacting voltage sensing devices for higher voltages will be considered as Hazardous work.
- Normal operation of electrical welding machines.
- Testing of energized electrical circuits with approved test equipment when it can only be done without interrupting the circuit.
- Making elaborate changes in live electrical circuit when isolation is not possible.
- Disconnecting motors without switching off motor starter
- Fuse pulling and installing on energized circuits rated 415 volts and above (using approved tools)
- Working on draw out type circuit breakers when electrical isolation is not possible and parts still remaining live even after draw out.
- Installing and removal of insulating barrier when the barrier is installed at less than the safe working distance as prescribed in Electrical Proximity Work.
- Installation of safety grounds when energized circuits are nearby and at less than the safe working distance as prescribed in Electrical Proximity Work.
- Work on high energy "battery system" of greater than 24 Volt DC.

The following are examples of Electrical Work on energized equipment performed by Tata Power personnel that may not require a work permit. Similar work performed by contractors require a work permit

- Changing of fluorescent lamp and bulbs with lighting fixture de-energized.
  - Racking out circuit breaker following approved work procedures.

- Polarity testing of power point, domestic and industrial, in non-hazardous areas.
- Working on live electrical equipment where the maximum operating voltage is 50 V AC or 100 V DC.
- Testing of energized circuits of any voltage level with approved test equipment when it can only be done without interrupting the circuit.
  - Racking out breakers (of ratings less than 415 VAC) for maintenance and work on non-electrical portion of equipment less than 415 V AC.

- Troubleshooting of energized control circuits in non-hazardous areas using approved test equipment and using appropriate PPE.
- Troubleshooting of energized motor starter circuit in MCC using approved test equipment using appropriate PPE and applying an approved work plan.
- As far as possible the procedure discourages working of any kind on live electrical Circuits. Only when it is necessary to work on live circuit all necessary and adequate Controls need to be exercised, required PPEs to be used and all hazards taken care of before starting the job on live circuits.

6.8. **Work at Height**

Work at a height of more than 1.8 meters or at a depth of 1.8 meters are covered under this category

Examples of "Working at Height" are –

- Flat roofs, slopping roofs, fragile roof
- Structure erection/ special structure.
- Working on pipe racks and cable trays.
- Working on flat and sloping tank roofs.
- Working on tall structures like lighting towers, chimneys, electrostatic precipitators, transmission towers, cooling towers etc.
- Insulation and painting work at height.
- Confined space work at Height (more than 1.8 meters).
- Loading and Unloading of materials from trucks where the height is more than 1.8 meters.
- Working near Excavations where the depth is more than 1.8 meters.
- Working on Bucket Trucks and Man lifts.
- Painting work inside or outside the building.
- Working on tall equipments like large capacity vertical motors. E.G. 6.6 KV CWPP motors at Trombay Jetty.

Refer to the Tata Power "Work at Height" Procedure - TPSMS/CSP/WAH/004 for details of mandatory requirements and safeguards of working at Height. (When Cross reference is made the above section work at Height to be deleted)

6.9. **Hot Work**

Examples of hot work are - the use or operation of any of the following:

- Welding or gas cutting equipment.
- Grinder, electric drill or other non-flameproof electrical equipment.
- Hammering, chipping, drilling (particularly in the presence of flammable /combustible/explosive atmospheres)
- Use of Spark ignition engines or compression ignition engines when spark arresters on the exhaust are not provided.
- Use of Match, naked light, cigarette, cigarette lighter, flame or spark.
- Use of Hand tools that may create a spark (e.g. portable drilling machine).

- Any device, which is likely to produce a source of ignition or be an ignition source, e.g. cell phones, pagers, radios, etc.

Hot Work shall not be carried out in or adjacent to any hazardous area unless Gas explosivity Test has been carried out using an approved explosimeter/toxic gas meter. The area or site shall be certified free of flammable vapors and gases and a "Hot Work Permit" issued by an authorized TATA POWER signatory.

A gas/vapour barrier fence may be required in some circumstances to exclude vapours from the work area. (Original draft)

A fully charged fire extinguisher (Minimum 9 Kg dry powder) must always be stationed within easy reach of the personnel in work area where Hot Work is involved.

Thorough knowledge of all kinds of fire fighting equipments is mandatory for all the employees involved in hot work.

6.10. Confined Space

A Confined Space is any enclosed or partially enclosed space, either above or below ground, where there is some risk of reduced oxygen level, or accumulation of toxic flammability or explosive materials, or entry or exits are limited or there is a risk of engulfment. A Confined Space:

- Is not intended as a regular workplace;
- Has restricted means for entry and exit;
- May have inadequate ventilation and/or an atmosphere which is either contaminated or oxygen-deficient; and
- Is at atmospheric pressure during occupancy.

Confined Spaces include, but are not limited to: - tanks, vessels, vaults, certain pipelines, certain pits, elevated water tanks, boilers drums, columns, reactors, spheres, silos, sumps, sewers, underground services and excavations deeper than 1.80 meters, column skirts (those skirts where operator goes for valve operations is excluded from the definition, provided there is cross ventilation and there are two opening for ingress and egress.) Note that these spaces could reasonably have atmospheres that are oxygen deficient or contain other hazards, for typical examples of confined space hazards: refer to the Confined Space Procedure.

These spaces are subjected to potential hazards, viz., accumulation of toxic or flammable gas, vapour, inert gas, oxygen deficient (<19.5%v/v), flooding of liquid, gas, steam or any other hazardous substance or development of a hazardous conditions.

A Work permit must be issued before a person enters a Confined Space, and before the issue of the Work permit, a formal documented risk assessment must take place. The risk being high utmost care has to be taken at all times during the execution of the job. The place must be rendered safe and appropriate PPE used. The Work permit must specify details of the location and the type of work to be done, with the risk assessment attached or cross referenced, and with the necessary protective measures detailed or attached.

Entry into a Confined Space must be in accordance with TATA POWER confined space procedure and any requirements demanded by legislation. Thus:
No person should enter a Confined Space unless:

- Formal risk assessment has been completed.
- All product and service lines isolating valves entering the space are closed or disconnected and blanked, if required, necessary; and checked. The incoming lines isolating valves have to be closed firmly and locked and checked for not passing, if possible. The drain and vent valves to be opened full and the inside atmosphere checked for safe human presence to execute the work. In case the drain valves are inadequate to take care of passing isolation valves; then adequate provision for evacuation of the passing fluid / gas / steam in to the atmosphere to be made by providing additional drains and inside atmosphere healthiness checked with approved gas test meters.
- All mechanical equipment such as stirrers and heaters are positively disconnected and electrically locked off.
- All concerned operating and maintenance personnel are advised of the activity and the period for which it is approved.
- No cylinders of compressed gas, other than those used for self-contained breathing apparatus, shall be taken into a confined space.
- There is adequate illumination inside and entry / exit ports are clearly visible to the persons inside.
- There are no obstructions in the exit paths and are devoid of slippery and uneven surfaces.
- The person inside has worn a life line and the other end of the rope is in the hands of the person (observer) stationed just outside the confined space. The rope is always held in slight tension. The person inside to signal to the person outside of any possible discomfort felt by pulling the rope.
- Emergency response plans are in place and the working personnel are fully trained in the concerned job and understand the risks involved of working in confined spaces. They are also aware of all safety procedures.
- Air-Supplied breathing equipment is being worn by persons entering the confined space, where:
    - All personnel involved have been instructed practiced and have proven competence in its use.
    - An observer is stationed immediately outside the entry to the confined space all the time a person is inside.
    - A minimum of a single self contained BA set is on hand for emergency use, unless a risk assessment indicates additional units are required for higher risk activities, e.g. entry into underground tanks where there is only a single access manhole.

Note: Recommendations for types and use of breathing apparatus are set out in the supplier manuals.

Refer to the Tata Power “Confined Space Entry” Standard and Procedure for details of mandatory requirements and safeguards of working safely in a confined space.

6.11. Low Risk/Routine Works

If any sort of change occurs that alters a low risk activity (which may or may not be routine) to a high or medium risk activity, then the WP System must be applied. Changes in the atmospheric condition due to weather change / process related change in the vicinity of the work place or beginning of additional activities in the vicinity during the course of the initial activity.

Low Risk activity should be covered by a HIRA.

6.12. Changes in Conditions & Emergency Action

In the event of any of the following circumstances occurring during the course of an activity under permit, the Permit Holder must refer back to the Permit Issuer (through Permit Acceptor) on the appropriate course of action:

- The specified equipment or tools to be used not being available.
- Any changes in the type and nature of work.
- Occurrence of any condition / situation during the progress of the work that was not anticipated.
- Any change in the process condition or the surrounding. (E.g. unexpected release of gas from a nearby tank).
- An emergency in the area.
- Any change in the weather condition.

6.13. Self-Permitting

No one is allowed to issue a permit to himself as this would defeat one of the prime objectives of a PTW system of having a third party check to critically review the proposed controls.

6.14. Permit Validity

A Permit is valid for a specific scope of work, on a specific site, within a specified period of time as mentioned in the PTW Daily authorization of the work permits from the permit issuer is necessary till the completion of the job. This however implies that none of the preconditions have changed.

The permit issuer can re-validate a Permit provided that none of the conditions have changed.

6.15. **Blanket Permits**

Blanket Permits are strongly discouraged and therefore not issued / authorized or considered a valid document. They should not exist.

6.16. **Permit to work in conjunction with Contractor safety code of conduct (CSCOC):**

Tata Power has adopted a formal CSCC which has the following components:

- Contractor selection (includes – selection criteria, contract document preparation, floating of tenders / enquiries and contract award),
- Orientation and training of the contractor and his personnel. Safety training of all such personnel and carrying of the safety training card on person is mandatory.
- Managing and supervising the work, and
- Periodic evaluation.

WP System shall be applied in conjunction with the CSCC. The CSCC requires contractors to demonstrate, via a selection/accreditation process, that they are competent (through education, training and experience) in a nominated activity and that they have the necessary SHE management systems in place to manage SHE risks in their given field.

The selected contractors can undertake work for TATA POWER in the area that they are accredited for, provided the following conditions are met:

- A valid WP is obtained by the permit acceptor (a Tata employee.)
- A HIRA is completed for each activity they undertake.
- That they adopt the controls stipulated in WP.
- They comply with local legislations.
- They carry out the entire job in accordance with the safety manual and rules and procedures (with revisions and modifications) in force in TATA POWER as on the date of issue of WP.

Note: Use terms like permit acceptor and permit approver as the short form of both is PA and may be confusing.

The guiding principle behind the CSCC is that contractors are specialists and competent in their own area, and therefore should be advising TATA POWER, via the completion of a HIRA for each project/activity, how risks associated with the work they are undertaking will be managed and controlled. If there are additional controls that need to be managed because they are working on a TATA POWER facility i.e., working within a hazardous zone or the nature of work involves hazards with medium to high risks, then TATA POWER shall appraise the contractor of additional site-specific controls and mention them in the WP document. These controls should be adhered to along with the controls identified in the HIRA.

The WPS (work Permit system) and CSCC work hand in hand. The contractor identifies and manages risk within their area of expertise and TATA POWER personnel will

instruct/advise the contractor on additional site specific controls they must adhere to because they are doing work on a TATA POWER site.

Works under WPS are considered to be SHE Critical.

Signatories should be authorized by the SBU head on the basis of competence demonstrated through experience, training, coaching and assessment process.

Records must be kept and regular assessment (every two years) to determine competence levels of the signatories shall be carried out.

Set out below are the principal roles and associated responsibilities required in operating a WP system.

Tables 1, 2 and 3 below provide a summary of the selection criteria and a competency profile for each role.

6.17. **Responsibilities**

Typical Hierarchy of designations at Trombay (for example only)
GM—asset owner
DGM/AGM—HOD
Unit in-charge—permit approver
Operation engineer—permit issuer
O.E./A.O.E./APOs—area operators
Maintenance Department—Sr manager/manager/Asstt.
Manager/Executive/chargehand---
Permit Acceptor
Maintenance fitters (and their helpers) ---permit holders
GM/DGM/DGM-Projects
The Site Manager is overall responsible for ensuring the implementation of WP system. In a project site, Head, Project is overall responsible for the SHE.

The GM himself or through a nominated representative DGM/DGM-Projects is responsible for monitoring the performance of the WP system on an ongoing basis, for conducting periodic reviews of the effectiveness of the WP system and for providing assurance to the Site Manager that the WP system is being implemented effectively. He is also responsible for appointing Permit Issuers/permit approvers/permit acceptors.

6.17.1. Responsibilities of the GM/DGM/DGM-Projects or their nominated representatives:

- Implement and manage the WP system and provide a source of expertise in its application.
- Implement, apply and monitor and audit the Work Permit System within the Operating Unit (complete premises included e.g. for Trombay all the units and services - like CLP, LDD, central civil department - within the fence)

- Oversee training programs for Permit Issuers, Permit Approvers, and Area Operators and Gas Testers.
- Delegate Work Permit System authorities on behalf of the Asset Owner (number one post at the site). Ensure that those who are appointed as Permit Issuers, Approvers and Area Operators are competent to undertake the role.
- Ensure authorities are revalidated and endorsed every two years by the asset owner or his deputy.
- Ensure regular audit of WPS as a whole and the performance standard of the officers enforcing WPS.
- Receive feedback from the users of the WP system.

He will approve work permits in the absence of permit approvers.

He will delegate various levels of authority in accordance with needs, subject to appropriate training and competency.

6.17.2. Permit Issuer {Control Room Shift In-charge} divisions may add specific designations)

The Permit Issuer is responsible for writing the permit and for identifying (in conjunction with the person who is to undertake work/contractor if practical) hazards, risks and controls required to manage the risks.

He must confirm that the hazards have been correctly identified and risks assessed and, that the proposed controls are adequate. The PI has the requisite training, experience and competence in the WP system.

A Permit Issuer can only be authorized to issue Permits in areas where they are trained to do so, e.g. Toxic Gas/oxygen Testing, Confined Space Entry, Hot Work, Working at Height etc.

The Permit Issuer shall have a minimum of one years experience in the relevant activities and processes and have had appropriate training for the work he is authorising and included in Safety Tagging List. And as per Electricity Rules.

The PI must have a minimum of 1 years experience in the plant/activity and formally trained in WP system.

The PI is responsible for the following:

- Confirming that all hazards associated with the work have been identified assessed managed and all relevant parties have provided their inputs and agree with the precautions.
- Ensuring that the permit accurately details the scope of works and that the documented controls combined are adequate to ensure the work can be completed in a safe manner
- Ensuring that all necessary supporting permits/certificates, HIRA, JSA if required, and drawings are attached or referred to in the permit

- Ensuring that the Permit acceptor knows the exact location and scope of the work, all the hazards that may be present and all the precautions and controls that must be taken and maintained during execution of the work.
- If discussion at the work site and checking the controls are delegated to another member of the operating team, the Permit Issuer still takes full responsibility for authorizing the work to go ahead.
- Confirming that all operational preparations, including process clearance and isolations, de-energizing and de-pressurizing have been completed.
- LOTO is performed as laid down in the permit.
- Confirming that the work site is safe for the work to proceed.
- Specifying on the permit any additional precautions that need to be taken during the work.
- Identifying any conflicts between the proposed work and other activities in the area, and if necessary cross-referencing the permits.
- Informing all people who may be affected by the work.
- Signing and issuing the permit.
- Knowing the status of the work at all times,
- Signing off and closing the permit when the work is complete or suspended.

The PI can only delegate his authority during a period of his absence. Authority can only be delegated to another PI who satisfies the competencies required for a PI.

The PI must notify the permit approver/HOD if their responsibilities have been delegated.

6.17.3. Permit Acceptor (Person who is responsible to handle work)

The permit acceptor is a permanent employee. There are many activities that will be undertaken where the contractor is more of an expert than Company staff. It is not the purpose of the WP system, or the Work Permit, to advise the contractor how to specifically address the expertise issues in their scope of work – the contractor will address this via completion of the HIRA.

The permit, when combined with a HIRA, experience of permanent employee and contractor expertise, ensures that SHE risks involved in the work are addressed. It should be a joint effort of the contractor and the company staff to bring forth all the SHE risks, hazards etc. It is possible that the Permit acceptor / permit issuer may contribute a point that the contractor has missed / not foreseen.

Permit acceptor shall be responsible for executing the entire work in full compliance with the permit requirements. His/her responsibilities include the following:

- Understanding the potential hazards.
- Ensuring that LOTO is performed at all points before the commencement of the work.
- Understanding how the hazards are controlled.
- Knowing the emergency situations likely to occur in the work area and actions to be

taken including evacuation procedure.

- Ensuring that the permit holder understands all the hazards and controls, explaining them to the workers, and ensuring that the controls are maintained throughout the execution of work.
- Informing all people who may be directly affected by the work.
- Signing and accepting the permit.
- Knowing the status of the work at all times,
- Transferring duties formally.
- Knowing how to mitigate a possible incident, safe closure of work at such time, rescue of men and material, arrange / administer medical aid if required.
- Knowledge of first aid and its administration.
- Is aware of the on-site emergency plan.
- Lead and take care of his group at times of emergencies.

6.17.4. Permit Holder - the supervisor of the working party at the site, executing the job.

The permit holder shall be responsible for commencing and completing the authorized task while fully complying with all the requirements as listed in the permit. His/Their responsibilities include the following:

- Knowing and understanding the potential hazards.
- Knowing and understanding how the hazards are controlled.
- Knowing the right kind of PPEs required, ensuring correct use and compliance thereof.
- Knowing the emergency situations likely to occur in the work area and actions to be taken including evacuating the area.
- Knowing the terms and conditions of safe work.

6.17.5. Permit Approver

The Permit Approver shall be responsible for ensuring that the hazards have been evaluated, adequate controls are provided and precautions are specified in the permit. He/she is responsible for the following:

- Knowing the hazards including potential hazards and confirming that all hazards associated with the work have been identified, assessed and managed and all relevant agencies have provided their inputs and agree with the precautions.
- Knowing how to control and manage hazards.
- Verifying that the work area is safe to commence and carryout work, including checking that representative atmospheric sampling results are within the acceptable limits.
- Confirming that the permit accurately details the scope of works and that the documented controls are adequate to ensure that the work can be undertaken and completed in a safe manner.

- Confirming that all necessary supporting permits, hazard & risk assessment are attached or referred to in the permit
- Confirming that the permit holder has been explained the exact location of the work, all the hazards & risks that may be present and all the precautions and controls are taken care of.
- Confirming that the permit holder understands all the hazards and controls.
- Confirming that all operational preparations, including process clearance and isolations, de-energizing and de-pressuring, have been completed.
- Signing the permit.

6.17.6. Area Operator

Area Operator shall be responsible for ensuring that the work location has all the necessary safeguards available in line with the permit requirements. His/her responsibilities include the following:

- Understanding the potential hazards in the work to be done and no new hazards are introduced during the execution of the assigned work. If the situation alters and new hazards occur or the safety requirements are not complied with, stop the work and inform the permit issuer.
- Understanding how the hazards are controlled.
- Knowing the emergency situations likely to occur in the work area and actions to be taken including evacuation procedure. Take appropriate actions when an emergency occurs.
- Ensuring that the permit holder complies with the controls and takes all specified precautions throughout the work.
- Ensure that the permit holder restores the site to its original condition after completion of work.
- Signing the permit.
- Knowing the status of the work at all times.
- Transferring duties formally.
- On behalf of permit issuer to isolate, ground, depressurize, de-energize and vent out the equipment and perform LOTO.
- To advise precautions left uncovered, if any.
- To ensure that LOTO is performed by the concerned party before the commencement of the work.

6.17.7. Authorised Toxic Gas/Oxygen Level Tester (the person)

The Authorised Toxic Gas/Oxygen Level Tester shall be suitably trained for the work he is undertaking and shall have access to (throughout the execution of the work) and be competent to use approved gas testing equipment. The test equipment should be readily available at site all the time. The test equipment shall be calibrated at the specified frequency of time and use.

The Authorised Toxic Gas/Oxygen Level Tester is responsible for:

- Carrying out gas tests (oxygen/ toxic gas and flammability) at the frequency specified on the permit and supporting certificates.
- Stopping the work and instructing personnel to withdraw from the area whenever a gas test or change in conditions indicates that it is unsafe for the work to continue.
- Reporting back to the Permit Issuer about the stoppage of work and reasons there for.
- Being at the site throughout or on call whichever is applicable.

7. Records:

7.1. Filled Permit-To-Work (PTW) – Retention Period - One year

8. TRAINING & COMMUNICATION

8.1. Training of Permit-To-Work procedure shall be carried out to cover for following-

(i) Permit Issuer,

(ii) Permit acceptor,

(iii) Permit Holder

(iv) Permit approver.

8.2. Initial Communication to be done through Corporate Communication, Email and subsequently shall be made available at safety portal at Sangam

9. VERIFICATION

9.1. Verification of implementation shall be done during Permit-To-Work (PTW) procedure audit, field safety visit and site inspections.

10. EXCEPTION: Any Exception to this procedure shall only be done as per Document Control .Procedure (TPSMS/GSP/DC/014).

11. REFERENCES

- Indian Factory Act 1948 and State Factory Rules
- Excavation Safety (Shoring and Sloping) Procedure - TPSMS/CSP/EXS/002
- Tata Power LOTO Procedure - TPSMS/CSP/LOTO/001
- Tata Power Job Safety Analysis (JSA) Procedure - TPSMS/CSP/JSA/009
- Tata Power Hazard Identification & Risk Assessment (HIRA) Procedure - TPSMS/GSP/HIRA/005
- Tata Power Confined Space Entry Procedure - TPSMS/CSP/CSE/003
- Tata Power Work At Height Procedure - TPSMS/CSP/WAH/004

12. REVIEW: Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

13. Attachments/Appendix:

13.1. Annexure-1 : Work Permit - Activity Table

13.2. Annexure-2 : (Typical) Site - Hazardous Areas Map

13.3. Annexure-3 : Sheet 1 - Work Clearance Process Flow Diagram

Sheet 2 - Work Permit Process Flow Diagram

13.4. Attachment- 4 : Safety Precautions & Requirements

Annexure -1

Work Permit - Activity Table

The following table lists activities that MUST be covered by a Permit in Tata Power activities. In addition to a Permit, a HIRA is required, plus other supporting certificates as specified:

"HIRA, isolation and LOTO" shall be common items in the last column of the table below.

S. No.	Activity	Supervised By	Issuer	Typical Checks/Other Supporting Certificates/Documents e.g., Isolation, Gas Free, HIRA, Electrical Work, Confined Space Entry, Work at Height
Construction Activities				
1	Site Clearing and Barricading			
1.1	General Cleaning	Permit Acceptor	Permit Issuer	JSA/HIRA
1.2	Cutting down trees, grass cutting	Permit Acceptor	Permit Issuer	JSA/HIRA, Work at Height
1.3	Demolition of old structures	Permit Acceptor	Permit Issuer	JSA/HIRA, Confined Space entry
2	Construction of Temporary Facilities/Structures			
2.1	Installation of portable cabins temporary structures	Permit Acceptor	Permit Issuer	JSA/HIRA
2.2	Installation of electrical switch board for temporary power supply	Permit Acceptor	Permit Issuer	JSA/HIRA. Refer to the document Electrical safety Procedure/guidelines for safe working on electrical systems during project execution and office areas.
3	Installation of Equipment, Tanks etc.			
3.1	Drilling, Excavation	Permit Acceptor	Permit Issuer	JSA/HIRA
3.2	Electrical work	Permit Acceptor	Permit Issuer	Electrical isolation
3.3	Excavation, back filling	Permit Acceptor	Permit Issuer	JSA/HIRA, Shoring/Sloping
3.4	Lifting and installation of rafters/beams/ columns/girders	Permit Acceptor	Permit Issuer	JSA/HIRA
3.5	Hot Work Including but not limited to Welding / Grinding /Gas	Permit Acceptor	Permit Issuer	Hot work, Confined space entry

	Cutting			
3.6	Installation of electrical and electronic Instruments/equipments switch yards, switch rooms, transformer rooms, MCC etc.) unless certified Intrinsically safe.	Permit Acceptor	Permit Issuer	JSA/HIRA, Refer to on site emergency plan (emergency preparedness response), General safety procedures (TPC/OCP/01/026), Control procedures during electrical work (TPC/OCP/01/020), Control procedures for fire (TPC/OCP/01/027). Also Refer to the document Electrical safety Procedure/guidelines for safe working on electrical systems during project execution and office areas.
4	Construction of Utilities			
4.1	Excavation	Permit Acceptor	Permit Issuer	JSA/HIRA, Shoring/Sloping
4.2	Concreting	Permit Acceptor	Permit Issuer	JSA/HIRA
4.3	{Blank space in original draft} This may be “work in confined space”.	Permit Acceptor	Permit Issuer	JSA/HIRA, Gas test, Isolation
4.4	Signage, including canopy signage / Aviation warning lamps, High mast fittings for lighting towers	Permit Acceptor	Permit Issuer	JSA/HIRA, Isolation, working at heights, medical fitness
4.5	Setting up of Temporary equipment including Product recovery equipment. E.g. Compressor, water blasting Equipment, scaffolds etc.	Permit Acceptor	Permit Issuer	JSA/HIRA, Equipment test certificates, scaffold stability inspection certificate, working at height
4.6	Tank Removal/ Decommissioning	Permit Acceptor	Permit Issuer	JSA/HIRA, Confined space
4.7	Transfer between tankers, and other product transfer and pumping between tanks.	Permit Acceptor	Permit Issuer	JSA/HIRA. This is a very low risk routine job not requiring a permit. This needs to be deleted.
5	Operational Sites			
5.01	Air conditioning maintenance	Permit	Permit	JSA/HIRA. Confined

	not covered by long term, routine maintenance contract (AMC)	Acceptor	Issuer	Space, Electrical Isolation, Roof mounted equipment may need Work at Height
5.02	All activities capable of producing a spark inside hazardous areas	Permit Acceptor	Permit Issuer	JSA/HIRA. Hot work. May require gas free test.
5.03	Activities involving access to transmission towers, building/canopy/ roof / all jobs related to maintenance/ erection of O/H transmission lines	Permit Acceptor	Permit Issuer	JSA/HIRA, Work at Height
5.04	Access into a Building/canopy Cavity	Permit Acceptor	Permit Issuer	JSA/HIRA, Confined Space entry
5.05	Repair/rework on tanks and pipe work	Permit Acceptor	Permit Issuer	JSA/HIRA, Gas free certificate, confined space entry
5.06	Repair/rework on equipments	Permit Acceptor	Permit Issuer	JSA/HIRA, Gas free certificate, confined space entry,
5.07	Concrete cutting in hazardous zones	Permit Acceptor	Permit Issuer	JSA/HIRA
5.08	Cranes / Lifting devices	Permit Acceptor	Permit Issuer	HIRA Low risk routine job. Does not require a permit. Delete.
5.09	Demolition	Permit Acceptor	Permit Issuer	JSA/HIRA, electrical isolation, As in 3.6
5.10	Drilling/Machining	Permit Acceptor	Permit Issuer	JSA/HIRA
5.11	Electrical Switchboard work	Permit Acceptor	Permit Issuer	JSA/HIRA, Electrical isolation, As in 3.6
5.12	Excavation	Permit Acceptor	Permit Issuer	JSA/HIRA, Shoring/Sloping
5.13	Surface repair	Permit Acceptor	Permit Issuer	JSA/HIRA. Low risk routine job. Delete.
5.14	Hot Work Including but not limited to Welding / Grinding /Gas Cutting 5.02 above can be merged here	Permit Acceptor	Permit Issuer	Hot work, Gas test if in hazardous zone/Confined space entry. To confirm whether HIRA covers incidents (Fire) due to sparks falling down if the job is to be performed at a height.
5.15	Whether this can be reworded for TATA POWER as “work in Confined space?”	Permit Acceptor	Permit Issuer	JSA/HIRA. Confined space, Gas test

5.16	Breakdown and preventive maintenance of electrical and electronic Instruments/equipment inside hazardous; non-hazardous areas on equipments like main transformers, service transformers, 100 KV, 220 KV, 22KV equipments, GODs buses, (e.g., switch yards, switch rooms, transformer rooms, MCC etc.) (we do not consider anything intrinsically safe under this category)	Permit Acceptor	Permit Issuer	JSA/HIRA, AS in 3.6
5.17	Oxygen Deficient/ Inert Gas Entry	Permit Acceptor	Permit Issuer	JSA/HIRA. Gas test, Isolation. Delete. This is covered in confined space
5.18	Pneumatic/Hydraulic pressure testing.	Permit Acceptor	Permit Issuer	Gas test, Isolation
5.19	Signage, including canopy signage / Aviation warning lamps, High mast fittings for lighting towers	Permit Acceptor	Permit Issuer	Isolation, working at heights, medical fitness
5.20	Setting up of temporary equipment e.g. Compressor, water blasting equipment, scaffolds, cranes etc.	Permit Acceptor	Permit Issuer	JSA/HIRA, Equipment test certificates, scaffold stability inspection certificate
5.21	Tank Removal/ Decommissioning	Permit Acceptor	Permit Issuer	JSA/HIRA, Confined space
5.22	Transfer between tankers, and other Material transfer and pumping between tanks.	Permit Acceptor	Permit Issuer	HIRA AS in 4.7 Delete.
5.23	Breakdown repairs, preventive maintenance of auxiliaries and the main process equipment. E.g. boiler, turbine,BFP, CEP, CCPPs, service water equipments, and so on	Permit Acceptor	Permit Issuer	JSA/HIRA. As in 3.6 above.

- The above table is “work permit activity table’’ and not the list of activities where PI’s presence is required.

- Depending on the site conditions, the severity and urgency of the type of job involved the Permit Acceptor has to remain present at the site throughout the completion of the job. He will exercise his own discretion on the level of supervision required.

Annexure-2

A) (Typical) Site - Hazardous Areas Map

B) Hazard identification & Risk Assessment – Reference to individual department HIRA(RAM)

THE EXTENT OF THE HAZARDOUS AREA IS SHOWN THUS:
-- METRES from dispensing pumps
-- METRES from dip/fill points on underground tanks
-- METRES from tank vents

Warning – Any product transfer, pipeline, modifications or repairs, excavations could extend hazardous areas.

ATTACH SITE MAP

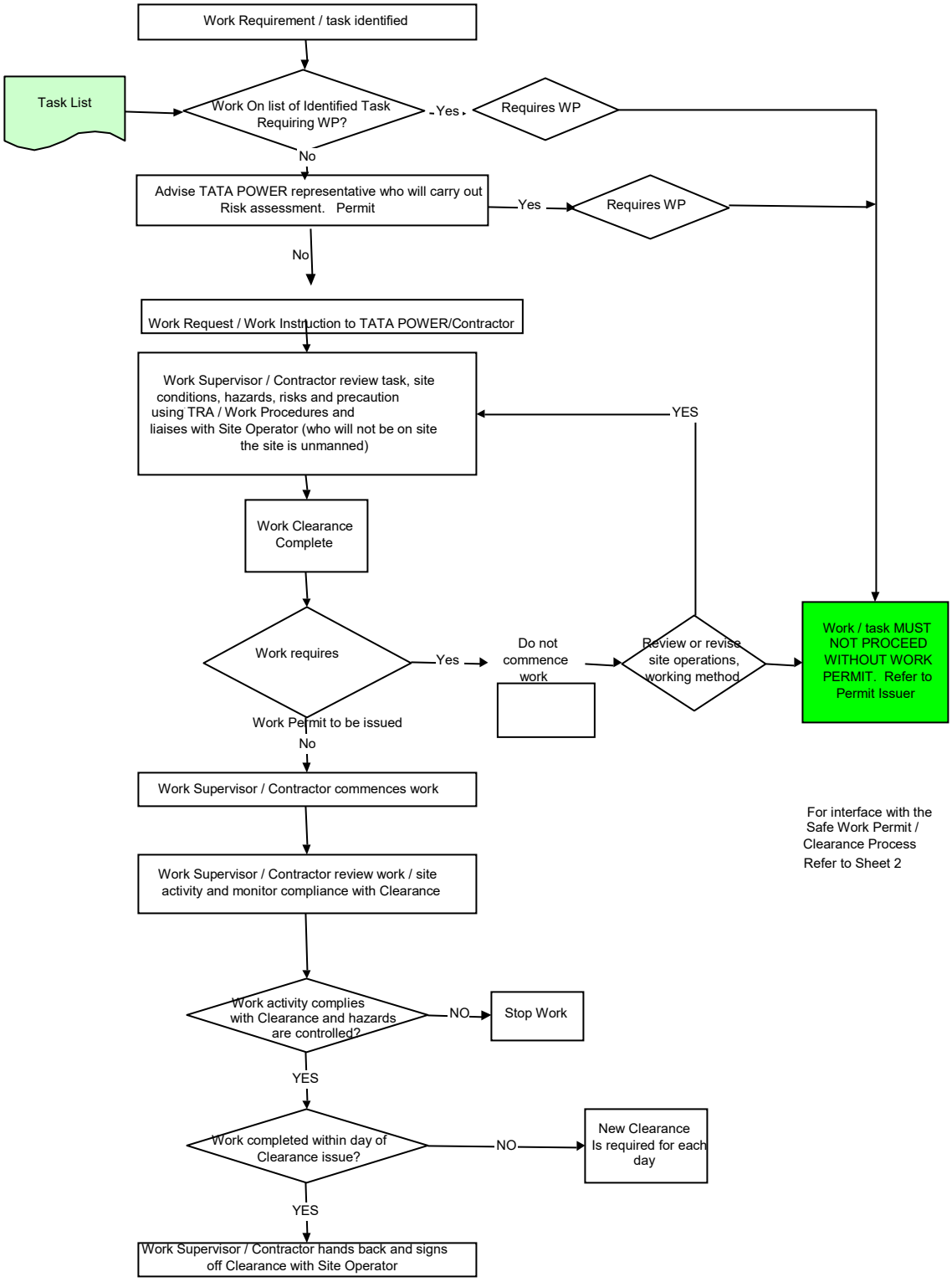
HAZARDOUS AREAS HAVE NO HEIGHT LIMITATIONS FOR PERMIT CONDITION PURPOSES

.

SMOKING IS NOT PERMITTED ON SITE

Annexure- 3

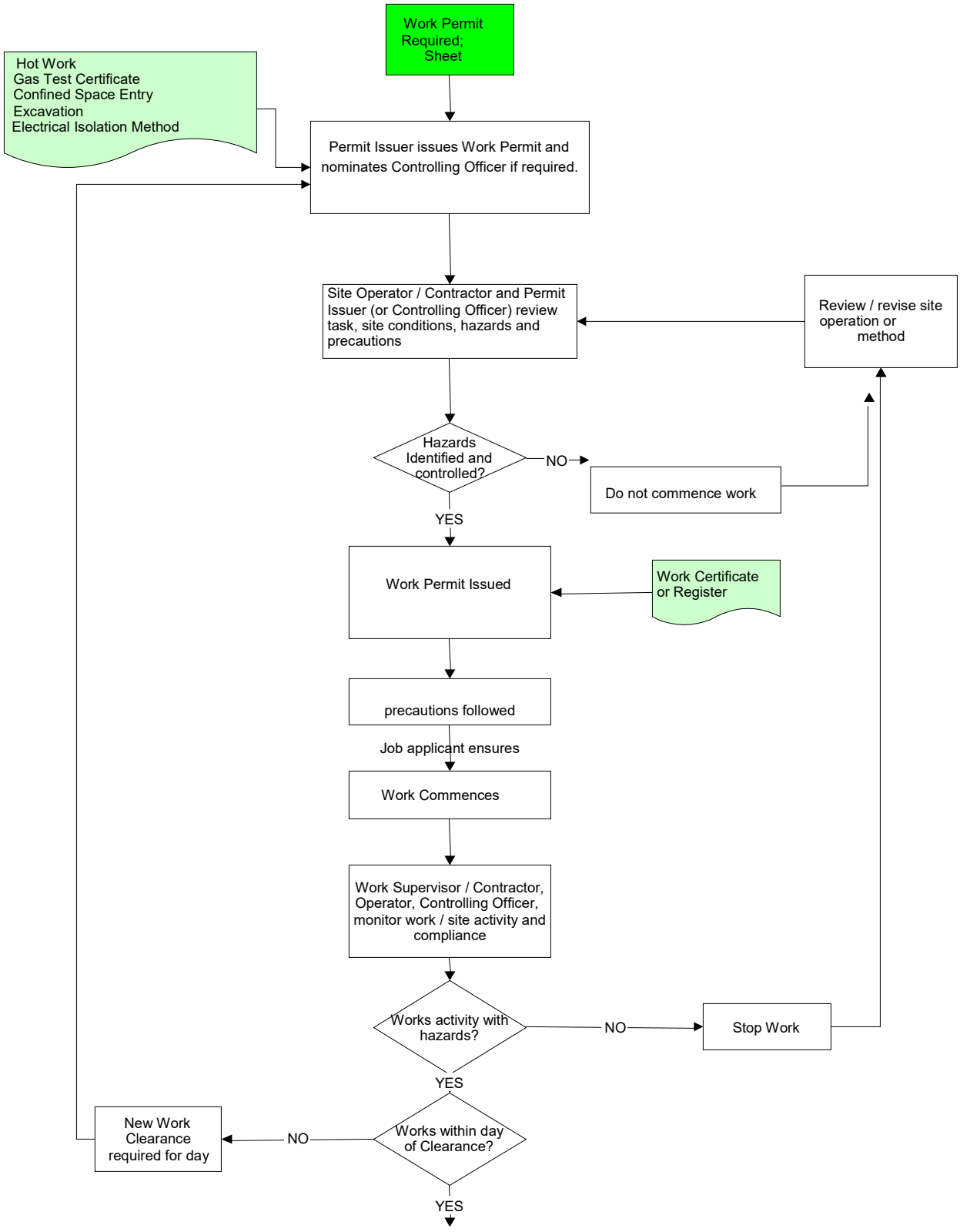
Sheet 1 - Work Clearance Process Flow Diagram



PERMIT PROCESS OPERATONAL FACILITIES SHEET 1

Annexure-3

Sheet 2 – Work Permit Process Flow Diagram



Annexure- 4

SAFETY PRECAUTIONS AND REQUIREMENTS

FOR HOT WORK,
Gas testing shall be carried out at least once every 2 hours within 15 M of the work site by the approved gas tester if hot work is at close proximity of area where there is potential fire and/or explosion risk. However, gas testing shall be carried out as frequent as practicable if the prevailing site conditions call for maximum safety.

FOR CONFINED SPACE ENTRY,
Continuous and/or Periodic monitoring:
Testing should always be carried out as close as possible to the time of entry. Continuous monitoring shall be used when the activity inside the confined space can alter atmospheric conditions or there is a known activity-taking place outside the space during the entry that has direct potential to alter the atmospheric conditions inside the space. Periodic monitoring (not more than 2 hours apart) shall be done in the cases when the condition inside the confined space is not likely to be altered because of the work inside the confined space and/or activities being carried out in the surrounding space.

Testing stratified atmospheres:
When monitoring for entries involving a descent into atmospheres that may be stratified, the atmospheric envelope should be tested from top and bottom and using a probe so that representative sampling is done.
Sampling
A person authorised (Permanent TATA POWER employee only)for the purpose must carry out sampling of confined space atmosphere and testing and the results of such tests must be entered in the CSEP at appropriate space available for the purpose and also in sheet for recording gas test as per Table above.

The confined space shall be evaluated prior to re-entry after any break in continuous entry, for example if both the attendant and the entrant leave the work area to take a lunch break.

A. SAFETY PRECAUTIONS AND REQUIREMENTS FOR HOT WORK

The following safety precautions and requirements, though not necessarily exhaustive, shall be observed before and during the hot work:

1. The equipment to be worked on shall be positively isolated electrically, hydraulically and on gaseous side whatever applicable. Isolation of the equipment for normal outages shall be carried out at normal isolation points. For extensive repairs / rehabilitation / reconstruction both mechanical and electrical isolation (at other than normal isolation points) by disconnection / blanking need be performed. For normal outages also at

times mechanical isolation / blanking may have to be performed if the isolation valves are passing.

2. Blanking is not required for stand-alone utilities supply pipes. Utilities supply in this instance are: process water, potable water, LP/HP De-mineralized water, soft water, direct/indirect sea-water, ID cooling water, chilled water, fire water, LP/HP nitrogen, steam, plant air, process air, instrument air and steam condensate.

   Prior to commencement of hot work on the utilities supply line mentioned above, it is of utmost importance that the line to be worked on is Clearly and positively identified, isolated and depressurized or drained. This verification can be done by: a) opening a bleed valve (drain valve); b) first break; or c) by doing a cold-cut.

   Utmost care has to be taken while taking a cold cut / break, if we are unable to stop the passing of fluid through the isolating valve. The work may have to be done with the passing of fluid / gas. In that case additional safety measures / controls need to be exercised for safe completion of the job. This is not necessary because when the work is planned WP is issued. When WP is issued LOTO is performed at all necessary points including the one mentioned here.

3. The equipment shall be freed of liquid and gas by depressurizing, draining, venting, purging and flushing.
   In lined vessels or equipment containing pockets, recesses, double bulkheads, etc. precautions shall be taken to ensure that no material is trapped behind the lining. This may require cold drilling and steaming through behind the lining followed by gas testing. Where it is not possible to achieve gas free condition in the equipment or there is a doubt that all potentially hazardous materials have been removed, the space shall be filled with nitrogen/ inert gas or water during hot work.

4. Any combustible material, including paper cartons, oily rugs and grass, located nearby shall be removed. Oil spills or deposits around the work site shall be cleaned up. Where it is not practical to remove combustible materials they shall be suitably covered or wetted with water.

5. Drain covers and surface manhole covers within 15 m from the work site shall be properly sealed throughout the work period to prevent emission of flammable vapours.

6. If flammable liquid is present in any open drain or ditch which runs within 15m of the work site, it shall be ensured that the flammable liquid is pumped out beyond a distance of 15 meters.

7. Any potential source of flammable gas or vapor emission, such as sampling point, vent or drain situated within 15m of the work site shall be rendered safe by sealing. If there is a potential release of flammable gas or vapor in the vicinity of hot work, it may be necessary to monitor the atmosphere using continuous gas monitors which will alarm on detection.

8. The equipment on which hot work is to be carried out must be certified as being gas free by the authorized gas tester. The equipment cannot be certified as gas free until all sludge, grease, scale, deposits, etc. have been removed, as subsequent work could disturb or heat the remaining materials and give rise to a hazardous condition.

9. Gas free condition must also be maintained within a radius of15m from the work site throughout the hot work period. The PI will ensure that there is no process related releases in 15 meter radius from the work site and the permit acceptor / holder shall bring it to the notice of PI in case there is an accidental release.

10. If the hot work could result in the projection of material, the work site must be adequately contained. In the case of welding, cutting or grinding, where molten metal and sparks are produced, the work site must be adequately surrounded by fire resistant or flame retarding tarpaulin (asbestos cloth) to contain such sources of ignition. Particular attention must be paid to elevated hot work where sparks and molten metal can fall and cause injury to passers-by or ignition to potential sources of flammable or combustible materials underneath. The immediate area around and underneath the hot work site must be properly barricaded or roped off with warning signs. Proper ventilation shall be used to ensure the hot work workers do not inhale the welding fumes.

11. All hot work sites must be equipped with sufficient portable fire extinguishers of the appropriate type, fire hose lines charged with water from the nearby fire hydrants. The end sections of the 2½" hose line shall be 1½" hose connected to the gated "Y" piece with stream/fog shut-off nozzles for easy maneuverability.

12. The vicinity of the hot work area where there is a potential of sparks or molten metals falling off the ground shall be wetted with water where practicable.

13. The permit approver and permit acceptor must monitor the progress of hot work on a regular basis to ensure the work group abides by the permit conditions and requirements. In the case where hot work, especially heavy hot work, is carried out reasonably close to an operating plant of 'live' system containing hazardous materials, a 'fire watch' from the permit acceptor must be stationed at the work site to closely monitor and supervise
    the work where practicable.
    (No person or equipment should be known by more than one name)

14. The parking of mobile equipment such as welding sets and generators must be outside the classified hazardous area and away from the pipe-bridge carrying flammable materials.

15. All electrical appliances, connectors and power sockets or extension cords to be used in the classified hazardous areas must be of industrial and flame-proof type.

16. Cigarette or tobacco smoking including the use of lighters or matches at the hot work site is STRICTLY PROHIBITED even if the work site is covered with a hot work permit.

17. It is difficult to cover every possible type of work in this write up. In cases not covered by this write up the Permit Issuer/Approver/Site incharge will study the job thoroughly and ensure that the job is done in a safe manner. The ultimate responsibility shall be with the Permit approver.

B. SAFETY PRECAUTIONS FOR COLD WORK

The following precautions (though not necessarily exhaustive) should be observed in relation to the performance of Cold Work:

1. For work involving the opening-up or de-energizing of equipment, the Lock, Tag and Try Procedure must be followed.

2. If equipment is to be opened up, it should first be depressurized, drained and purged of hazardous material under valve isolation, before positive mechanical isolation can be achieved.

3. If toxic gases could be present, suitable breathing apparatus should be specified.

   The possibility of the presence of pyrophoric material should be considered before admitting air. If necessary, the equipment should be water flushed/filled before opening up and wetted down afterwards.

4. Where hazardous materials such as hydrocarbons and chemicals are involved, mechanical isolation should consist of spading, blanking or disconnecting.

   An exception to this requirement would be some cases of minor work when locked off valve would suffice, provided the isolation is confirmed effective by opening drains on the equipment and confirming that the drains are clear and not choked.

   This exception is not made in the interests of expediency, but recognizes that swinging spades or making disconnection can be equally, or more hazardous, than some examples of minor work.

5. Work should not be attempted on any equipment where the possibility ~~exists~~ of hot material escaping exists, e.g. temperature exceeds its flash point, boiling point or auto-ignition temperature. The material should be allowed to cool before draining and extra care exercised when checking isolation effectiveness.

6. Particular care is required in achieving and proving isolation when equipment operates under a vacuum.

   Wherever practicable, a formal maintenance preparation procedure should be written for any equipment where hazards such as hot material or vacuum operation are encountered.

7. Where driven machinery is to be worked on, the prime mover should be positively isolated and any switch gear locked off as per the Lock, Tag and Try Procedure.

8. Appropriate protective equipment must be specified. This is not specific and can be deleted.
9. The area around any work site must be appropriately identified and barricaded, if necessary, to prevent other personnel in or passing through the area from being exposed to hazards.

Close Out of WP
When the work is complete, all copies of the permit should be reunited at the issuing point. The Permit Issuer or his delegate and the Permit Holder should then inspect the work site and jointly confirm that they are satisfied that the work has been completed as intended and the worksite has been left in a safe and tidy condition. Only then should the Permit Issuer will sign off the permit.
Closing out the permit does not necessarily mean that any equipment is ready to start up. The equipment is released under WP to the PA to rectify a problem. If the equipment is not service worthy then this needs to be mentioned in the “WP close out”. If the problem cannot be set right then a caution order needs to be placed on the equipment saying “not available for service due to ********** (state the nature of the problem)”. The working party needs to set the defect right at the earliest depending on the urgency of the process requirement.

The permit format clearly defines the status when the permit is closed, e.g.

- LOTO is removed after confirmation with permit holder & PI
- The work site in a safe condition and tidied up.
- The equipment is lined up (isolation valves opened and drains and vents closed).
- Power supply restored.
- Tightness of the system checked. (there are no leakages)

Other Permits and Attachments Applicable to the Site/Works

Delete standard attachments not applicable and list others.
List other permits applicable to the work area. They may apply to the same or different persons (one equipment released to more than one party).

The Permit Approver / PI must validate The Permit – To -Work
Insert the times and dates, between which the permit is authorized, provided it is validated. Generally it is for a time greater than expected duration of the works.

Acknowledgement
The On Site Supervisor (Permit Holder --Contractor/TATA POWER as applicable) is to acknowledge by signing on the permit that they have read, questioned, understood and advised their staff of the Permit conditions.

It is a good practice to keep the period of validity of permits to the minimum needed to complete a task, as this minimises the possibility of changes in process conditions undermining effective control of the work.

Long-term routine work is more effectively controlled by means of procedures or work Instructions than by the use of long term permits.

Conditions prior to the issue of PTW
Permit Issuer / Permit Approver (PA) to ensure that they have inspected the site and the conditions meet the permit requirements and all tests are completed and satisfactory.

Accepted By (Permit acceptor)
To be signed by the PA after accepting for themselves that the Permit conditions have been met. Any change in conditions related to the work permit has to be marked on all the copies of the permit and signed by the concerned authority.

Site Copy

When closed, mark page numbers on the permit. Enter the WP name and number in the index of the record file and preserve in the record section in line with the company procedure. If there is no set procedure, then preserve this for three months.

JOB SAFETY ANALYSIS (JSA) PROCEDURE

Rev No.	Reason for Revision	Prepared By	Checked By	Approval by
Rev 00	Initial Release	Navendra Singh	Sanjay Kale	Shrinivas Katti
Rev 01	To implement Tata Power JSA Standard	Navendra Singh (Group Head – P & CB; Corp Safety.)	Rajesh Sharma (Head – Crop. Safety Operation)	Vijay Chourey (Chief – Corp Safety)

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1. **OBJECTIVE:** Objective of this procedure is to have a task/job based risk assessment process in place that identifies, evaluates and controls the risks associated with work activities, and as a result, prevents those involved in the task or those potentially affected by the task, from being harmed.

2. **SCOPE:** This procedure applies to all operating and project sites of Tata Power Group companies. A JSA (Job Safety Analysis) Shall be carried out:
   2.1. When new / different people will be undertaking the job for which an SOP / SMP is available

   2.2. When a non-routine task is to be undertaken

   2.3. When Job to be executed under Permit-To-Work (PTW)

   2.4. When deviations, due to some specific reasons, are required for Standard Operating procedure (SOP) / SMP (Standard Maintenance Procedure)

   2.5. Whenever a job with a Standard Operating procedure (SOP) / SMP (Standard Maintenance Procedure) is being undertaken in circumstances where the conditions of the job are changed with respect to the SOP/SMP. e.g. A welder working in his fabrication area will be covered by a SOP with HIRA already carried out, however, if the welding is being done on the site at a height or a confined space or in an area which may interfere with other jobs we need to conduct a JSA and use this in conjunction with the HIRA (Hazard Identification Risk Assessment) for the welding activity.

3. **EXPECTED RESULTS:**
   3.1. Manage Non routine jobs being done under permit-to-work safe.

   3.2. Manage Routine jobs being done under SOP/SMP.

   3.3. Control of incidents related to Routine & Non routine Jobs.

   3.4. Compliance to Regulatory requirements to make work place safety

4. **ACCOUNTABILITY & RESPONSIBILITY:**
   4.1. **ACCOUNTABILITY:** Concerned Division's Heads / Assets Custodian.
   4.2. **RESPONSIBILITY:** Concerned Engineer

5. GLOSSARY/ DEFINITIONS:

Hazard Identification & Risk Assessment: Hazard Identification & Risk Assessment is to identify and evaluate the hazards, Risk and put controls measures for safe execution of activities.

Hazard: Source or situation with potential for harm, something that can cause body injury / occupational illness, damage company property.

Job: A piece of physical work defined by time or other limits and that has a clear start and end point

Job Safety Analysis: Job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job. In a JSA, for each basic step of the job, it is to identify potential hazards and to recommend the safest way to do the job.

Non Routine Job / Task: Where an SOP / SMP is not available or the conditions of the SOP / SMP have changed

Risk Assessment: A systematic and structured process whereby hazards present in a workplace, or arising from workplace activity, are identified, risks assessed

Risk: The likelihood (probability) which can lead to potential negative consequences.

Severity: The level of consequence / harm of an event that could occur due to exposure to the hazard present

SOP: Standard Operating Procedure

SMP: Standard Maintenance Procedure

Shall: Mandatory requirement

Should: Optional requirement

Task / Activity: A sequence of steps taken to conduct a job. A task is a sub element of a Job.

6. PROCEDURES

6.1. The following criteria shall be used in determining whether HIRA or JSA will be required. Following illustrations may be useful to understand between selection of HIRA and JSA.

6.1.1. HIRA is activity specific like use of OXY-Acetylene Set for cutting.

6.1.2. JSA is Job specific like cutting of steam tubes using OXY-Acetylene set in the boiler

6.1.3. HIRA is Quantitative while JSA is Qualitative

6.1.4. HIRA primarily contain hazard & control measures specific to tools & equipment's and methodology to be used for the activity.

6.1.5. JSA contain hazards and control measure including to activity and site conditions where job to be accomplished.

6.2. For methodology and details about HIRA refer Tata Power Hazard Identification & Risk Assessment (HIRA) Procedure (TPSMS/GSP/HIRA/005).

6.3. Job Safety Analysis (JSA) involves the following:

6.3.1. Determining the scope of the job and listing the steps in the job.

6.3.2. Identifying possible hazards in the job.

6.3.3. Determining who and/or what is at potential risk

6.3.4. Describing the recommended safe way to do the job in order to prevent incidents and injuries.

6.3.5. Anticipating what might go wrong and devising back-up controls.

6.4. This will help to:

6.4.1. Identify and address hazards.

6.4.2. Prevent incidents and injuries.

6.4.3. Get organized to do the job right and more efficiently.

6.4.4. Create procedures that can be used by everyone.

6.4.5. Get people in the habit of working safely.

6.5. **Key Steps: The Job Safety Analysis consists of the following 6 steps**:

Step 1: Describe the job and the sequence of job steps

Step 2: Identification of the potential hazards of each step

Step 3: Determine who and/or what is at potential risk

Step 4: Description of the recommended safe job procedure

Step 5: Identification of what might go wrong

Step 6: Identification of back up controls

JSA should be done using SAP-EHS Modules. Alternatively it can be done using above 6 steps and format given in the Annexure 1.

6.6. Team Composition: The JSA is generally carried out by a team comprising;

6.6.1. Person/Team who do the work

6.6.2. Person supervising the job

6.6.3. Person with safety knowledge

6.6.4. Person (Specialist/Consultant) with technical knowledge

6.6.5. The number of team members will depend on and vary with the complexity of the job.

7. RECORDS :

7.1. Job safety analysis (JSA) (TPSMS/CSP/JSA/009/FORM/001)- Retention 12 Months

8. TRAINING & COMMUNICATION

8.1. Training of procedure shall be covered along with Permit-To-Work (PTW) procedure as Safety Training Needs identified.

8.2. Initial Communication to be done through Corporate Communication, Email and subsequently shall be made available at safety portal at Sangam.

9. VERIFICATION

9.1. Verification of implementation shall be done during Permit-To-Work (PTW) audit, field safety visit and site inspections.

10. EXCEPTION: Any exception to this procedure Any Exception to this procedure shall only be done as per Document Control .Procedure (TPSMS/GSP/DC/014)**.**

11. REFERENCES

- Tata Group Job Safety Analysis (JSA) Standard
- Tata Power Permit-To-Work (PTW) procedure (TPSMS/CSP/PTW/008)
- Tata Power Hazard Identification & Risk Assessment (HIRA) Procedure (TPSMS/GSP/HIRA/005)

12. REVIEW: Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

13. ATTACHMENTS/APPENDIX :

13.1. Annexure – 1: Sample Format for Job Safety Analysis (JSA) (TPSMS/CSP/JSA/009/FORM/001)

Annexure - 1

TPSMS/CSP/JSA/009/FORM/001

JOB SAFETY ANALYSIS

Division			
Job Title			
ID / Order No/ PTW No			
Job to be performed by	Tata Power / Contractor		
Date			
Tag No			
JSA Team / Assessment Team			
Name			
Role	Team Member	Maint. Engineer	HOD
Generated by			
Name	(Maker)		(Checker)
Company /Contractor			

Locations

Job Location

Analysed Job

Job Steps, Hazards and Controls

Sr. No.	Activities	Hazard	Required Control	Person Responsible

To be filled before applying for PTW

All above activities, Hazards, Controls have been explained to M/S _____
and are required to be followed by M/s _____.

FIRE SAFETY MANAGEMENT PROCEDURE

Rev No.	Reason for Revision	Prepared By	Reviewed By	Approval by
Rev 00	Initial Release	Navendra Singh	Sanjay Kale	Shrinivas Katti
Rev 01	To implement Tata Power Fire Safety Management Standard	Navendra Singh (Group Head – P & CB; Corp Safety.)	Sanjay Kale (Head – Fire & Safety; Corp Safety)	Vijay Chourey (Chief – Corp Safety)

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1. **OBJECTIVE:** Objective of this procedure is to specify the minimum mandatory requirements to ensure prevention of fire related incidents and managing / controlling their impacts if they do occur.
2. **SCOPE:** This procedure applies to all operating and project sites of Tata Power Group companies.
3. **EXPECTED RESULTS:**

   3.1. Prevention of occurrence of fire incidents.

   3.2. Control of incidents related to Fire to minimize loss of lives and property.

   3.3. Compliance to Regulatory requirements to Fire Safety Management
4. **ACCOUNTABILITY & RESPONSIBILITY:**

   4.1. ACCOUNTABILITY: Concerned Division's Heads / Assets Custodian

   4.2. RESPONSIBILITY: Concerned engineer/s

5. **GLOSSARY/ DEFINITIONS:**

   Auto Ignition Point: The lowest temperature to which a solid, liquid or gas requires to be raised to cause self-sustained combustion without initiation by a spark or flame.

   BCDMP – Business Continuity and Disaster Management Plan

   Class A Fire: Fires involving solid combustible materials or organic nature such as wood, paper, rubber, plastics, etc, where the cooling effect of water is essential for extinction of fires.

   Class B Fires – Fires involving flammable liquids or liquefiable solids or the like where a blanketing effect is essential.

   Class C Fires – Fires involving flammable gases under pressure including liquefied gases, where it is necessary to inert gas, powder or vaporizing liquid for extinguishment.

   Class D Fires – Fires involving combustible metals, such as magnesium, aluminum, zinc, sodium, potassium, etc, when the burring metals are reactive to water and water containing agents and in certain cases carbon dioxide, halogenated hydrocarbons and ordinary dry powders. These fires require special media and techniques to extinguish.

   Explosive Limit: Explosive limits are those concentrations of inflammable vapour or gas in air below or above which, propagation of a flame does not occur on contact with a source of ignition.

   Fire Extinguishing Method: Extinguishing fire involve removal or limiting of one or more of the factors depicted by the fire triangle. The method of extinguishing fire may be classified under the following heads:

   - Starvation – Elimination of fuel
   - Smothering – Removal of oxygen supply

- Cooling – Removal of Heat

Fire Classification: Fires can be classified based on the intensity and extent as given below:

- Small Fire: A fire in its incipient stage which is controlled by the first line of fire fighting team.
- Major Fire: The fire which is spreading to other equipment or areas which threatens to go beyond the control of first and second line firefighting and when external help is sought, any lost time incident due to the fire, Plant / Unit shut down due to fire.

Fire Point: It is the minimum temperature at which a liquid gives off sufficient vapors to form a mixture with air near the liquid surface within the container and gives sustained fire when an external source of ignition is brought to it.

Fire Tetrahedron: New understanding in 'Fire Safety Management' has necessitated the addition a fourth element to the Fire Triangle (i.e. the chemical chain reaction) making the fire triangle now a "Fire Tetrahedron"

Fire Triangle: Three elements Fuel, oxygen and Heat are necessary for initiation of a fire or combustion and it's known as "Fire Triangle".

Fire: Fire is a chemical reaction where matter reacts with oxygen under certain conditions to release heat and light energy.

Flash Point: The minimum temperature at which the liquid gives so much vapour that this vapour, when mixed with air, forms an ignitable mixture and gives a momentary flash on application of small pilot flame under specified conditions of test.

Ingredients of Fire:

- Fuel: in form of vapor, liquid and solid.
- A source of ignition (Heat or thermal energy): Sufficient to initiate and propagate the chemical reaction of combustion
- Oxygen: In sufficient proportion to form a combustible mixture

Lower Explosive Limit: The Lower Explosive Limit (LEL) is the minimum concentration of inflammable vapour/ gas in air below which the vapour air mixture is too "lean" to burn or explode.

Shall: Mandatory requirement

Should: Optional requirement

Upper Explosive Limit: The Upper Explosive Limit (UEL) is the maximum concentration of inflammable vapour/ gas in air above which the vapour air mixture is too "rich" to burn or explode.

Volatility: When liquid is in an open container and exposed to the atmosphere, it will gradually change into vapor and disappear. This process takes place more rapidly with some liquids than with others. Example: If a small quantity of gasoline is exposed to the air it disappears very quickly, diesel requires longer period to

evaporate and grease even longer. The inherent tendency of a substance to vaporize is termed as volatility.

6. PROCEDURES:

6.1. Division/JV shall have option to either to follow corporate safety procedure on Fire safety management or they may develop their procedure so as to satisfy the requirements mentioned in this procedure.

6.2. The management of Fire-Risk deals with three aspects:

6.2.1. Fire Prevention: It is the adoption of safe practices initially at the design stage and subsequently in the day to day operation to prevent break out of fires.

6.2.2. Fire Protection: It involves different facilities which shall help in immediate handling of fire effectively.

6.2.3. Firefighting: It is the physical phenomenon of handling the fire with the use of fire protection equipment, facilities as well as with the help of firefighting personnel who have been specifically trained for this job.

6.3. All these three distinct aspects are very closely related to each other but are completely separate in their individual scope with a philosophy that all fires can be prevented.

6.4. Divisions/JVs shall adopt a Preventive approach to Fire Safety (i.e. Control on ignition source, Safe handling of fuel source)

6.5. Facilities shall be designed and constructed in accordance with applicable laws, codes, and regulations in force in that jurisdiction. In the absence of local regulations / laws, facilities shall be designed with technically sound practices.

6.6. Sites / Facilities should be managed in a way that fires are prevented, injuries and business losses are avoided, property is protected, and trust is fostered in the communities in which the Division/JV operates

6.7. Facilities should be managed, operated, and maintained in such way that the fire safety features are not compromised

6.8. Fires are to be controlled in the initial stage itself and not allowed to spread

6.8.1. Fire equipment is to be used for intended purpose only

6.8.2. BCDMP Plans shall be put in place.

6.9. As part of the due diligence review, each Division/JV shall assess the level of fire protection / prevention in use or being planned in case of:

6.9.1. Acquisitions and Divestments

6.9.2. Process shutdowns / phase outs

6.9.3. Selection / Design Stage:

6.10. Fire Risk Assessment: During the selection / design of a site / office / facility, a risk assessment and fire load calculation shall be carried out. The following key elements shall be considered:

6.10.1. Risk of fire occurring to the particular facility / site

6.10.2. Assessment of fire load to the particular facility/site

6.10.3. Provision of means of escape

6.10.4. Fire Compartmentation (Passive measures) etc.

6.10.5. Fire Detection (Active measures)

6.10.6. Firefighting & Emergency Handling arrangements

6.10.7. Emergency procedures

6.10.8. In the case of a new facility being constructed it shall be ensured that fire prevention / protection systems are installed. These systems are to be designed and constructed in accordance with applicable laws, codes regulations and they shall be authenticated by a fire expert or a third party fire engineer.

6.10.9. For occupied buildings located in the vicinity of a high hazard facility, a separate risk assessment shall be carried out to assess the risk due to the external threat of fire / explosion.

6.10.10. Hazard studies on 'high hazard facilities' (e.g. Process Hazard Reviews etc.) shall consider the potential scenarios associated with a fire.

6.10.11. Where there is no reasonable alternative to hot working methods, a hot work permit system shall be utilized to ensure that appropriate control measures are put in place.

6.10.12. Fire Risk Assessment should be done by including neighboring areas as well. i.e. asses the possibility of fire spreading from the neighboring areas to the companies specific site / facility / business unit

6.11. Fire Detection & Alarm Systems:

6.11.1 Effective means for detecting an outbreak of fire and warning people who may be at risk shall be established.

6.11.2 Fire detection and alarm systems shall be installed in every site / office / facility.

6.11.3 The following types of detection systems are available and should be chosen based on their suitability for use at locations where they are required:

6.11.3.1 VESDA (Very Early Smoke Detection Apparatus) systems

6.11.3.2 Fire Alarm and Detection System – With Various type of fire alarm detectors like as Heat Detector, Smoke detector, Heat & Smoke Combined detector, Flame detector, Beam Detector, Normal Manual call points (MCP), intrinsically safe Manual call point, Hooter, Beacon light etc.

6.11.3.3 Gas Detection System – With Various types of detectors like as Ammonia detector, Chlorine detector, Bromine detector, Hydrogen detector, Carbon monoxide detector, H2S detector, Beacon light etc.

6.11.4 The detection system to be used is to be selected as per the following criteria:

6.11.4.1 Type of Occupancy

6.11.4.2 Nature of Fire and Emergency Hazard

6.11.4.3 Quantum of Hazard

6.11.4.4 Selection of appropriate detector device considering the hazard

6.11.4.5 Physical and environment condition

6.12 Fire Protection / Control Systems: The following two types of fire protection systems are to be used:

6.12.1 Passive restraints / protection: Passive fire protection systems should be installed to contain fires or reduce the speed at which they may spread, through:

6.12.1.1 Compartmentalization

6.12.1.2 Segregation

6.12.1.3 Separating distances

6.12.1.4 Use of Fire resistance wall, Floors & doors etc.

6.12.1.5 Dykes for storage tank

6.12.1.6 Fire resistant/retardant coatings

6.12.1.7 Fire retardants paints / Cables

6.12.2 Active restraints / protection: This requirement is a risk based decision, and suggests the provision for suitable and sufficient firefighting/escape equipment and devices will be determined by the fire risk assessment.

6.12.3 A combination of the following types of protection systems shall be considered

6.12.3.1 Portable type system

6.12.3.2 Portable Fire protection systems, which are used at the incipient stage of fire for immediate control, need to be installed. Some examples are:

6.12.3.3 Fire extinguishers (Based on extinguishing media: DCP, Co2, Water, Foam)

6.12.3.4 Sand buckets

6.12.3.5 Fixed / Semi fixed type system

6.12.3.6 Fixed / Semi fixed fire protection systems needs to be installed. Some Examples are:

6.12.3.7 Fire Hydrant system

6.12.3.8 Fire Alarm & Detection system

6.12.3.9 Sprinkler system

6.12.3.10 Gas flooding system

6.12.3.11 Medium velocity & High velocity water spray system

6.12.3.12 Mobile type system

6.12.3.13 Mobile Fire Protection systems (Fire Vehicles) need to be provided / mobilized as appropriate. Some examples are:

6.12.3.13.1 Fire Tenders – With various type of firefighting media like as Water, Foam, Dry Chemical powder, Carbon dioxide.

6.12.3.13.2 Rescue Van – With Various type of Rescue equipment Like as TRIPOD, lifting Pads, COMBI

6.12.3.13.3 TOOL, Hydraulic RAM, Descended/De-rope device, Rescue rope, Rescue stretcher, Emergency light mast etc.

6.12.3.13.4 HAZMAT (hazardous material) Response Van – With Various types of equipment like as hazardous chemical spill control kit, Leak arrest Kit, decontamination unit, various suits etc.

6.13 Inspection and Maintenance: To ensure integrity and reliability of the fire protection systems, they should be checked, inspected, maintained, and tested periodically. The inspection and maintenance shall:

6.13.1 Ensure that the systems are available for intended protection all the time and are in a working condition at all times

6.13.2 Ensure that the systems perform as per design specifications

6.13.3 Safe systems of work shall be established and implemented for entry into gas and water flood protected areas to ensure that the extinguishing media is not discharged whilst the area is occupied.

6.13.4 Applicable technical codes and standards are to be referred for inspection and maintenance of fire detection/ protection systems.

6.13.5 Each Division/JV shall ensure that there is a documented maintenance schedule and shall ensure that this schedule is adhered to.

6.14 Emergency Preparedness:

6.14.1 An emergency preparedness plan shall be put in place to address emergencies on account of fires. This emergency plan shall ensure that there is no harm to life, environment or property.

6.14.2 Each Division/JV shall have BCDMP emergency plans based on their requirements. Roles and responsibilities are to be defined in the plan. The plan should also be communicated to all personnel who may be affected by the emergency.

6.14.3 Auxiliary support squad shall be identified for responding to emergencies & assisting the fire fighters. Their names shall be displayed in operation/fire control rooms.

6.14.4 Each site / premises shall include in their emergency plan, risks on account of potential fires and the appropriate measures for:

6.14.4.1 Raising the alarm, which shall be distinct from all other alarms in the Division/JV,

6.14.4.2 Evacuation of personnel to an area of safety and accounting for their attendance.

6.14.4.3 Quick reporting the fire to 'on site' or 'off site' emergency services,

6.14.4.4 Containment of the fire until arrival of the emergency services, and

6.14.4.5 Periodic testing to demonstrate adequacy of the plan / resources to manage the foreseeable scenarios.

6.14.5 Regular mock drills should be conducted as per the Division/JV's standard/procedure.

7 RECORDS :

7.1 Record of inspection/test of fire equipment/system (Retention -Three years)

7.2 Record of mock drills (Retention - Three Years)

8 TRAINING & COMMUNICATION:

8.1 Training shall be conducted to ensure appropriate response in times of an emergency. The training should be conducted, in the following categories:

8.2 Awareness Training: To be conducted for all employees and Contractors. It should cover basics of fire, emergency preparedness, emergency response and general do's and don'ts

8.3 Specific fire Training- This training and competency testing is to be conducted for individuals on specific topics such as how to handle fire extinguishers, emergency management plans etc. Those who are trained in this usually become fire marshals/fire guards (or equivalent)

8.4 Training and competency testing for Fireman-To be conducted for the dedicated fire response team as per the individual Division/JV's standard/procedure

8.5 Ensure that all employees and contractors are competent enough to handle fire related emergencies.

8.6 Auxiliary Support Squad shall be trained to ensure their capability to respond to emergencies.

9 VERIFICATION

9.1 Audits shall be carried out to ensure identification of areas of strengths and weakness of the fire safety management systems.

9.2 These audits should be undertaken to meet the following objective:

To ensure that fire detection/protection and firefighting systems are in place

To ensure that proper inspection and maintenance schedules are followed

To ensure that adequate training has been imparted

To ensure that proper emergency procedures are in place

9.3 Fire Safety Audit and Fire Load Study shall be conducted as per legal requirements. In case of absence of legal requirement these shall be done once within three (3) years and in no case this duration shall exceed more than five (5) years.

9.4 Both internal and external audits shall be carried out by companies. These audits shall be carried out at a predefined schedule.

10 EXCEPTION:

Any Exception to this procedure shall only be done as per Document Control .Procedure (TPSMS/GSP/DC/014**).**

11 REFERENCES

- Tata Group Fire Safety Management Standard
- IS 2190: 2010
- Indian Factory Act 1948 and State Factory Rules
- Tata Power Document Control .Procedure (TPSMS/GSP/DC/014**).**
- Tata Power Safety Audit Procedure (TPSMS/GSP/AUDT/012)

12 REVIEW

Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

13 ATTACHMENTS/APPENDIX :

Nil

FIRE SAFETY MANAGEMENT PROCEDURE

Rev No.	Reason for Revision	Prepared By	Reviewed By	Approval by
Rev 00	Initial Release	Navendra Singh	Sanjay Kale	Shrinivas Katti
Rev 01	To implement Tata Power Fire Safety Management Standard	Navendra Singh (Group Head – P & CB; Corp Safety.)	Sanjay Kale (Head – Fire & Safety; Corp Safety)	Vijay Chourey (Chief – Corp Safety)

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   - Smothering – Removal of oxygen supply

- Cooling – Removal of Heat

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Shall: Mandatory requirement

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6.9.2. Process shutdowns / phase outs

6.9.3. Selection / Design Stage:

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6.10.2. Assessment of fire load to the particular facility/site

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6.10.4. Fire Compartmentation (Passive measures) etc.

6.10.5. Fire Detection (Active measures)

6.10.6. Firefighting & Emergency Handling arrangements

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6.10.8. In the case of a new facility being constructed it shall be ensured that fire prevention / protection systems are installed. These systems are to be designed and constructed in accordance with applicable laws, codes regulations and they shall be authenticated by a fire expert or a third party fire engineer.

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6.11.3 The following types of detection systems are available and should be chosen based on their suitability for use at locations where they are required:

6.11.3.1 VESDA (Very Early Smoke Detection Apparatus) systems

6.11.3.2 Fire Alarm and Detection System – With Various type of fire alarm detectors like as Heat Detector, Smoke detector, Heat & Smoke Combined detector, Flame detector, Beam Detector, Normal Manual call points (MCP), intrinsically safe Manual call point, Hooter, Beacon light etc.

6.11.3.3 Gas Detection System – With Various types of detectors like as Ammonia detector, Chlorine detector, Bromine detector, Hydrogen detector, Carbon monoxide detector, H2S detector, Beacon light etc.

6.11.4 The detection system to be used is to be selected as per the following criteria:

6.11.4.1 Type of Occupancy

6.11.4.2 Nature of Fire and Emergency Hazard

6.11.4.3 Quantum of Hazard

6.11.4.4 Selection of appropriate detector device considering the hazard

6.11.4.5 Physical and environment condition

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6.12.1.6 Fire resistant/retardant coatings

6.12.1.7 Fire retardants paints / Cables

6.12.2 Active restraints / protection: This requirement is a risk based decision, and suggests the provision for suitable and sufficient firefighting/escape equipment and devices will be determined by the fire risk assessment.

6.12.3 A combination of the following types of protection systems shall be considered

6.12.3.1 Portable type system

6.12.3.2 Portable Fire protection systems, which are used at the incipient stage of fire for immediate control, need to be installed. Some examples are:

6.12.3.3 Fire extinguishers (Based on extinguishing media: DCP, Co2, Water, Foam)

6.12.3.4 Sand buckets

6.12.3.5 Fixed / Semi fixed type system

6.12.3.6 Fixed / Semi fixed fire protection systems needs to be installed. Some Examples are:

6.12.3.7 Fire Hydrant system

6.12.3.8 Fire Alarm & Detection system

6.12.3.9 Sprinkler system

6.12.3.10 Gas flooding system

6.12.3.11 Medium velocity & High velocity water spray system

6.12.3.12 Mobile type system

6.12.3.13 Mobile Fire Protection systems (Fire Vehicles) need to be provided / mobilized as appropriate. Some examples are:

6.12.3.13.1 Fire Tenders – With various type of firefighting media like as Water, Foam, Dry Chemical powder, Carbon dioxide.

6.12.3.13.2 Rescue Van – With Various type of Rescue equipment Like as TRIPOD, lifting Pads, COMBI

6.12.3.13.3 TOOL, Hydraulic RAM, Descended/De-rope device, Rescue rope, Rescue stretcher, Emergency light mast etc.

6.12.3.13.4 HAZMAT (hazardous material) Response Van – With Various types of equipment like as hazardous chemical spill control kit, Leak arrest Kit, decontamination unit, various suits etc.

6.13 Inspection and Maintenance: To ensure integrity and reliability of the fire protection systems, they should be checked, inspected, maintained, and tested periodically. The inspection and maintenance shall:

6.13.1 Ensure that the systems are available for intended protection all the time and are in a working condition at all times

6.13.2 Ensure that the systems perform as per design specifications

6.13.3 Safe systems of work shall be established and implemented for entry into gas and water flood protected areas to ensure that the extinguishing media is not discharged whilst the area is occupied.

6.13.4 Applicable technical codes and standards are to be referred for inspection and maintenance of fire detection/ protection systems.

6.13.5 Each Division/JV shall ensure that there is a documented maintenance schedule and shall ensure that this schedule is adhered to.

6.14 Emergency Preparedness:

6.14.1 An emergency preparedness plan shall be put in place to address emergencies on account of fires. This emergency plan shall ensure that there is no harm to life, environment or property.

6.14.2 Each Division/JV shall have BCDMP emergency plans based on their requirements. Roles and responsibilities are to be defined in the plan. The plan should also be communicated to all personnel who may be affected by the emergency.

6.14.3 Auxiliary support squad shall be identified for responding to emergencies & assisting the fire fighters. Their names shall be displayed in operation/fire control rooms.

6.14.4 Each site / premises shall include in their emergency plan, risks on account of potential fires and the appropriate measures for:

6.14.4.1 Raising the alarm, which shall be distinct from all other alarms in the Division/JV,

6.14.4.2 Evacuation of personnel to an area of safety and accounting for their attendance.

6.14.4.3 Quick reporting the fire to 'on site' or 'off site' emergency services,

6.14.4.4 Containment of the fire until arrival of the emergency services, and

6.14.4.5 Periodic testing to demonstrate adequacy of the plan / resources to manage the foreseeable scenarios.

6.14.5 Regular mock drills should be conducted as per the Division/JV's standard/procedure.

7 RECORDS :

7.1 Record of inspection/test of fire equipment/system (Retention -Three years)

7.2 Record of mock drills (Retention - Three Years)

8 TRAINING & COMMUNICATION:

8.1 Training shall be conducted to ensure appropriate response in times of an emergency. The training should be conducted, in the following categories:

8.2 Awareness Training: To be conducted for all employees and Contractors. It should cover basics of fire, emergency preparedness, emergency response and general do's and don'ts

8.3 Specific fire Training- This training and competency testing is to be conducted for individuals on specific topics such as how to handle fire extinguishers, emergency management plans etc. Those who are trained in this usually become fire marshals/fire guards (or equivalent)

8.4 Training and competency testing for Fireman-To be conducted for the dedicated fire response team as per the individual Division/JV's standard/procedure

8.5 Ensure that all employees and contractors are competent enough to handle fire related emergencies.

8.6 Auxiliary Support Squad shall be trained to ensure their capability to respond to emergencies.

9 VERIFICATION

9.1 Audits shall be carried out to ensure identification of areas of strengths and weakness of the fire safety management systems.

9.2 These audits should be undertaken to meet the following objective:

To ensure that fire detection/protection and firefighting systems are in place

To ensure that proper inspection and maintenance schedules are followed

To ensure that adequate training has been imparted

To ensure that proper emergency procedures are in place

9.3 Fire Safety Audit and Fire Load Study shall be conducted as per legal requirements. In case of absence of legal requirement these shall be done once within three (3) years and in no case this duration shall exceed more than five (5) years.

9.4 Both internal and external audits shall be carried out by companies. These audits shall be carried out at a predefined schedule.

10 EXCEPTION:

Any Exception to this procedure shall only be done as per Document Control .Procedure (TPSMS/GSP/DC/014**).**

11 REFERENCES

- Tata Group Fire Safety Management Standard
- IS 2190: 2010
- Indian Factory Act 1948 and State Factory Rules
- Tata Power Document Control .Procedure (TPSMS/GSP/DC/014**).**
- Tata Power Safety Audit Procedure (TPSMS/GSP/AUDT/012)

12 REVIEW

Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

13 ATTACHMENTS/APPENDIX :

Nil

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Section E.1: Special conditions of contract

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Sr. No.	TOPIC	PRINCIPLES OF TERMS & CONDITIONS
1	GENERAL	The following **Special Conditions of Contract (SCC)** shall supplement the General Conditions of Contract. Wherever there is a conflict, the provisions herein shall prevail over those in the "General Conditions of Contract" (GCC).
2	CONTRACT PRICE AND CONTRACT STRUCTURE	The Bid shall remain valid for **180 days** from the due date of submission of the bid. Price submitted as part of E-auction / Negotiation shall remain valid for **90 days** from date of E-auction / Negotiation. Notwithstanding clause above, Tata Power may solicit the Bidder's consent to an extension of the Period of Bid Validity. The request and responses thereto shall be made in writing. Bidders to quote for the package on Firm Price basis. The prices and unit rates shall remain firm and fixed till the commissioning of the project, and no price variation is applicable.
3	COMMENCEMENT / EFFECTIVE DATE (Note: It is to be noted that commencement date, effective date and notice to proceed are one and the same.)	The bidder will commence work / manufacturing of equipment on issue of Letter of Award (LOA) / Firm Purchase Order by TATA POWER and notice to proceed by the Order Manager. No equipment shall be delivered without specific dispatch clearance from project Manager TATA POWER.
4	CONTRACT PERFORMANCE BANK GUARANTEE	This is as per General Conditions of Contract clause 13.2. Successful bidder shall submit CPBG cum PBG for 10% of Contract Value in format specified by Tata Power within 15 days after placement of confirmed Purchase Order. This CPBG cum PBG shall be valid till warranty period with additional claim period of 6 months.
5	TERMS OF PAYMENT	This is further to General Conditions of Contract clause 13.3. A. No Advance Payment shall be made. B. Payment Terms shall be as follows:

		Supply Part: • 80% of supply part after delivery of material at Site (Pro-rata basis). • 10% of Supply part after installation. • Balance 10% of supply part after commissioning and handover of the project. • Payment Credit Period is **90 days.** Sunset clause: In case commissioning delayed due to reason attributable to Tata Power then the balance 10% payment shall be released within 90 days from scheduled date of commissioning against submission of 10% CPBG cum PBG. Service Part: • 90% of service part after erection of the materials / equipments against monthly running bills. (Pro-rata basis). • Balance 10% of service part after commissioning and handover of the project. • Safety Retention shall be as per safety Terms and Conditions (Enclosed as Annexure to GCC). • Payment Credit Period is **60 days.** C. All payments against supply and services are subject to acceptance of material/services and submission of error free invoice copy in ARIBA portal. D. Income tax and any other statutory recoveries as applicable shall be recovered from Contractor monthly running bills and TDS certificate for the deductions shall be furnished. E. All payments against supply and services are subject to submission of unconditional CPBG cum PBG (as per clause 4 of SCC above) and unconditional acceptance/signing of the PO/Contract agreement.
6	FREIGHT & INSURANCE	This is further to General Conditions of Contract clause 6.0, Complete Freight and insurance will be in bidder's scope.

7	LIQUIDATED DAMAGES FOR DELAYS, NON – PERFORMANCE & OVERALL CAP	In the event of delay, LD shall be levied at 1% of Contract value per week of delay or part thereof subject to maximum of 10% of Contract value.
8	WORK COMPLETION PERIOD (Final project completion timelines)	Supply: a) Drawing submission/approval shall be completed within 04 weeks from the date of award (Bidder shall submit the complete drawings within 02 weeks from date of award and Tata Power shall approve the drawing and provide manufacturing clearance within 02 weeks from date of receipt of complete drawing) b) EHV Cable and other accessories (except Cable Termination/joints) shall be delivered at site/store within 03 months from date of manufacturing clearance. c) Cable Terminations/joints shall be delivered at site/store within 04 months from date of manufacturing clearance. Service: Erection, testing and Commissioning work shall be completed within 05 months from date of manufacturing clearance.
9	WARRANTY PERIOD	This supersedes warranty period in General Conditions of Contract clause 12.0. The warranty period for the relevant equipment's shall be for a period of 5 years from date of commissioning. The Performance Bank Guarantee shall be submitted accordingly by the bidder.
10	Total Compliance to TCOC, safety Terms & Conditions and International Safety standards	Tata Power Contractor Safety Terms and Conditions is enclosed as Annexure to the GCC. Bidder shall have to abide fully without any deviation.
11	BID SUBMISSION (In Ariba)	Bidders are requested to submit their offer in line with this Tender document, instructions given in “Tender Notice and instructions to Bidders”.
12	Special note for Statutory requirements related to contract workmen and BOCW license.	In addition to all prevailing admin / statutory approvals bidder to take special note of following; All employees should submit medical fitness on Form No 6. ESIC / PF is mandatory for all employees deputed for the project. Police Verification / Indemnity Bond to be produced for all employees

		working at site. The welfare cess payment for BOCW license shall be borne by bidder only.
13	TPSDI Training	To improve work safety and to ensure that all work force deployed at owner premises have the right orientation / induction and skills training before they undertake any work, the bidder shall accordingly plan and enrol his and sub-contractors work force to the respective skills / crafts training (Levels L1/L2/L3) offered by TPSDI.
14	Construction Water and Power	Bidder will arrange and pay for construction water and power for execution of contract.
15	BOQ / Price bid format	This tender is for completing the required job on EPC basis and the quantity given in "Price bid format" is indicative only. Bidder is requested to ascertain the actual quantities required based on site survey. ***Bidders are requested to quote in the Rationalized BOQ (estimated) format. Although job responsibility will be on EPC basis, payment will be done on actual quantity utilization as approved by Tata Power***.
16	Reverse Auction	Tata Power reserves the right to go for Reverse Auction (RA) for price negotiation and discover the most competitive price on ARIBA portal, Tata Power's official e-tendering platform. This will be decided after techno-commercial evaluation of the bids. Bidders need to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case Tata Power decides to go for RA. Only those bidders who are techno-commercially qualified shall be eligible to participate further in RA process. However, the original H1 bidder (whose price bid is the highest post techno-commercial evaluation) shall not be allowed to participate in further RA process provided minimum three techno-commercially qualified bids are available. Date and time of e-auction will be intimated through E-Tender system to Authorized Person of eligible Bidders.

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Section E.2: Price bid format

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E.2 Price bid: Design, Engineering, Manufacturing, Factory Acceptance Test, Transportation to site, Installation and Commissioning of 220kV EHV Cable and associated accessories for 110KV Carnac-Grant road line cable replacement project

SUPPLY PART

Sr No	Item Description	Qty.	UoM	GST	Basic Unit Price	Total Basic Price	Applicable Taxes	All Incl. Price
1	Supply of 1C x 1600 Sqmm Copper Conducror XLPE, lead sheath cables of 220 kV	30000	Mtrs.	18%		-	-	-
2	Supply of 1C x 1600 Sqmm Copper Conducror XLPE, lead sheath cables of 110 kV	900	Mtrs.	18%		-	-	-
3	Sealing End for GIS termination with Cable 110 kV 1C XLPE Copper 1600 sq mm as per specifications	9	Nos	18%		-	-	-
4	Supply of cross bonded straight joints for 220 kV 1C 1600 Sqmm Cu. XLPE Cable	64	Nos	18%		-	-	-
5	Supply of 3 piece straight joints for 220 kV & 110 kV 1C 1600 Sqmm Cu. XLPE Cable	8	Nos	18%		-	-	-
6	Supply of Three Phase link box with SVL for cross bonding	11	Nos	18%		-	-	-
7	Supply of Three Phase link box without SVL for cross bonding	9	Nos	18%		-	-	-
8	Supply of Coaxial Cable along with Lugs and Connectors	2000	Mtrs.	18%		-	-	-
9	Supply of Single Phase link box for sheath bonding	6	Nos	18%		-	-	-
10	Sheath bonding cable	500	Mtrs.	18%		-	-	-
11	Supply of HDPE pipes for EHV cable (OD 250 mm & 6 mtr length)	1500	Nos	18%		-	-	-
12	Supply of Fibre optic cable along with patch cord **(Quantity considered 2 no. 96 Core FO cable per circuit)**	21.0	KM	18%		-	-	-
13	Cable Cleats	50	Nos	18%		-	-	-
14	Galvanised Steel structure for cable Cleating arrangement	3	MT	18%		-	-	-
15	Supply of Fiber termination Rack	2	Nos	18%		-	-	-
16	Supply of HDPE pipes for FO cable (dia 40 mm)	31.5	KM	18%		-	-	-
17	Supply of FOP joint boxes	24	Nos	18%		-	-	-
18	Supply of cable tiles	30000	Nos	18%		-	-	-
19	PATCH CORD FOR 96F OPTIC FIBER CABLE	100	Nos	18%		-	-	-
20	Supply of FO termination kit	8	Nos	18%		-	-	-
21	DISTRIBUTED TEMP MONITORING SYSTEM(DTS)	1	Set	18%		-	-	-
22	OPTIC FIBER CABLE FOR DTS	10.5	KM	18%		-	-	-
			TOTAL - SUPPLY PART			-		-

SERVICE PART

Sr. No.	Item Description	Qty.	UoM	GST	Basic Unit Price	Total Basic Price	Applicable Taxes	All Incl. Price
1	Detailed surveying of the Cable route along the alignment fixed by the owner & preparation of profile drawing for cable laying and preparation of final cable route in 6 sets of hard & soft copy in a scale of 1:10 indicating the position of cable jointing chambers, earthing details, position of cable route marker, land marks etc., after completing the work & energizing for the use of permanent record, GPS mapping of utilities to be indicated in the drawing complete. **(Based on preliminary route survey, total route length 5000 mtr.**	10,000	Mtr	18%		-	-	-

2	Excavation of Cable trenches as per approved drawings with proper wooden shoring, de-watering arrangement & with sufficient clearances from all sites . Excavation in all types of soil -except hard murrum, earth rock/debries, backfilled earth, where underground service lines are likely to be present, shoring the trenches, demolising PCC, Brick work, Rubble masionary encountered while making the trenches, disposal of excavated earth within 24 hours. Laying of PCC bed erecting side tiles ,Warning tape refer Approved trench drawing. Backfilling with STB upto 660 mm as per drawing of trench. Backfilling above RCC tiles upto road level with excavated earth as per approved trench drawing with Compaction and NOC from Concern Authority/Agency complete (For two Circuits). Trench Cross sectionDrawings shall be prepared by Bidder as per Specifications and approved by Owner.	1,000	RMtr	18%		-	-	-
3	Excavation for Major Road crossing as per approved drawings with proper, de-watering arrangement & sufficient clearances from all sites . Excavation in all types of soil - hard murrum, earth rock, debris, backfilled earth, where underground service lines are likely to be present, demolising PCC/brick work/rubble masionary encountererd while making the trenches, disposal of excavated earth within 24 hours. Laying of PCC bed, & erecting side tiles approved trench drawing. Backfilling with (sand metal mix) ,Warning tape, Top will be Reinstated with Soling & Compaction , Asphalt,& PCC M 20 or Satutory requirement on Top Crossing drawing complete. (For two Circuits) Trench Cross sectionDrawings shall be prepared by Bidder as per Specifications and approved by Owner.	1,000	RMtr	18%		-	-	-
4	Excavation for Minor Road crossing as per approved drawings with proper, de-watering arrangement & sufficient clearances from all sites . Excavation in all types of soil - hard murrum, earth rock, debris, backfilled earth, where underground service lines are likely to be present, demolising PCC/brick work/rubble masionary encountererd while making the trenches, disposal of excavated earth within 24 hours. Laying of PCC bed & erecting side tiles approved trench drawing. Backfilling with (sand metal mix) ,Warning tape, Top will be Reinstated with Soling & Compaction , Asphalt,& PCC M 20 or Satutory requirement on Top Crossing drawing complete. (For two Circuits) Trench Cross sectionDrawings shall be prepared by Bidder as per Specifications and approved by Owner.	200	Rmtr	18%		-	-	-
5	HDD services for crossings (100 mtr for 8 runs of cable)	200	Mtr	18%		-	-	-
6	Services for laying of tiles 660x500x60 mm complete (including shifting, transportation and laying in trench).	30,000	Nos	18%		-	-	-
7	Services for un-coiling & laying 220 kV, 1600 Sq.mm XLPE insulated cable as per approved drawing, & specification in open trench & through HDPE pipe laid along the route,including Loading from store ,transportation,unloading at site , returning cable drum to tata power warehouse ,permits from concern authority ,trefoil formation ,phase marking complete.	31.0	kM	18%		-	-	-
8	Serices for un-coiling & laying optical fibre cable 96 Fibre of specified type along the cable trench through HDPE pipe as per approved drawing & specifcation including Loading from store ,transportation,unloading at site , returning cable drum to tata power warehouse ,permits from concern authority , labour charge complete, Tests.	31.50	kM	18%		-	-	-
9	Services for OFC splicing & termination	5	Nos	18%		-	-	-
10	Construction of FO cable hand hole	17	Each	18%		-	-	-
11	Services for construction of cable jointing chamber (RCC types) along with Below ground Earth mat (along with supply of material as per specification) for Joint bay of suitable dimensions as mutually agreed for 1 circuits i.e., 3 no of cable with link boxes, earthing as per site requirement as per specifications. Including supply & filling submerged (Including supply and filling of STB) [10.0 mtr] **(As per Site conditions, final number of joint bays will be decided)**	10	Nos	18%		-	-	-
12	Services for installation of straight joint/cross bonding joint of 220 kV UG cable.	60	Nos	18%		-	-	-
13	Services for installation of 3 Piece joint of 220 kV UG cable.	6	Nos	18%		-	-	-
14	Services for installation of GIS termination of 220 kV UG cable.	6	Nos	18%		-	-	-

15	Services for 40 mm dia duct for 96F optical fibre cable complete (including DTS FO cable duct)	31.500	KM	18%		-	-	-
16	Services for termination rack for 96F optic fibre cable complete	2	Nos	18%		-	-	-
17	Services for FO Termination box	8	Sets	18%		-	-	-
18	Services for Joint box for FO cable	17	Sets	18%		-	-	-
19	Installation of Link Box in Termination/joints including earthing	26	Nos	18%		-	-	-
20	Fabrication of Structural Steel for cable cleating arrangement	3	MT	18%		-	-	-
21	INSTALLATION OF DTS SYSTEM	1	Each	18%		-	-	-
22	INSTALLATION OF DAS SYSTEM	1	Each	18%		-	-	-
23	PATCH CORD FOR 96F OPTIC FIBER CABLE	100	Nos	18%		-	-	-
24	Trial Pits	50	Nos	18%		-	-	-
25	Testing & Commisioning (Per Circuit)	1.0	Lot	18%		-	-	-
26	HDPE pipe cleaning (4 nos Each)	4.0	kM	18%		-	-	-
			TOTAL - SERVICE PART			-		-
			GRAND TOTAL - SUPPLY + SERVICES			-		-

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Section E.3: General Conditions of Contract

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1.0 DEFINITIONS OF THE TERMS AND CONDITIONS OF CONTRACT

1.1 Definitions

1.1.1 In this Contract unless the context requires otherwise the words and expressions defined below shall have the meaning hereinafter assigned to them.

1.1.2 "Affiliate" shall mean an entity controlling, controlled by, or under the common control with, a Party directly or indirectly through ownership of voting securities or by Contract or otherwise.

1.1.3 "Annexure" means all appendices, annexures and schedules annexed to this Contract or incorporated by reference herein and shall include all amendments and revisions thereto made by mutual agreement of Owner/Project Manager and Contractor in accordance with the provisions contained in this behalf in this Contract.

1.1.4 "Applicable Laws" means all laws, treaties, ordinances, rules, regulations applicable in India and amendments, re-enactments, revisions, applications, and adaptations thereto made from time to time and in force and effect, judgements, decrees, injunctions, writs and orders of any court, arbitrator or governmental agency or authority, rules, regulations, orders and interpretations of any Governmental Instrumentality, court or statutory or any other body having jurisdiction over construction of the Facility on the Facility Site, performance of the Work or supply of Goods, including Applicable Permits, as may be in effect at the time of performance of work or supply of Goods hereunder by the Contractor, which time would include Latent Defects Period as appropriate, provided, however, that if at any time the Applicable Laws are less stringent than the standards set forth in the Contract hereto, the standard set forth in the contract hereto shall be deemed to be the standards under Applicable Laws.

1.1.5 "Applicable Permits & Clearances" means any and all Permits, Clearances, authorizations, consents, licenses (including without limitation any import or export licenses), lease, ruling, exemption, filing, agreements, or approvals, required to be obtained or maintained in connection with construction of the Plant on the Site, performance of Work, and the operation of the Plant respectively by the Contractor and the Owner/Project Manager in accordance with the Contract and their maintenance, as may be in effect at the time of Contractor's performance of Work or supply of Goods hereunder; which time would include Latent Defects Period as appropriate.

1.1.6 "Bid" means the offer of the Contractor to the Owner/Project Manager in response to the Tender Documents.

1.1.7 "Business Day" means a day other than a Sunday or public holiday on which banks are open for domestic business in Mumbai.

1.1.8 "Cause" in relation to the revocation or amendment of any Permit means any fact or circumstance, including without limitation any default, neglect or failure to abide by any of the terms and conditions of such Permit.

1.1.9 "Change in Law" means the occurrence of any of the following after the Effective Date of this Agreement.

a) The enactment of any or issuance of any new Indian law that becomes Applicable Law;

b) The amendment or repeal, or re-enactment of any existing Applicable Law;

c) A change in the interpretation or application or enforcement of any Applicable Law by Government instrumentality

d) The revocation or cancellation of any Applicable Permit unless due to a cause attributable to the Contractor.

1.1.10 "Change Order" means a written order from the Owner/Project Manager to the Contractor after the Effective Date of the Contract requiring a change in any part of the Work or supply of Goods that may involve

a) A change in the Scope of Work or supply of Goods,

b) An additional Work or supply of Goods,

c) The omission of a portion of the Work or supply of Goods as per clause 14.0 or

d) If appropriate, an adjustment in one or more of the (i) Contract Prices, (ii) Guaranteed Completion Dates, (iii) Milestone Payment Schedule, (iv) any of the Performance Guarantees, or (v) any provision of this Contract including any Annexure or Schedule hereto or

e) Any of the above in combination.

1.1.11 "Change Order Notice" means a written Notice issued and signed by Owner/Project Manager requesting a scope change, submitted to Contractor by Owner/Project Manager pursuant to the terms of clause 14.0 hereof.

1.1.12 "Change Order Request" means a written request to Owner/Project Manager issued by Contractor indicating that a scope change order is required in connection with the performance of the Work or supply of Goods.

1.1.13 "Commissioning" shall mean integrated activity covered under "Preliminary Operation", "Initial Operation", "Trial Operation" and carrying out "Tests before Taking-Over" of Relevant Package under the Contract

1.1.14 "Contract" means the documents as set out in the form of Purchase Order or Contract Agreement including all appendices thereon and as may be amended, supplemented or modified from time to time by agreement in Writing between the Parties.

1.1.15 "Contract Period" means the period from the Effective date up to and including the last day of the Latent Defect Liability Period.

1.1.16 "Contract Price" means the lump sum fixed turnkey EPC price as stated in the Contract or such price as may be modified pursuant to clause 14.0 and as payable by the Owner/Project Manager to the Contractor in consideration of it performing the Work or supply of Goods on DDP Site basis including all obligations of the Contractor under and in accordance with the provisions of the Contract. Contract Price shall be deemed to be inclusive of all Taxes, Duties and Levies as may be applicable for supply of Goods or Works executed under the Contract whether payable within or outside India. Contract Price shall inter alia also include Taxes, Duties and Levies applicable for supply of Goods or Works executed under the Contract for which the liability of payment of Taxes, Duties and Levies are with Owner (e.g. Entry Tax, Building and Other Construction Workers Tax etc.)

1.1.17 "Contractor's Works" shall mean the places which are used by the Contractor or any of its Sub-vendors / Sub-contractors for the manufacture of equipment for the performance of Work or supply of Goods for the Relevant Package.

1.1.18 "Contractor's Equipment" means all machinery, apparatus, equipment, appliances, Materials, items and other things (other than temporary Works) of whatsoever nature required for the execution and completion of the Works, performance of the Contractor's obligations under the Contract including supply of Goods and Work, establishing of Performance Guarantees, and the remedying of any defects and deficiencies, but does not include equipment, apparatus, appliances, machinery, Materials, items and other things of whatsoever nature intended to form or forming part of the Plant.

1.1.19 "Contractor" means the person whose Bid has been accepted by the Owner/Project Manager and the legal successors in title to such person who satisfies the qualification criteria set forth in the Tender Documents.

1.1.20 "Contractor Permits" means all Permits, required by the Contractor from any Government Instrumentality for the performance of his obligations under the Contract.

1.1.21 "Contractor's Representative" means the person named as such in the Contract or other person appointed and from time to time communicated to the Owner/Project Manager by the Contractor in his place in accordance with the terms of the Contract.

1.1.22 "Contractual Time for Completion" shall mean the timeline set forth for the successful completion of all Performance Tests and of 'Tests before Taking Over' and issuance of Taking Over Certificate by the Owner/Project Manager as per clause 9.3, and 10.5.2 of this Section.

1.1.23 "Cost" means all expenditure properly incurred (or to be incurred) by the Contractor, whether on or off the Site, including overhead and similar charges, for the full complete and proper performance of Work or supply of Goods including discharge of all of the Contractor's obligations under and in accordance with the Contract which are duly audited and supported but does not include profit.

1.1.24 "Consultant" shall mean Consulting Engineers appointed by the Owner/Project Manager for the Project and shall include, their duly authorised representatives.

1.1.25 "Day" means a calendar day of 24 (twenty four) hours and "Year" means 365 (three hundred and sixty five) days.

1.1.26 "Documents" means and includes all design documents, engineering documents, Drawings, calculations, computer software (programs), computer media, samples, patterns, models, construction documents, erection documents, Operation and Maintenance Manuals, and other manuals, and the like as well as, all other data and information to be submitted by the Contractor and shall include without limitation, engineering, design and construction drawings, data sheets, specifications, plans, bills of Materials and estimates.

1.1.27 "Document Distribution Schedule" means the communication protocol / list of Owner/Project Manager representatives to whom all Documents shall be released by the Contractor in number of copies as defined / elaborated in Technical Specifications. Owner has implemented an internet-based document management system for distribution of Documents and same shall be utilised by Contractor for all document distributions. In case a Document Distribution Schedule is not specified in the Technical Specifications, the Master Document List and distribution / communication protocol thereon shall be mutually agreed at the time of Kick-off Meeting of the Relevant Package.

1.1.28 "Drawings" shall mean all:

a) Drawings and any other engineering data/documents furnished by the Owner/Project Manager or the Consultant.

b) Supplementary drawings furnished by the Owner/Project Manager or the Consultant to clarify and to define in greater detail the intent of the Contract.

c) Drawings submitted by the Contractor with his proposal provided such drawings are acceptable to the Owner/Project Manager or the Consultant.

d) Engineering data and drawings submitted by the Contractor during the progress of the Work under the Contract, provided such engineering data and drawings are acceptable to the Consultant or the Owner/Project Manager.

1.1.29 "Effective Date" / "Effective Date of Contract" means the date on which the Contract comes into force and effect, i.e. from the date of issue by the Owner/Project Manager of the Letter of Intent or Purchase Order or Contract Agreement whichever is earlier to the Contractor,

1.1.30 "Facility" or "Plant" means, collectively, the Relevant Package and other apparatus, appliances, machinery, equipment, components and other Works, together with all auxiliaries, Materials, apparatus, appliances others things whatsoever and related buildings as an integrated whole, including without limitation all systems and sub-systems thereof and related facilities, including without limitation any and all appliances, parts, instruments, appurtenances, accessories and other property that may be incorporated or installed in or attached to or otherwise become part of the Plant or as envisaged in the Contract or which otherwise constitutes a part of the Facility and located on Site.

1.1.31 "Final Performance Acceptance" means the acceptance by the Owner/Project Manager of the Relevant Package as a whole in accordance with clause no. 10.6 of this General Conditions of Contract.

1.1.32 "Final Acceptance Certificate" means the acceptance by the Owner/Project Manager of the Relevant Package as a whole in accordance with clause no. 10.7 of this General Conditions of Contract.

1.1.33 "Final Payment Certificate" means the payment certificate issued by the Owner/Project Manager or his Representative under clause 13.8 hereof to the Contractor.

1.1.34 "Final Proposal" shall mean the Bid or proposal of the successful Bidder amended to the extent deviations/clarifications were mutually agreed and accepted in writing as part of post-bid discussions/clarifications with priority in descending order of date/time of communications giving highest priority to the latest communication.

1.1.35 "Financing Document" means any document relating to the Debt or equity financing to the Owner/Project Manager for provision of funds for the development, Design, construction and / or operation of the Plant; or funds for refinancing part or whole or take-out of any such financing.

1.1.36 "Financial Closing Date" means the date on which Owner/Project Manager has access to funds pursuant to Financing Documents.

1.1.37 "Financing Party" means any Person or Persons providing:

a) Debt or equity financing to the Owner (including Owner's sister concerns) to provide funds for the development, Design, construction and / or operation of the Project;

b) Interim or long-term financing for the construction of the Plant.

1.1.38 "Force Majeure Event" shall have the meaning set forth in clause no. 20.0 of these Conditions of the Contract.

1.1.39 "Foreign Currency" means a freely convertible currency, specified in the Schedule of Prices in which part of the Contract Price is payable, but not Indian Rupees.

1.1.40 "General Conditions of Contract" also referred as "GCC" means these Terms and General Conditions of Contract as mutually amended in accordance with the provisions contained in this behalf herein as applicable to scope of supply of Goods or Work.

1.1.41 "Goods" means all of the equipment, machinery, apparatus, appliances, components and/or other Materials and things, which the Contractor is required to supply to the Owner/Project Manager under the Contract.

1.1.42 "Good Engineering Practices" means those practices, methods, acts, techniques and standards as may be followed or employed in the performance of the Work or supply of Goods and discharge of its obligations by the Contractor and which (i) are generally accepted internationally for use in the electric utility industry, taking into account conditions in India, in connection with power stations of the same or similar size and type as the Plant, (ii) are commonly used in prudent engineering, construction, project management and operations including those related to electric utility, and (iii) would be expected to result in supply of Goods, performance of Work and completion of Works in a manner consistent with Applicable Laws, Applicable permits, reliability and safety.

1.1.43 "Government Instrumentality" means the Government of India, the Government of State and any other State, or any political subdivision, ministry, department, agency, corporation, commission or any regional, local or municipal authority or governmental body thereof or any other governmental or statutory body under the direct or indirect control of the Government of India or Government of State or of any other State, or of any political subdivision, ministry, department, agency, corporation, commission, or any regional, local or municipal authority or governmental body thereof, and shall include without limitation any other governmental or statutory body having jurisdiction over the facility or over the performance of any part of Work or the Works or any obligation of the Contractor or the Owner/Project Manager under the Contract.

1.1.44 "Grid" means the system of electrical transmission and distribution with their associated generating stations.

1.1.45 "Guaranteed Completion Date" or "Guaranteed Completion Dates" means, individually or collectively, the date by which contracted Works for the Relevant Package shall be completed as per the agreed Contractual Time for Completion till the PAC of the respective Unit/s of the Relevant Package.

1.1.46 "Hazardous Materials" means (i) hazardous materials, hazardous wastes, hazardous substances, toxic substances or contaminants as those terms are defined under any environmental law or regulation, including, but not limited to, Applicable Laws, and in the regulations adopted or promulgated pursuant thereto; (ii) petroleum and petroleum products including crude oil and any fractions thereof; (iii) any other hazardous, radioactive, toxic or noxious substance, material, pollutant, or solid, liquid or gaseous waste; and (iv) any substance that, whether by its nature or its use, is subject to regulation under any environmental law or with respect to which any applicable environmental law or any Governmental Instrumentality requires environmental investigation, monitoring or remediation.

1.1.47 "Initial Operation" shall mean all operations undertaken as part of "Commissioning" after completion of "Preliminary Operation" and up to commencement of "Performance Tests" of the Relevant Package covered under the Contract.

1.1.48 "Inspector" shall mean the authorised representatives appointed by the Owner/Project Manager or the Consultant or Owner's/Project Manager's Third-Party Inspection Agency for purpose of the inspection of materials / Equipment / Work / Services.

1.1.49 "Intellectual Property" means copyrights conferred under statute, common law or equity in relation to inventions (including patents) registered and unregistered trademarks and service marks registered and unregistered designs, circuit layouts, confidential information, proprietary information and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields."

1.1.50 "Interim Payment Certificate" means any payment certificate other than Final Payment Certificate, issued by the Owner/Project Manager pursuant to clause no. 13.4 hereof.

1.1.51 "Kick-off Meeting" means the first meeting called for by Owner/Project Manager at the earliest convenient schedule immediately after the Effective Date (preferably not later than 15 days from the Effective Date and with a notice of 5 days to Contractor) which shall be attended by Contractor along with the identified key personnel including but not limited to the Contractor's proposal engineering manager, project manager, engineering manager/s, quality manager/s designated for the Relevant Package and wherein the Contractor shall come fully prepared for and present to Owner the execution philosophy, detailed PERT/network diagram for the execution of the contracted Works within the Contractual Time for Completion, Master Document List, Communication Protocol, Escalation Matrix (for any dispute resolution) etc.

1.1.52 "Latent Defect" shall be the defects inherently lying within the Goods which do not manifest during normal inspections carried out by the Owner/Project Manager or the defects inherently lying within the Relevant Package which do not manifest during the normal operations and maintenance of the Relevant Package / Plant in accordance with O&M manual during the initial Warranty Period.

1.1.53 "Latent Defect Liability Period" means the liability period as set forth in clause 12.2.2 hereof.

1.1.54 "Liquidated Damages" means the appropriate measures of the damages for such delays or such shortfalls in performance and are neither penalty nor consequential damages sustained by Owner/Project Manager as a result of such delays and / or shortfalls, as set forth in clause 11.0 hereof.

1.1.55 "Manuals" means various instruction manuals to be provided as per the Contract by the Contractor and shall include Manuals described in Technical Specifications or Special / General Conditions of Contract.

1.1.56 "Manufacturer" means any entity or firm who is the producer and furnisher to the Contractor of any material or designer and fabricator of any equipment / systems which is to be incorporated in or forms part of the Plant / Relevant Package.

1.1.57 "Materials" means Goods and other things of all kinds to be provided and incorporated, to be used in the permanent Works / Plant/ Relevant Package by the Contractor, including Goods purchased by the Owner/Project Manager and supplied to the Contractor or as a free issue or the supply-only items (if any) which are to be supplied by the Contractor under the Contract.

1.1.58 "Mechanical Completion" means the completion of all Works by the Contractor including completion of construction, erection, installation and calibration, construction and testing services with respect to all mechanical, electrical, structural, instrumentation and control systems (including equipment) of the Relevant Package, and it has achieved a state of readiness for "Preliminary Operation". The existence of "Punch List" items, which do not prevent or adversely affect the Relevant Package, from being in a state of readiness for "Preliminary Operation" shall not be construed as preventing the Relevant Package, from achieving Mechanical Completion.

1.1.59 "Milestone Payment Schedule" means the document which sets forth the limits of payments to be released (worked out, inter alia, on the basis of payment terms agreed by the

Owner/Project Manager) by linking such payment limits (in terms of percentages) with detailed milestones commencing from the Effective date. Such percentages shall be with reference to the Contract Price, more particularly defined in clause 13.1.1 (v).

1.1.60 “Month” shall mean calendar month or a period of 30 (thirty) days as relevant to the context.

1.1.61 “Monthly Progress Report” or “Progress Report” means a progress report meeting the requirements set forth in sub–clause 3.22 hereto.

1.1.62 "Notice to Proceed" (NTP) means the written notice delivered by the Owner/Project Manager to the Contractor pursuant to clause no. 9.1 hereof

1.1.63 “Notice in Writing” or “Written Notice” shall mean a notice in writing, typed or printed or hand written characters, sent (unless delivered personally or otherwise proved to have been received) by registered post or by electronic transmission to the last known private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post or by electronic media it would have been delivered.

1.1.64 “Offshore Supply Contractor” means Contractor for supply of Goods from outside India.

1.1.65 “Onshore Supply Contractor” means Contractor for supply of Goods from within India.

1.1.66 “Onshore Service Contractor” means a Contractor for providing Services from within India.

1.1.67 “Other Contractor” shall mean contractors engaged by Owner/Project Manager for carrying out civil/other Plant works and other allied infrastructure facilities required for the Plant.

1.1.68 “Owner” shall have the meaning as defined in the Special Conditions of Contract (SCC) in its capacity as owners of the Facility and shall include its successors and assigns, as well as authorised officers. ‘Project Manager’ shall have the meaning as defined in the SCC and shall include its successors and assigns, as well as authorised officers.

1.1.69 Owner’s/Project Manager’s Representative” means the person appointed by the Owner/Project Manager from time to time and notified as such to the Contractor to act as Owner’s/Project Manager’s Representative for the purposes of the Contract.

1.1.70 “Owner’s/Project Manager’s Instructions” shall mean any drawings, instructions, details, directions and explanations, in writing issued by the Owner/Project Manager or the Consultant from time to time during the subsistence of the Contract.

1.1.71 “Owner/Project Manager Permits” means the permits, authorisations, consents and approvals required by the Owner/Project Manager to own, posses, operate and maintain the Plant and to generate therein electrical energy.

1.1.72 “Party” means Owner/Project Manager or Contractor individually and “Parties” means Owner/Project Manager and Contractor collectively.

1.1.73 “Permanent Works” means the Permanent Works, equipment and Materials including all electro-mechanical works to be designed, engineered, manufactured, installed, erected, supplied, executed, commissioned or tested in accordance with the Contract and which form part of the Facility.

1.1.74 “Performance Guarantees” shall have the meaning set forth in the Technical Specifications (including but not limited to Schedule of Peformance Guarantee) and forming integral part of the Contract

1.1.75 "Performance Test" means, the test to be carried out in accordance with the provisions of Technical Specifications to prove and establish the Performance Guarantees as per Technical Specifications

1.1.76 "Permit" means any valid permit, authorisation, license, registration, approval, consent, waiver, exemption, No-Objection Certificate, Approval, variance, franchise or any similar order of or from any Government Instrumentality, court or other body having jurisdiction over the matter in question.

1.1.77 "Person" means any individual, corporation, partnership, association, joint stock Company, trust, unincorporated organisation, Hindu Undivided Family, joint venture, government or political subdivision or agency thereof.

1.1.78 "Plant" shall have the same meaning as that of "Facility" defined in 1.1.30 above.

1.1.79 "Preliminary Operation" means all activities undertaken as part of Commissioning after Mechanical Completion upto commencement of Initial Operation and shall include mechanical and electrical checkouts, calibration of instruments and protection devices, Commissioning of sub-supporting systems and chemical cleaning of the system/equipment covered under Contract. Trial Operations shall have the same meaning as per Technical Specifications.

1.1.80 "Project" shall have the meaning as defined in the SCC and shall include the Facility and all the Works that are necessary for the Project

1.1.81 "Project Manager" shall mean the authorised officers of Owner or the appointed Owner's consultant's authorised representatives who can act as Owner's representative for the Project

1.1.82 "Project Documents" mean collectively this Contract, the Power Purchase Agreement, the State Implementation and Support Agreement, the Land Lease Agreement, Fuel Supply Agreement, Transportation Agreement and any other contracts entered into or to be entered into by the Owner/Project Manager with Other Contractors in connection with the Project including without limitation any contracts for Related Works.

1.1.83 "Provisional Acceptance" or "Take Over" means the provisional acceptance by the Owner/Project Manager of the Relevant Package, pursuant to the provisions of clause 10.5 hereof.

1.1.84 "Prudent Utility Practices" means those practices, methods, equipment specifications and standards of safety and performance, as the same may change from time to time, as are generally accepted for use in electricity generating utilities taking into account conditions in India and commonly used in prudent electricity generation utility engineering and operations including design, engineering construction, erection, installation, Commissioning, testing, operation of the equipment comprised therein lawfully, safely, efficiently and economically for facilities of the type and size similar to the Project and that generally conforms to the Equipment Manufacturer's operation and maintenance guidelines and also any guidelines provided in this regard by any Government or statutory organisation or a Rating agency and the like requirements of the latest Gazette of India - CEA Notification Sr. No.211 dated 20th August 2010: – "Technical standards for construction of electrical plants and electric lines" / any amendments thereon.

1.1.85 "Punch List" means the list prepared by Owner/Project Manager at the time of Provisional Acceptance and thereafter periodically revised by Owner/Project Manager as necessary, and in any case updated by Owner/Project Manager within 20 (twenty) days following Owner's/Project Manager's receipt of a Notice of Final Acceptance, in each case with the full co-operation of Contractor, which list shall set forth certain items of Work which remain

to be performed by the Contractor in order to ensure that the Relevant Package fully complies with all of the standards and requirements set forth in the Contract.

1.1.86 "Related Works" shall mean other than the Work under the Contract performed or to be performed by the Owner/Project Manager or Owner's/Project Manager's Other Contractors in connection with the Project either prior to, concurrently or subsequently with the Works within or outside the Site with whom the Contractor shall co-ordinate and interface his activities covered by the Contract.

1.1.87 "Relevant Package" means, design, engineering, manufacturing, shop fabrication, assembly, testing and inspection at supplier's work, packing, dispatch, shipping, inland transportation to site, insurance up to time of Taking Over, delivery at Site, receipt, unloading, handling, storage and in-plant transportation at Site, erection installation, testing, commissioning and handing over of the subject package as per the Requirement Specifications / Scope of Work defined in the Technical Specifications.

1.1.88 "Responsibility Matrix" - is the division of all the responsibilities between the Owner and the Contractor for permits clearances & licenses required for the execution of the contracted Works including operation & maintenance of the Works by Owner post Take-over.

1.1.89 "Schedule" shall have the meaning set forth in clause no. 3.23 hereof.

1.1.90 "Site" means all those parcels of land owned by / in possession of Owner on which the Relevant Package will be located, as more particularly identified on the site plan and described in Drawings forming part of Contract hereto.

1.1.91 "Sub-contractor" means any person named in the Contract as a sub-contractor, sub-vendor, Manufacturer or supplier for a part of the Works or any person to whom a part of the Works has been subcontracted in accordance with clause no. 4.0 and the legal successors in title to such Person, but not any assignee of such Person.

1.1.92 "Take Over" or "Taking Over" shall mean Taking-over of the Relevant Package for the purpose envisaged under the Contract upon successful completion of the Performance Tests and acceptance of Performance Test by Owner/Project Manager for having established Performance Guarantees of the Relevant Package.

1.1.93 "Take Over Certificate" or "Provisional Acceptance Certificate (PAC)" shall mean the certificate issued under clause no. 10.5.2.

1.1.94 "Temporary Works" means all temporary works of every kind (other than Contractor's equipment) required for the execution and completion of the Works and the remedying of any defects.

1.1.95 "Tender Documents" means the Invitation to Bid together with all documents & amendments thereto and clarifications if any issued by the Owner/Project Manager or the Consultant from time to time in respect thereof.

1.1.96 "Tests" means all tests to be undertaken by the Contractor under or pursuant to the Contract including all the tests set forth in Technical Specifications.

1.1.97 "Tests before Take Over" means the tests prescribed in Technical Specifications and any other such tests as may be agreed between the Owner/Project Manager and Contractor or instructed as a Change Order, which must be carried out by the Contractor before the Taking Over of the Relevant Package.

1.1.98 "Trial Operation" shall have the same meaning as per Technical Specifications.

1.1.99 "Unit" shall mean all the equipment/works for each of the Units of the Project / Relevant Package as defined in the Tender Specification.

1.1.100 "Warranty Period" for the Relevant Package shall mean the period of 24 (twenty-four) months beginning from the date of Take Over of the Relevant Package. During this Warranty Period, the Contractor will be liable to rectify all defects in the Relevant Package if any arisen.

1.1.101 "Works" or "Services" means all the work and obligations of the Contractor under the Contract including without limitation, the Work and services briefly described in Specifications for the Relevant Package including permanent works and temporary works as appropriate under the Contract.

1.1.102 "Writing" shall include any manuscript, typewritten e-mail or printed statement, under or over signature and / or seal of the originator or author as the case may be.

1.2 Headings and Marginal Notes

The section headings and marginal notes are not part of these Conditions and shall not be taken into consideration in their interpretation.

1.3 Interpretation

1.3.1 Words importing Persons or Parties shall include related firms and corporations and any organisation having legal capacity. Words importing the singular also include the plural and vice versa where the context requires. Words importing one gender also include other genders.

1.3.2 Unless inconsistent with the provisions of the Contract, the meaning of any shipping terms and the rights and obligations of the parties there under shall be as set forth in the latest International Chambers of Commerce (ICC) official rules for interpretation of trade terms as per "INCOTERMS 2010".

1.3.3 The term Contractor shall include its Sub-contractor as the context requires.

1.4 Law, Language and Measurements

1.4.1 Applicable law to this Contract shall be the Indian Law. The respective rights, privileges, duties and obligations of the Owner/Project Manager and the Contractor under this Contract shall be governed and determined by the Laws of State and of the Republic of India.

1.4.2 The official text of this Contract shall be English, regardless of any translation that may be made for the convenience of the Parties. All correspondence, information, literature, data, manuals, definitive documents, notices, waivers and all other communication, written or otherwise, between the Parties in connection with this Contract shall be in English.

1.4.3 All measurements shall be in metric system.

1.5 Stamp Duty and Similar Charges

The costs of stamp duties and similar charges imposed by the law (shall be as per Indian Stamps Act & Indian registration act) on the Contract or Agreement or any part thereof shall be shared equally by the Parties.

1.6 Effective Date of Contract

The Contract shall be deemed to have come into force and effect from the date of issue of the Letter of Intent (LOI) by the Owner/Project Manager to the Contractor.

1.7 Priority of Documents

The order of precedence of the following documents shall be as listed herein below. The Contractor is deemed to have full knowledge and understanding of the contents of all the documents whether contained in or incorporated by reference thereto, and accepted all the terms and conditions contained therein

a) The Contract Agreement including Special Conditions of Contract, and General Conditions of Contract, Schedule of Prices, all Schedules and Appendices, Technical Specifications
b) Owner's/Project Manager's Letter of Intent to the Contractor
c) Post tender correspondence including jointly signed minutes of meetings with the Contractor and jointly signed record notes of tender negotiations
d) Tender document

The order of precedence for Annexures to Contract Document shall be as listed herein below:

(i) Contractor's Implementation Plan including Contractor's Organization and Key Personnel
(ii) Approved List of Subcontractors & Vendors
(iii) Responsibility Matrix for Permits, Approvals and Clearances as they shall apply to this Contract Agreement
(iv) Owner's / Project Manager's Contractor Safety Terms & Conditions, Health Safety & Environment Policies, Responsible Supply Chain Management and Sustainability Policies

In the event of any ambiguity or conflict between any of the foregoing Contract Document, the Contractor shall prior to the commencement of supplies or work be deemed to have clarified from the Owner/Project Manager any such ambiguities or conflicts.

1.8 Documents on Site

The Contractor shall keep on the Site one complete set of the Contract, the Documents, Change Orders, communications given or issued under various clauses and sub clauses duly authenticated by the Owner's/Project Manager's Representative. These Documents shall be either true copies or original documents, the same being verified as true copies by Owner's/Project Manager's Representative. The Owner/Project Manager, the Owner's/Project Manager's Representative and his delegates (as referred to in sub-clause 2.4) shall have the right to use such Documents at all reasonable times.

1.9 Communications

All certificates, notices**,** instructions, communications, consents, approvals, orders or determination to be given to the Contractor by the Owner/Project Manager or the Owner's/Project Manager's Representative, (in as many copies required) and all notices or communication, to be given to the Owner/Project Manager or to the Owner's/Project Manager's Representative by the Contractor, shall be in Writing and may either be delivered by hand against written acknowledgement of receipt, or be sent by airmail or one of the agreed systems of electronic transmission as agreed by the Owner/Project Manager. The addresses for the receipt of such communications shall be as stated in the Contract as modified by notice given in accordance with this clause no. 1.9. The Contractor shall maintain a separate set of copies of all the inward and outward correspondences which should be produced at any time if need be. The Contractor shall act or modify actions only on the basis of valid written communications received from the Owner/Project Manager / Owner's/Project Manager's representative and would need to provide the documentary

evidence (correspondences received from Owner/Project Manager/ Owner's/Project Manager's Representative) if required by the Owner/Project Manager.

1.10 Provision of Documents

1.10.1 The Documents referred to in Technical Specifications shall be in the custody and care of the Contractor. The Contractor shall furnish to the Owner/Project Manager / Owner's Representative Documents, Drawings, etc. as per Technical Specifications.

1.10.2 In addition, and without prejudice to the foregoing, the Contractor shall provide to the Owner/Project Manager "as built" Drawings of the Relevant Package consequent to Provisional Acceptance and only after the delivery of such as built Drawings, the Final Acceptance shall take effect.

1.11 Contractor's Use of Owner's/Project Manager's Documents

1.11.1 Copyright in the Owner's/Project Manager's requirements and other Documents issued by the Owner/Project Manager or the Owner's Representative to the Contractor shall (as between the parties) remain the property of the Owner/Project Manager. Ownership in all documents provided by the Contractor to the Owner/Project Manager pursuant to the Contract including design, engineering, Drawings and Works layout (but excluding proprietary information and Manuals provided by vendors of equipment for use of the Owner/Project Manager) shall be with the Owner/Project Manager. The Contractor may, at its Cost, copy, use and communicate any such documents for the purposes of the Contract. They shall not, without the Owner's/Project Manager's consent, be used, copied or communicated to a third party by the Contractor, except as necessary for the purposes of the Contract including performance of Work or supply of Goods

1.11.2 The Contractor shall indemnify the Owner/Project Manager in case of breach of this clause by the Contractor. If these Documents are received by a third party from the Contractor and the third party makes use of these Documents to cause harm or monetary loss to the Owner/Project Manager or use these Documents for their personal gain / monetary gain, the Contractor shall compensate the Owner/Project Manager for the loss suffered as well as for the value of gain derived by third party.

1.12 Confidential Details

1.12.1 The Contractor shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out his obligations hereunder. The Contractor shall not publish, permit to be published, or disclose any particulars of the Contract in any trade or technical paper or elsewhere without the previous consent in writing of the Owner/Project Manager and at the Owner's/Project Manager's sole discretion.

1.12.2 The Contractor shall indemnify the Owner/Project Manager in case of breach of this clause. If the confidential details relating to this Contract or its contents are received by a third party from the Contractor and the third party makes use of these details to cause harm or monetary loss to the Owner/Project Manager or use these Documents for their personal gain/ monetary gain, the Contractor shall compensate the Owner/Project Manager for the loss suffered as well as for the value of gain derived by the third party. The Contractor shall not use the confidential details of the Contract for any other purpose except for the strict purpose of this Contract.

1.13 Contract Co-ordination and Interface

1.13.1 From fiscal and execution considerations, the Owner/Project Manager intends to enter into independent stand-alone contracts with one or more Other Contractors for Related Works in connection with the Relevant Package tendered by the Owner/Project Manager including (i) Onshore Contract for Civil Works, (ii) Offshore Contract for Supply of Imported Material;

(iii) Onshore Contract for Supply of Indigenous Material; (iv) Contract for Installation, Commissioning, Guarantees and other Services; and such other contracts.

Present GCC appended to the Tender document is applicable to the comprehensive turnkey EPC scope covering item 1.13.1 - (i) to (iv). In case Owner/Project Manager exercises the option of entering into independent stand-alone contracts, the GCC may be suitably modified to suit the standalone contracts without dilution of the principles of the tender GCC

1.13.2 The Contractor, with whom any of above Contracts are entered into by the Owner/Project Manager, shall be responsible for effective co-ordination and interfacing of all his contracting activities and obligations under the Contract with the activities and obligations of the Other Contractors in a seamless manner, irrespective of whether the same is specifically detailed in such Contracts, to ensure that the Guaranteed Time Schedule and Performance Guarantees set forth in the Contracts are properly fulfilled in a timely manner by all such Other Contractors.

1.13.3 Where one or more of such Contracts are entered into by the Owner/Project Manager with the same Contractor or any of his Affiliates, such Contractor shall be additionally liable to ensure that all such co-ordination and interfacing of contracting activities under all such Contracts are performed and guaranteed by him on a single point responsibility basis in as much as the Owner/Project Manager will only be required to liaise with and look up to only such Contractor for the timely and proper performance of all such Contracts by the Other Contractors.

1.14 **Assignment**

1.14.1 The Contractor shall not, without the prior consent of the Owner/Project Manager assign to any person any benefit of or obligation under the Contract in whole or in part. Such assignment, even though approved by Owner/Project Manager, shall not relieve the Contractor from any obligations, duty, or responsibility under the Contract.

1.14.2 The Contractor consents to the creation by the Owner/Project Manager of a security assignment of the Contract in favour of any Financing Parties (or a trustee acting on behalf of one or more Financing Parties) and hereby undertakes to execute upon the request of the Owner/Project Manager such Documents including those giving effect to this consent of Contractors as may be reasonably required to give effect to any such assignment provided that the Contractor is not subject to any duty, liability or responsibility greater than that under the Contract.

1.14.3 The Owner/Project Manager shall not, without the prior consent of the Contractor, assign to any Person any benefit of or obligation under the Contract in whole or in part. However, the Owner/Project Manager can assign to its parent companies or subsidiary companies without prior permission of the Contractor. Such assignment shall not relieve the Owner/Project Manager from any of its obligations, duties or responsibilities under the Contract.

1.14.4 Any sub-contracts entered into by Contractor pursuant to clause no. 4.0 of these General Conditions of Contract shall provide that, pursuant to terms that are available on a commercially reasonable basis, the rights and obligations of the Contractor under each such sub-Contract are assignable and delegable to Owner/Project Manager, its successors and assigns and the Financing Parties and shall be deemed to have been assigned to the Owner/Project Manager, or if required by the Owner/Project Manager to the Financing Parties forthwith upon Owner's/Project Manager's written request without any further act, deed or thing and irrespective of termination or otherwise of the Contract.

1.15 **Relationship between Parties**

This Contract is on a principal-to-principal basis only. The Contract shall not be construed as a partnership or an association of persons. There is no agent and principal relationship between the Parties. Each Party shall be responsible for its own conduct. The Contractor shall ensure at all times that all the work carried out under this Contract either by its own person or through any of its Sub-contractors shall be always done under its own direct supervision

2.0 OWNER'S / PROEJCT MANAGER'S OBLIGATIONS

2.1 Access and Right to use of the Site

The Owner/Project Manager shall grant the Contractor right of access to, and make available the Site to the Contractor, in accordance with the terms of the Owner's/Project Manager's property rights within reasonable time after the Effective Date for the performance of the Work or pursuant to and in accordance with the Contract. Such right and use of the Site may not be exclusive to the Contractor. In the execution of the Works, no persons other than the Contractor or his duly appointed representative, Sub-contractor and workmen, shall be allowed to do Work on the Site, except by the special permission, in Writing of the Owner's/Project Manager's representative.

2.2 Permits, Licences or Approvals

2.2.1 The Owner/Project Manager shall, at the request and cost of the Contractor assist him in applying for Contractor Permits and other Construction Permits as defined herein. Such requests may also include requests for the Owner's/Project Manager's assistance in applying for any necessary government consent for the export of Contractor's equipment when it is removed from the Site.

2.2.2 The Owner's/Project Manager's assistance in applying for Permits, licenses or approvals (for which the Contractor is responsible under the Contract) is not obligatory and the extent of such assistance shall be at the sole discretion and convenience of the Owner's/Project Manager's. In any case, the Contractor shall be responsible for applying and obtaining all the Permits, licenses or approvals as required to be obtained by Contractor for carrying out and completion of the Works and operation of the Plant, in time as per the Schedule agreed in the Contract irrespective of the manner, outcome and extent of assistance from the Owner/Project Manager. All the necessary fees and any incidental charges required to be paid for obtaining all Contract permits shall be borne by and be the liability of the Contractor. All statutory fees paid for obtaining the permits / Licenses / approvals pertaining for execution of the Project specified in Owner's scope shall be reimbursed by the Owner against submission of documentary evidence. However, Contractor shall obtain permits / Licenses, approvals required for carrying out his responsibilities at his cost.

2.2.3 Owner/Project Manager shall be responsible for obtaining only those permits / approvals listed as Owner's/Project Manager's responsibility in Annexure-I enclosed at the end of this section and other incidental approvals relating to investment.

2.3 Owner's/Project Manager's Other Obligations

Owner/Project Manager shall

a) Designate a person as Owner's/Project Manager's Representative (the "Owner's Representative") to be the contact for Contractor with respect to the performance of the Works and Contractor's obligation under the Contract, and shall be authorised to act for and on behalf of Owner/Project Manager and administer this Contract on Owner's/Project Manager's' behalf, agree up on procedures for co-ordinating Owner's/Project Manager's efforts with those of Contractor and as appropriate, make information available to Contractor.

b) Provide at its expense fuel, water and electricity as reasonably required during Commissioning and during Performance Tests before Take-Over as set forth in Technical Specifications. The provisions of fuel and electricity as required for other activities and Work of the Contractor including those as per sub-clause no. 3.11 of the Conditions of Contract shall, however, be by the Contractor at its cost and expense.

c) Provide, at its own expense, the Operation and Maintenance ("O&M") personnel to operate the Relevant Package under the direction, guidance and supervision of the Contractor prior to Provisional Performance Acceptance, but nevertheless after successful Trial Operation.

d) Pay in a timely manner in accordance with Terms of Payment, subject to fulfilment of milestones and provided the Contractor is not in breach of Contract, the Contract Price and all other sums, if any, required to be paid by it to Contractor pursuant to the Contract.

2.4 The Owner's Representative

2.4.1 **Owner's Representative's Duties and Authority**

Owner's Representative shall exercise all rights and carry out the duties of the Owner under the Contract. Owner's representative shall also include Consultant / Consulting Engineer or Third-Party Inspection Agency as required or deemed appropriate or authorised by the Owner/Project Manager. Any act, instruction or decision of the Owner's Representative shall be as if this was an act, instruction or decision of the Owner/Project Manager.

2.4.2 Except as expressly stated in the Contract, the Owner's Representative shall have no authority to (a) amend, alter, modify or waive any provision or term of the Contract, or (b) relieve the Contractor of any of his duties, obligations or responsibilities under the Contract. Any proposal, inspection, examination, testing, consent, approval or similar act by the Owner's Representative (including absence or disapproval) shall not relieve or absolve in any manner whatsoever, the Contractor from any responsibility, liability or obligation under the Contract, including responsibility and liability for his errors, omissions, discrepancies, and non-compliance with the Specifications and any provisions of the Contract.

2.4.3 **Owner's Representative's instructions**

The Contractor shall comply with written decision, instruction or order given by the Owner's Representatives in accordance with the Contract.

2.4.4 **Right to Examine and copy**

The Owner/Project Manager/Owner's Representative shall have the right, at any time on reasonable notice and at the premises of the Contractor or any Sub-contractors, to examine Drawings or Documents which have been prepared by the Contractor or any Sub-contractor for the purpose of Contract (including manufacturing Drawings of items not manufactured exclusively for the purpose of Works but which are normally intended for disclosures to purchasers), except Drawings or Documents containing proprietary manufacturing know-how which is confidential to its proprietor. The Owner shall have right to inspect, examine & usage of Contractor's and his Sub-contractor's facilities such as warehouse / stores/ handling & lifting equipment, offices & associated premises / equipment.

2.4.5 Further, the Owner/Project Manager is also free (subject to the rights the Contractor himself has) to copy, use, reproduce all designs, Drawings, models, plans, Specifications, design details, photographs, CAD Materials, and any other material as supplied by the Contractor in connection with Facility or Works for completion, repair, reconstruction, modification,

maintenance etc. The Owner/Project Manager/Owner's Representative may also allow third parties to use, copy and reproduce the same. Owner/Project Manager shall have the right to inspect, examine or use of Contractor's and his Sub-contractor's facilities such as warehouses, stores, handling & lifting facilities, office and associated premises/equipment.

3.0 WORK TO BE PERFORMED BY CONTRACTOR AND CONTRACTOR'S OBLIGATIONS.

3.1 General

3.1.1 The Owner/Project Manager has engaged the Contractor relying upon the representations, assurances and Warranties made by the Contractor including the representation that the Contractor has the experience, skill and resources to perform the Work or supply the Goods and to design, engineer, supply, erect, construct, install, build and complete in all respects the Relevant Package fit for the purpose and deliver the same to the Owner/Project Manager in accordance with the Contract, and Contractor acknowledges such reliance by the Owner/Project Manager and the acceptance of the Contractor for such engagement.

3.1.2 Without prejudice to the foregoing, except as otherwise expressly set forth in the Contract as within the scope of Owner's/Project Manager's obligations under the Contract, the Contractor shall supply the Goods and / or perform or cause to be performed all Work and Services required in connection with the design, engineering, supply of equipment, procurement (including, without limitation, all transportation services in connection therewith), construction, erection, start-up, commissioning, testing including conducting of Performance Tests and other works and services upto the Final Acceptance of the Relevant Package by the Owner/Project Manager and in connection therewith provide all Materials, equipment, machinery, tools, labour, transportation, administration and other services and items required to complete the Relevant Package in all respects upto the Final Acceptance and having demonstrated the performance as guaranteed under the Contract by the Contractor on a total fixed price basis and otherwise in accordance with this Contract.

3.1.3 If there are any supplies, Work and Services required in connection with the design, engineering, procurement, manufacture, supply, transportation to site, fabrication, construction, erection, testing, commissioning and upto Final Acceptance of the Relevant Package which are not specifically mentioned in the Contract or which are not under the Contract expressly stated to be outside the Contractor's Scope of Work or Supply described in the Contract, but which are necessary to complete, commission and efficiently operate the Plant as per Prudent Utility Practices, and have the performance as guaranteed under the Contract by the Contractor including for normal, safe and continuous operation of the Plant, the Contractor shall provide or cause the same to be provided as part of its obligations under the Contract. The Work to be performed or Goods to be supplied by the Contractor under the Contract shall, without prejudice to the generality of the foregoing include but not be limited to the following:

a) All engineering and design services including necessary investigations required for a completely engineered Relevant Package including necessary documentation;

b) Provision of all equipment, systems and materials as per Technical Specifications that will be merchantable, new and of first class quality, Contractor's Equipment, Temporary Works and all other items, whether of a temporary or permanent nature including those required for the design, execution, completion, testing upto Taking Over and remedying of defects during Warranty Period including Latent Defect Period;

c) Transportation to Site from Port of entry, import clearance and handling services in and into India and inland transportation from the relevant points of delivery required in connection with the completion of the Relevant Package, and the performance of the other Work;

d) Receipt of (c) above at site including preservation during storage and stores management;

e) Project management.

f) Mechanical, electrical and instrumentation, installation, erection and installation services; Mechanical Completion, testing and commissioning, start-up, Preliminary Operation, Initial Operation, and conducting of Performance Tests and proving of Performance Guarantees before Take Over of the Relevant Package including obtaining of all Applicable Permits, with Contractor having responsibility for overall co-ordination of licenses and permits under this Contract and all training activities;

g) Provision of all necessary superintendence, labour, construction fuels and construction materials and Contractor's other Equipment, chemicals, utilities, tools, supplies and other consumables and services and Work;

h) Rectification of defects and deficiencies including replacement to achieve Performance Guarantees and / or remedying of defects and deficiencies discovered or occurring during Warranty Period including the Latent Defect Liability Period; and

i) Provide training to Owner/Project Manager's operation & maintenance personnel.

3.1.4 Further, it is acknowledged by the Contractor that he himself shall be primarily responsible for successful execution of all deliverables as specified in the Contract clauses.

3.2 Engineering and Design

3.2.1 Contractor shall provide all design and engineering services necessary for design, engineering, erection, supply of equipment, installation, testing and completion of the Relevant Package in accordance with and conformity to the Contract, Good Engineering Practices and Prudent Utility Practices including and engineering / designs meeting safety standards & codes:

a) Preparation and submission of

(i) The conceptual design including the design basis of Relevant Package and auxiliaries; and

(ii) The engineering and design necessary to describe and detail the Works and the Project.

b) Provision of criteria for the detailed design by other suppliers of Equipment/ system/ structures for incorporation into the Relevant Package.

c) Preparation of design, engineering Drawings, plans, bill of material, schedule and estimates for the Relevant Package and the Project and the performance by Contractor of its obligations hereunder so that the Works constructed and commissioned by the Contractor is capable of meeting the Performance Guarantees and will be such as could be legally, safely and reliably placed in commercial

operation by the Owner/Project Manager in accordance with Prudent Utility Practices.

Contractor acknowledges the fact that the Owner/Project Manager has agreements with the fuel suppliers, Other Contractors, off takers and other third parties. Contractor shall co-operate with all these parties in the design, engineering, procurement, fabrication, supply, delivery, construction, Commissioning, start-up, testing, Take-over, operation, maintenance and repair efforts, and accommodate their reasonable interface and interconnection requirements within the limitations of Contractor's design and scope of Work or Goods or other obligations hereunder.

3.2.2 **Design / Construction Documents**

a) The Contractor shall prepare documents in conformity with Relevant Package including those listed in Technical Specifications hereto (collectively, the 'Design Documents") as per Document Distribution Schedule in Technical Specification in sufficient detail to satisfy and comply with, all Applicable Permits including regulatory approvals, to provide suppliers and construction personnel sufficient instruction to execute the Works, and to describe the operation and maintenance of the completed Works. The Owner/Project Manager/Owner's Representative shall have the right to review and inspect the preparation of design and construction Documents.

b) Each of the design and construction documents shall, when considered ready for use, be submitted to the Owner/Project Manager/ Owner's Representative for pre-construction review. In this sub-clause 3.2.2, "review period" means the period required by the Owner's Representative, which shall not exceed 15 (fifteen) Days, calculated from the date on which the Owner /Project Manager/ Owner's Representative receives a design / construction document and the Contractor's notice that it is considered ready, both for a pre-construction review in accordance with this sub-clause 3.2.2, and for use thereof. If the Owner/Project Manager/ Owner*'s* Representative, within such review period, notifies the Contractor that such design / construction document fails (to the extent stated) to comply with the Owner/Project Manager's requirements, it shall be rectified, resubmitted and again reviewed in accordance with this sub-clause, at the Contractor's cost. Any such notification by the Owner/Project Manager/ Owner's Representative or their failure to so notify shall not, however, relieve or absolve the Contractor in any manner whatsoever of its obligations, Performance Guarantees and Warranties under the Contract.

c) For each part of the Relevant Package, and except to the extent that the prior consent of the Owner/Project Manager/ Owner's Representative shall have been obtained:

(i) Construction**,** and erection shall not commence prior to the expiry of the review periods for the design / construction documents, which are relevant to the design and construction of such part;

(ii) Construction shall be in accordance with such construction documents; and

(iii) If the Contractor wishes to modify any design or Document which has previously been submitted for such preconstruction review, the Contractor shall immediately notify the Owner/Project Manager/Owner's Representative, and shall subsequently submit revised Documents to the Owner/Project Manager/Owner's Representative for pre-construction review.

d) If the Owner/Project Manager/Owner's Representative instructs that further design / construction documents are necessary for carrying out either pre-construction review or the Works, the Contractor shall upon receiving the Owner/Project

Manager/Owner's Representative's instructions prepare such design / construction documents at no extra cost.

e) The Contractor at his cost shall rectify errors, omissions, ambiguities, inconsistencies, inadequacies and other defects.

f) Manuals

Contractor shall submit to Owner/Project Manager, as they become available from time to time during their preparation, all Contractor specifications and Documents including data sheets, plans and drawings, and other information and documents required for the Relevant Package including those listed in Technical Specifications hereto (collectively, the 'Design Documents") as per Document Distribution Schedule in Technical Specifications. In addition, Contractor shall provide the following:

(i) Operation & Maintenance Manual:

Owner/Project Manager and Contractor shall work together to agree, at the earliest practicable date on a preliminary outline of the form and content of, and not later than 3 (three) Months after the Effective Date, Owner/Project Manager and Contractor shall agree on the final form and content of, complete equipment and system, instructions for the start-up, operation and maintenance of the Relevant Package (the 'Operating Manual"). Not later than 6 (six) Months from the Effective Date, Contractor shall prepare in individually numbered bound volumes and deliver to Owner/Project Manager 10 (Ten) sets of the Operating Manual in English language.

The "Operating Manual" shall incorporate relevant technical details, procedures and sequences in respect of Relevant Package including all sub-systems. Contractor shall consult with Owner/Project Manager in the preparation of the Operating Manual and Owner/Project Manager will be permitted to make recommendations as to the final form and substance of the Operating Manual. Subsequent to such delivery, Contractor shall update and revise the Operating Manual, as required, in order to reflect changes in Contractor or Sub-contractor recommended operating or maintenance procedures, improvements in the original Operating Manual, or revisions requested by Owner/Project Manager,

Contractor shall obtain all instruction Manuals and special directions required for preparation of the Operating Manual from equipment Manufacturers or vendors or shall itself provide any such written instructions when they are not available from such Manufacturers or vendors. The Operating Manual shall be based on a generally accepted standard of professional care, skill, diligence and competence applicable to engineering and operating practices, shall be consistent with Prudent Utility Practices, and shall be prepared so that operation of the Relevant Package in accordance with the Operating Manual shall, under anticipated operating conditions, result in operation of the Project at the capacity, efficiency, reliability, safety and maintainability levels contemplated by the Contract and shall in no way impair any Warranty or Guarantee on equipment, Materials or Services relating to the Project including those being furnished by Contractor or Sub-contractors under the Contract.

For the purpose of Operating Manual, the Contractor shall comply with an approved standard system of Equipment Codification. The Contractor shall also develop Codification of Equipment in respect of the sub system, auxiliary plants and facilities delivered / furnished by others. The final Operating Manual shall also be submitted in softcopy. The O&M manual shall be indexed so that the navigation to the O&M manuals of all the sub-Contractors is possible from the main menu.

(ii) Procedure Manual:

Contractor shall, within 15 (fifteen) Days from the Effective Date, deliver to Owner/Project Manager a manual which provides the guidelines by which the normal working relationships will be conducted between Owner/Project Manager and its representatives and Contractor and between Contractor and Sub-contractors (the "Procedure Manual"). The Procedure Manual will contain, among other materials, an organisational chart, correspondence procedures, a Project filing system, procedures for the review of the design Documents and Project progress, and verification procedures to be implemented for the Project. The Procedure Manual shall be discussed and agreed with the Owner/Project Manager. The Contractor shall deliver the final agreed Procedure Manual to Owner/Project Manager within sixty (60) days from the Effective Date.

(iii) Quality Control Manual:

Contractor shall, within 30 (thirty) Days from Effective Date deliver to Owner/Project Manager a manual prepared conforming to the Quality Assurance Program based on Technical Specifications which the Contractor shall adhere to. The manual shall elaborate the manufacturing and engineering methods and standards to be employed by Contractor for executing the Contract (the "Quality Control Manual).

3.2.3 **Contractor's Undertaking**

The Contractor undertakes that the execution of the Contract and the performance will be in accordance with the Applicable Laws.

3.2.4 **Technical Standards and Regulations**

The design, engineering, manufacturing, procurement, supply, erection, installation, testing, commissioning of Relevant Package shall comply with

a) Indian National Standards and Codes; Bureau of Indian Standards, ASME etc.

b) Technical and environmental regulations and Codes;

c) Regulations and Codes applicable to the electrical energy being generated at the Facility, as also to the Facility and the standards specified in the Owner/Project Manager's Specification/the Contract.

d) International Environmental Standards which are more stringent with the applicable Indian Environmental Standards of Central Pollution Control Board and State Pollution Control Board; not withstanding what is stated in (a) to (c) above or elsewhere in the Specifications.

e) Requirements of the latest Gazette of India – CEA Notification Sr. No. 211 dated 20th August, 2010: 'Technical standards for construction of electrical plants and electric lines.' or any other latest CEA/MoEF&CC notifications

f) International safety standards & codes for engineering/design

g) Relevant sustainability standards & codes

The Contractor shall also ensure due compliance of Indian Electricity Grid Code covering all aspects as applicable from time to time. Complete text of the Code is available on the web site http://www.cercind.gov.in

References in the Contract to such specifications and other matters shall be understood to be references to the edition applicable on the Effective Date of Contract, unless stated otherwise. In case of any conflict between provisions of codes and the design criteria / specification the provisions that are more stringent shall be complied with. If substantially changed or new applicable national specifications, technical standards or regulations come into force after the Effective Date of Contract, the Contractor shall submit proposals for compliance to the Owner's Representative. In the event that the Owner's Representative determines that such proposals constitute a Change Order, he shall then initiate a Change Order in accordance with clause no. 14. Metric Units shall be used in all data/ documentation / drawings covered under this Contract.

3.3 Construction and Construction Management

3.3.1 Contractor shall develop a construction plan and shall carry out, oversee, co-ordinate and ensure the expeditious design, engineering, procurement, fabrication, construction, Commissioning, start-up and testing of the Relevant Package in accordance with Specification and other provisions of the Contract consistent with the Guaranteed Time Schedules.

3.3.2 Contractor shall supply all material and construction equipment required in the performance of the Work. All components of the Relevant Package including special tools shall be brand new equipment other than Contractor's special tools used in the construction of the Plant. In case of usage of Owner/Project Manager's special tools, they shall be refurbished before handing over.

3.3.3 Contractor shall perform and cause its Sub-contractors to perform all design, engineering, procurement, fabrication, construction, erection, Commissioning, start-up, testing, operation and maintenance upto Take-over in accordance with Good Engineering Practices and Prudent Utility Practices so that the Relevant Package shall operate in accordance therewith all Applicable Laws and all Applicable Permits and in a manner as not to void or diminish any manufacturer's Warranty or any Insurance coverage with respect to the Project. Contractor shall inspect or cause to be inspected all equipment and shall reject those items not in compliance with the Specification, or approved Quality Assurance Plans. Contractor also shall carry out and oversee (a) the manner of incorporation of the equipment into the Relevant Package and the workmanship with which such equipment is incorporated and (b) the performance of the Work.

3.3.4 Contractor shall establish and track Project management controls systems and provide design, engineering, procurement, fabrication, erection, Commissioning, start-up, testing and construction management services in accordance with the Standards of Performance set forth in the Technical Specifications and the Contract

3.3.5 The Contractor shall keep the Owner's Representative informed in advance regarding his field activity plans and schedules for carrying out each part of the Work. Any review of such plan or Schedule or method of Work by the Owner's Representative shall not relieve the Contractor of any of his responsibilities towards the field activities. Such reviews shall also not be considered as an assumption of any risk or liability by the Owner's Representative and no claim of the Contractor will be entertained because of the failure or inefficiency of any such plan or Schedule or method of Work reviewed. The Contractor shall be solely responsible for the safety, adequacy and efficiency of Relevant Package and equipment and his erection methods.

3.3.6 The field activities of Other Contractors working at Site will be co-ordinated by the Owner's Representative and his decision shall be final in resolving any disputes or conflicts between

the Contractor and Other Contractors and tradesman of the Owner/Project Manager regarding scheduling and co-ordination of Work. Such decision by the Owner's Representative shall not be a cause for extra compensation or extension of time for the Contractor.

3.3.7 The Owner's Representative shall hold weekly meeting or daily meeting if required of all the Contractors working at Site, at a time and place to be designated by the Owner's Representative. The Contractor shall attend such meetings and take notes of discussions during the meeting and the decisions of the Owner's Representative and shall strictly adhere to those decisions in performing his Works. In addition to the above weekly or daily meetings, the Owner's Representative may call for other meetings either with individual Contractors or with selected number of Contractors and in such case the Contractor, if called, will also attend such meetings.

3.3.8 Time is of the essence and the Contractor shall be responsible for performance of his Works in accordance with the specified construction schedule. If at any time, the Contractor is falling behind the schedule, he shall take necessary action to make good for such delays by increasing his work force or by working overtime or otherwise reduce such delays by increasing his work force or by working overtime or otherwise accelerate the progress of the Work to comply with the schedule and shall communicate such actions in writing to the satisfaction of Owner's Representative, satisfying Owner/Project Manager that his action will compensate for the delay. The Contractor shall not be allowed any extra compensation for such action.

3.4 Procurement

3.4.1 **Sourcing**

As part of the Work, Contractor shall procure and pay for, in Contractor's name as an independent Contractor and not as agent for Owner/Project Manager except as otherwise indicated, all Contractor and Sub-contractors labour, Materials, equipment, supplies, soil, cement, sand, gravel, paints and similar Materials and manufacturing, fabrication and related services (whether on or off the Site) for construction of and incorporation in the Relevant Package or which are otherwise required for completion of the Work in accordance with the Specification and the Contract and are not explicitly specified to be furnished by Owner/Project Manager pursuant to the terms and provisions of the Contract including Specification. This would also include provision of:

a) An inventory of spare parts (including maximum usage of standard items and engineering products as spare parts) that is required for efficient and cost effective operation of the Relevant Package.

(i) For start-up and Commissioning upto Take-Over of Relevant Package (start-up and Commissioning spares) and

(ii) For the Three (3) year period subsequent to such Take-Over period (Essential spares as per Contract)

(iii) For the effective performance, Contractor shall indicate spares required for 2 years O & M and valid pricing with contract terms thereon valid upto Latent Defect Liability Period

b) The Contractor shall procure all equipment, instruments, accessories and auxiliaries from Sub-Vendors approved by the Owner/Project Manager. However, in case Contractor suggests alternative Sub-Vendors, the Sub vendors shall be approved Vendors of high repute who will supply these Goods manufactured by reputed approved Manufacturers. The Contractor shall submit to the

Owner/Project Manager a list of proposed alternative Sub vendors and/or Manufacturers separately for such Equipment, components, instruments, accessories, auxiliaries and other Materials proposing adequate plurality of Vendors and suppliers with their details of experience and proof of their supplies having stood test of the time in similar application earlier at bid stage itself. The Owner/Project Manager may select among the list of Vendors/Manufacturers proposed by the Contractor more than one approved Vendor/Manufacturer. The Contractor shall procure the corresponding Plant, equipments, instruments, accessories and auxiliaries only from approved Vendor/Manufacturers.

c) all materials including lubricants, chemicals and other consumables, reasonably necessary or appropriate for operation of such Relevant Package prior to Owner/Project Manager's acceptance of Relevant Package. Upon Owner/Project Manager Final Acceptance of Relevant Package, Owner/Project Manager has a first right of refusal to purchase any unused Materials at Contractor's procurement cost. If any of the Owner's/Project Manager's spare parts or Materials are utilised during Warranty Period to fulfil Contractor's obligations hereunder, Contractor shall promptly replace such materials and spare parts at its own cost.

d) In connection with its procurement work, Contractor shall be responsible for the shipping, transportation and delivery to site of all items fabricated, manufactured, constructed or procured as set forth in the Specification and the Contract. All such items and equipment, Materials and supplies to be provided by the Contractor or procured on behalf of Owner/Project Manager pursuant to the Contract shall be new and of utility-grade quality, free from improper workmanship or defects and properly warranted or guaranteed in accordance with the Contract. Any apparent omission or error in the equipment specifications will be corrected by the Contractor to the extent required by the Contract including Specifications.

e) Contractor shall ensure that all construction equipment shall be of the most suitable grade of their respective kinds for the purposes and uses intended and construction equipment including rented construction equipment shall be maintained in a good state of repair and working condition.

f) When required by the Contract including Specification or where equipment / systems are referred to as "equal" any particular standard, Contractor shall furnish to Owner/Project Manager full information concerning the equipment / systems establishing compliance with the Contract which it contemplates incorporating in or using in connection with the Relevant Package. Should any such equipment required to be so submitted for approval under this paragraph be installed or used by Contractor or a Sub-contractor without approval by Owner/Project Manager, they may subsequently be rejected, and the cost thereof, including the Cost of all services and labour relating thereto, shall be to the account of Contractor and not reimbursable.

3.4.2 **Co-ordination with Owner/Project Manager/Owner's Representative/ Other Contractors**

a) The Onshore Service Contractor shall arrange for expediting, clearing of all imported Goods at the port of destination and transportation to Site on Owner's/Project Manager's behalf and in Owner's/Project Manager's name. The Goods so imported would be issued to the Onshore Service Contractor as a free issue at the Site for safe custody and use in erection, installation, commissioning and testing. The Onshore Service Contractor will be responsible for receiving, inspection, unloading/loading, transportation at Site, storage and handling, preservation, inspection, documentation and storage of Work and all Materials received at Site.

b) Onshore Service Contractor shall be responsible for completing all clearance formalities in respect of all imported equipment, standard spare parts, maintenance tools and tackles and other materials used in connection with the supply of Goods or performance of the Work imported in the name of the Owner/Project Manager on Owner's/Project Manager's behalf.

c) Onshore Service Contractor shall arrange and ensure the security of all the foregoing items while in handling, transport or storage, and the safe delivery of the same to the plant Site and the incorporation of the same into the Relevant Package. In the event any such materials, equipment, supplies or other items are damaged, lost, stolen, destroyed or otherwise impaired, Onshore Service Contractor shall at its own cost and expense restore or replace such items.

d) Since the Contractor shall co-ordinate and follow up with Owner/Project Manager/Owner's Representative and Other Contractors, except as may be expressly excused in the Contract including Specification, no delay or failure to perform on the part of Owner/Project Manager (or its vendors, Other Contractors and / or sub-suppliers) shall excuse Contractor from the timely performance of its obligations under the Contract.

e) The Contractor shall deploy all necessary effective manpower for coordination, expediting and erection / commissioning supervision required for the above works specified in item a to d, for completion of the works to meet the stipulated quality standards & Project Schedule. In case deficient performance of the Contractor in this regards is observed by the Owner / Project Manager, the same shall be brought out to the notice of the Contractor in writing. In case Contractor fails to remedy the performance, Owner/Project Manager will rectify the same by deployment of his own resources and the cost of the same shall be recovered from the Contractors running bills.

3.4.3 **Free Issue Materials / Equipment (FIM) (as applicable):**

If the Contract involves or the Owner/Project Manager & the Contractor mutually agree for the incorporation of any Free issue materials / equipment by the Owner/Project Manager depending upon criticality & availability of the materials during the course of the Contract then :

a) The Contractor shall prior to taking delivery of the Free issue materials / equipment arrange for an equivalent Security / Bank Guarantee for the value of the Free Issue Material / equipment in the format set forth by the Owner hereto valid from the date of the receipt of the Free issue materials /equipment until delivery of the Material(s) in which the Free issue materials / equipment has / have been incorporated.

b) The Contractor shall inspect the Free issue materials / equipment at the time of taking delivery thereof and satisfy himself of the quality, quantity and condition of the Free issue materials / equipment. The Owner/Project Manager shall not be liable for any claims or complaints whatsoever in respect of the quality, quantity or condition of the Free issue materials / equipment once the Contractor has taken delivery thereof.

c) All Free issue materials / equipment be taken possession, transported, stored and utilized by the Contractor as trustee of the Owner/Project Manager, and delivery of the Free Issue Material to the Contractor shall constitute an entrustment thereof by the Owner/Project Manager to the Contractor with the intent that any transportation, utilization, application or disposal thereof by the Contractor otherwise than for incorporation in the Plant shall constitute a breach by the Contractor.

d) The Contractor shall transport the Free issue materials / equipment only by such transportation as is suitable and shall hold and store them only at such place and/or premises that are air and water tight and otherwise suitable for the storage of the Free

issue materials / equipment so as to prevent damage or deterioration or theft or other loss, and shall arrange such watch and ward as shall be necessary to ensure the safety thereof.

e) Notwithstanding the Bank Guarantee mentioned in sub-paragraph (a) above, the Contractor shall replace any Free issue materials / equipment which is/are lost, damaged, misused, stolen or deteriorated with other Material(s) of equivalent quantity and quality and condition, and the same shall be deemed to constitute Free issue materials / equipment and the provisions of sub-paragraphs (a) to (f) hereof shall apply thereto in the same manner as to the originally supplied Free issue materials / equipment.

f) Unused Material(s) from the Free issue materials / equipment shall be returned by the Contractor to the Owner/Project Manager and if the Owner/Project Manager so directs, the Contractor shall dispose of the same by sale or otherwise on such terms and conditions as the Owner/Project Manager may stipulate or approve and the Contractor shall pay to the Owner/Project Manager the sale proceeds of the Material(s) so disposed of by sale.

3.5 Labour and Personnel

3.5.1 The Contractor shall make his own arrangements for the engagement of all staff and labour, local or otherwise, and for their payment, housing, feeding and transport. Contractor shall provide all labour and personnel required in connection with Work, including:

a) Professional engineers licensed in accordance with any applicable licensing requirements in India or by any other governmental instrumentality to perform engineering services pursuant to the Contract;

b) Project team of necessary engineers from various disciplines including, construction manager, Project engineer and lead structural, mechanical, electrical, instrumentation and control, cost, scheduling, procurement, construction, start-up and training supervisors, all of whom shall follow Good Engineering Practices and shall have had extensive Plant experience in facilities of similar technology and magnitude and shall be proficient in the English language and have knowledge of Prudent Utility Practices, Applicable Laws and Applicable Permits.

c) A Project Coordinator or other Representative, who shall be fully acquainted with the Project, shall be proficient in the English language and shall have the authority to administer this Agreement on behalf of Contractor. He shall give his whole time to directing the preparation of all documents required for the construction, erection and execution of the Works. Except as otherwise stated in the Contract, the Contractor's Representative shall receive (on behalf of the Contractor) all notices, instructions, consents, approvals, certificates, determinations and other communications under the Contract. Whenever the Contractor's Representative is to be absent from the site, a suitable replacement person shall be appointed, and the Owner/Project Manager/Owner's Representative shall be notified accordingly.

d) Quality assurance personnel, all of whom shall report directly to Contractor's home office management and not to the Project personnel located at the Site.

The Contractor shall employ (or cause to be employed) only persons who are appropriately qualified, skilled and experienced in their respective trades or occupations. The Contractor shall give preference for appointment of local labourers in unskilled, semi-skilled and skilled categories if such suitable labourers are available at the Project Site.

Upon Owner/Project Manager's request, Contractor shall provide Owner/Project Manager with the resumes of, and arrange for an interaction with the Owner/Project Manager of, any or all personnel described in clauses (a), (b) (c) & (d) of this Section 3.5.1. In addition, Owner/Project Manager will have the right to approve those individuals who will hold the positions described in clauses (a), (b) (c) & (d) of this Section 3.5.1 and any other key Project personnel employed by Contractor, and Owner/Project Manager will be afforded the opportunity to choose among candidates for the positions of Project Manager, Project Engineer and Construction Manager. Contractor shall not remove any Project personnel described in clauses (a), (b) (c) & (d), of this Section 3.5.1 or any other individual in a supervisory or lead position without the prior consent of Owner/Project Manager, which consent shall not be unreasonably withheld.

3.5.2 **Removal of Staff and Labour**

The Owner/Project Manager/Owner's Representative may require the Contractor by notice in Writing to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative, who in the opinion of the Owner/Project Manager/Owner's Representative:

a) Persists in any misconduct,

b) Is incompetent or negligent in the performance of his duties,

c) Fails to conform with any provisions of the Contract;

d) Persists in any conduct which is prejudicial to safety, health, or the protection of the environment; or

e) Other good and sufficient reasons.

3.5.3 **Rates of Wages and Conditions of Labour**

The Contractor shall ensure that he pays all his personnel and shall ensure that his Sub-contractors pay to their personnel regularly their wages, overtime and other compensations. The attendance register and the wage register shall be submitted to the Owner/Project Manager for verification at regular intervals. The Contractor shall also furnish the Owner/Project Manager at regular intervals as governed by Applicable Laws including local statutes but not less than Monthly intervals, certificates that he has paid to his Sub-contractors and workmen and caused his Sub-contractors to pay all the dues to his Sub-contractor workmen. In case such payment is not made regularly by the Contractor or his Sub-contractors, the Owner/Project Manager will be in his right to make such payments and deduct the same from the Contractor's progress payments. In case the Owner/Project Manager becomes liable to pay any wages or dues to the labour or to any Government agency under any of the provisions of the Minimum Wages Act, Workmen's Compensation Act or any other Applicable Law due to act or omission of the Contractor, the Owner/Project Manager may make such payments and shall recover the same from the Contractor's bills.

3.5.4 **Persons in the Service of Others**

The Contractor or any of his Sub-contractors shall not recruit, or attempt to recruit, his staff and labour from amongst persons in the service of the Owner/Project Manager or Other Contractors and agencies engaged by the Owner/Project Manager or the Owner's Representative.

3.5.5 **Labour Laws**

The Contractor shall comply with and shall ensure that he/his Sub-contractors comply with all the relevant labour laws applicable to his/ his Sub-contractors employees, and shall duly pay and afford and cause his Sub-contractors to pay and afford to them all their legal rights. The Contractor shall require all such employees to obey all Applicable Laws and regulations concerning safety at Work.

Contractor shall be responsible for all labour relation matters relating to the Work or Supply of Goods and shall at all times use its best efforts to maintain harmony among the personnel employed in connection with the Work or supply of Goods whether by the Contractor or his Sub-contractors and shall enter into all necessary labour agreements with such personnel. Contractor and his Sub-contractors shall at all times comply with all Applicable Permits and Applicable Laws relating to employment including but not limited to Contract labour regulations, Workmen Compensation Act, Employee State Insurance and Provident Fund regulations, retrenchment Compensation etc. and labour welfare and use its best efforts and judgement as an experienced Contractor to adopt and implement policies and practices to avoid Work stoppages, slowdowns, disputes, strikes, lockouts and other labour strife and disagreement.

3.5.6 **Working Hours**

The Contractor shall follow the working hours / shift timings as decided by the Owner/Project Manager. No work shall be carried out on the Site outside the normal working hours or on the locally recognised Days of rest or local festivals / holidays, unless:

a) Contract so provides after fulfilling Owner / Project Manager's process and procedures for the said working,

b) Work is unavoidable, or necessary for the saving of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Owner/Project Manager/Owner's Representative,

c) Owner/Project Manager/Owner's Representative gives his consent,

d) Extended working hours/shift working is essential for achieving Project progress/milestones at no extra cost to the Owner/Project Manager.

e) The Contractor is normally expected to work during daytime and is required to complete the work in all respects as stipulated elsewhere. For achieving Project progress/milestones, based on a specific request by the Contractor, Owner/Project Manager/Owner's Representative may consider granting permission for working during the night shifts, if he considers it essential with no extra cost to the Owner/Project Manager. Night work to be carried out only after obtaining necessary clearances and approval of the Project Manager/Owner's representative.

   Sufficient lights shall be provided by the Contractor to safeguard the workmen and the public and to afford adequate facilities for properly placing and inspecting the material when the night work is in progress. Contractor should be geared and in readiness to carry out extended shifts, including night shift and abide by all statutory and safety requirements.

3.5.7 **Facilities for Staff and Labour**

The Contractor shall provide and maintain all necessary accommodation and welfare facilities for his (and his Sub-contractor's) staff and labour. The Contractor shall also provide the facilities specified in the Contract including Specifications, for the Owner's/Project Manager's and Owner's Representative's personnel. The Contractor shall not Permit any of his or his Sub-contractors employees to maintain any temporary or permanent living quarters within the structures forming part of the Works or Plant Site.

Contractor shall make his own arrangements to procure and construct adequate labour housing outside the Plant Site and colony battery limits. No areas inside the Owner's/Project Manager's land and Plant Site shall be used as labour colony. No workers/labourers/supervisors or Other Contractor's or Sub Contractor's personnel should be allowed to stay within the Owner's/Project Manager's land area after his duty hours. Similarly, no workers / labourers / supervisors or Other Contractor's or Sub-contractor's personnel shall be allowed to enter the Owner's/Project Manager's land area before the start of their respective duty time.

3.5.8 **Foreign Staff and Labour**

The Contractor or Sub contractors may, subject to Applicable Laws, import and employ such staff, artisans, and labourers as are required in order to execute the Works. The Contractor shall ensure that all such staff and labour are provided with the required residence visa and Work permits as governed by the relevant Applicable Laws from time to time and to keep them in full force. The Contractor shall be responsible for the return of all such staff and labour to the place where they were recruited or to their domicile.

The Contractor shall submit to the Owner's Representative, a complete list of foreign personnel (including necessary data as may be required by Owner's Representative) as may be required for the performance of the Works in India.

The Contractor, Sub-contractors and their expatriate personnel shall not in any way interfere with Indian political and religious affairs. Such expatriate personnel shall work and live in close cooperation and co-ordination with their co-workers and the community and shall not engage themselves in any other employment neither part time nor full time nor shall they take part in any local politics

3.5.9 **Health and Safety**

Precautions shall be taken by the Contractor to ensure the health and safety of his and his Sub-contractors staff and labour. The Contractor shall, in collaboration with and according to the requirements of the local health authorities, ensure that medical staff, first aid facilities, sick bay and ambulance service are available at the accommodation and on the Site at all times, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics. The Contractor shall maintain records and make reports concerning health, safety and welfare of Persons, and damage to property, as the Owner's Representative may reasonably require. Contractor shall be responsible for the medical treatment / hospitalisation of his and his Sub-contractor's staff / labour.

The Contractor shall appoint a member of his staff at the Site to be responsible for maintaining the safety, and protection against accidents, of all personnel on the Site. This person shall be qualified for his Work and shall have the authority to issue instructions and take protective measures to prevent accidents. The Contractor shall send, to the Owner's Representative, details of any accident as soon as possible after its occurrence as well as notify the concerned Government authorities and attend to affected persons with due care and attention promptly and immediately. Contractor shall comply in toto with the Owner's/Project Manager's Contractor Safety Terms & Conditions, Health Safety & Environment Manual with sustainability document which is annexed to the GCC.

3.5.10 **Contractor's Superintendence**

The Contractor shall provide all necessary superintendence during the design, engineering, construction, erection and execution of the Works, and as long thereafter as the Owner's Representative may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. Such superintendence shall be given by the sufficient persons having adequate knowledge of the operations to be carried out (including

the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents) for the satisfactory and safe execution of the Works.

3.6 Permitting

3.6.1 Contractor shall obtain and maintain in effect all Applicable Contractor Permits including other permits as per sub clause 2.2 of this Section required in connection with Contractor's performance of its obligations hereunder, including supply of Goods or performance of the Work including (a) licenses to permit Contractor to do business in the jurisdictions where the Work is to be performed, (b) licenses / permits for design, engineering, procurement, fabrication; construction; erection, testing and commissioning; start-up testing; Tests before Taking-over; (c) export; import, other Applicable Permits necessary to move, transport and deliver construction equipment (including parts of the Plant and the Project) to and from the Site and into and out of India, and (d) all building Permits, construction permits and other Permits required to be obtained with respect to the supply of Goods or performance of the Work and discharging all other obligations under the Contract. Contractor shall also obtain in the name of Owner/Project Manager at the appropriate stage of construction all those Applicable Permits under his scope as per the Responsibility Matrix annexed to the GCC.

3.6.2 **Contractor and Construction Permits**

Contractor shall obtain all necessary Contractors' and Construction permits. If Contractor at any time becomes aware, whether as a result of notice from Owner/Project Manager or otherwise, of any applicable permit not obtained by him, Contractor shall promptly give notice thereof to Owner/Project Manager and Contractor shall be responsible for obtaining such Applicable Permit.

The Contractor shall indemnify and hold harmless Owner/Project Manager and all Owner/Project Manager indemnified parties from any damages arising from and out of the securing of, or failure to secure, such permits.

The Contractor shall submit work method statements, safe operating procedures and Hazard Identification and Risk Assessment (HIRA) to Owner for review and approval The Contractor shall obtain work permits from Owner prior to starting the job

3.6.3 **Support to Owner/Project Manager for Permits**

In case Owner/Project Manager is responsible for the permits, Contractor shall provide support to Owner/Project Manager in obtaining all Owner/Project Manager Permits. Such Contractor support shall include:

a) Attendance at meetings with Owner/Project Manager and third parties designated by Owner/Project Manager;

b) Assistance in Preparation of Permit applications or, as applicable, application to transfer permits to the Owner/Project Manager;

c) Assistance in preparation of responses to inquiries by Governmental Instrumentalities / agencies;

d) Assistance in presentations at hearing of Governmental Instrumentalities / agencies and

e) Provision of all available information and Documents required by Owner/Project Manager in connection with obtaining any Owner/Project Manager Permits;

3.7 Co-operation

3.7.1 The Contractor shall, as specified in the Specification, afford all reasonable opportunities for carrying out their respective Work to:

a) Any Other Contractors employed by the Owner/Project Manager and their workmen,

b) The workmen of the Owner/Project Manager, and

c) The workmen of any legally constituted public authorities who may be employed in the execution on or near the site of any work not included in the Contract, which the Owner/Project Manager may require to complete the Project.

3.7.2 Contractor shall not hinder the work of Other Contractors and Sub-contractors of Owner/Project Manager, if any employed by or on behalf of Owner / Project Manager at the Plant Site or the Project Site, to introduce and store Materials in those areas of the Plant Site and the Project Site under Owner's/Project Manager's direct control and shall cooperate to help them perform their respective services without hindrance or disruption. The Contractor shall also acknowledge that he works in congruence with requirements of lenders, Other Contractors, Project off takers and other related parties, and provide them appropriate information as and when required by them and not act as to harm the interests of any of them.

3.7.3 **Miscellaneous Liabilities in Co-operation with Other Contractors**

The Contractor shall also so arrange to perform his Work as to minimize to the maximum extent possible interference with the work of Other Contractors and their workmen.

Any injury or damage that may be sustained by the employees of the Other Contractors or the Owner/Project Manager, due to the Contractor's Work shall promptly be made good at contractor's expense.

The Owner's representative shall determine the resolution of any difference or conflict that may arise between the Contractor and Other Contractors or between the Contractor and the workmen of the Owner/Project Manager in regard to their work.

If the Works of the Contractor is delayed because of any acts of omission of Other Contractor, the Contractor shall have no claim against the Owner/Project Manager on this account other than an extension of time for completing his Works, provided the cumulative effect of such delays does not exceed 60 (sixty) Days. If such delays exceed 60 (sixty) Days, the financial and time implications, if any, shall be mutually discussed.

The Owner's Representative shall be notified promptly by the Contractor of any defects in the Other Contractor's Works that could affect the Contractor's Works. The Owner's Representative shall determine the corrective measures if any, required to rectify this situation after inspection of the Works and such decisions by the Owner's Representative shall be binding on the Contractor.

3.8 Transporting (Shipping), Forwarding, Storage and Related Matters

3.8.1 Contractor shall submit to Owner/Project Manager for approval the detailed list of equipment and materials to be shipped, and within a reasonable time after the Effective Date, an overall shipping and forwarding plan for all equipment and other items to be shipped from abroad to India in connection with the supply of Goods or performance of the Work. Contractor agrees that any material variation there from shall require the written consent of Owner/Project Manager. Contractor shall select the reputed shipping companies for the transportation and delivery of the equipment. The Contractor shall ship the Goods in classed vessels which are not more than 15 (fifteen) years old and which is unconditionally seaworthy and so declared by a reputed maritime agency as on the date

of travel and for the travel to its destination.. Owner/Project Manager will be the named importer of goods forming part of the Plant and its spares and the rights and title therein shall pass to Owner/Project Manager outside India in accordance with clause no. 7.0 hereof.

3.8.2 No part of the equipment shall be shipped to the Plant Site without Owner/Project Manager's prior written approval. Each application for approval shall include a complete list of the contents of each shipment and shall indicate the anticipated date of delivery and the serial number for each component to be used for identification.

3.8.3 At least Five (5) days prior to the delivery of Goods to the transporter or embarkation for India of each shipment of equipment or maintenance tools / tackles or spares (other than Contractor's Equipment) where Owner/Project Manager is to be named Importer, Contractor shall send a written communication (preferably by an email) to Owner/Project Manager setting forth the following information concerning each such shipment:

a) A reference to the date, parties and subject matter of the Specification

b) A description of the equipment and/ or construction equipment contained in such shipment or transport

c) The date of transportation/ embarkation and departure

d) The port or place of origin

e) The means of shipment or transportation (land air or sea)

f) The estimated date of arrival in India/Site.

g) The port of entry in India

h) The value of the shipment/transportation.

i) Material Despatch Clearance Certificate (MDCC) issued by the Owner/ Project Manager

j) The approximate weight and volume (gross and net)

k) The name, flag and owner of the vessel if shipment is by sea or the designation of aircraft if shipment is by air and

l) The number and value of Bill of Lading or Airway Bill or Railway Receipt or Lorry Receipt.

3.8.4 Within Five (5) days after embarkation for India of each shipment or before the Goods are received at the site in case of onshore Goods, as in sub-clause 3.8.2 above, Contractor shall send to Owner/Project Manager by courier (or by certified airmail if Owner/Project Manager so agrees) for information, the following documents:

a) Delivery note, Railway Receipt or Lorry Receipt or Shipping documents consisting of full set clean "onboard" (i) bill of lading, freight prepaid CIF Indian Port of entry for goods dispatched by sea or (ii) airway bill, freight prepaid CIF Indian port of entry for Goods despatched by air; (5 copies each). Bill of lading to indicate Consignee as Owner/Project Manager and Onshore Service Contractor as person to be notified.

b) Declaration made by Contractor, either by courier or email, in such form as shall be specified by Owner/Project Manager to the insurer providing the marine cargo

Insurance specified stating that such equipment is covered by such Insurance; (3 copies)

c) Commercial invoice with itemised prices duly signed by Contractor. (6 copies)

d) Packing lists for each separate package;(6 copies)

e) Statement of Contractor that the equipment is in accordance with the technical specifications and having attached all previously issued certificates and Test certificates concerning the equipment being shipped;(3 copies)

f) Certificate of origin;(3 copies)

g) Export license, if any; (3 copies)

h) Certificate of Insurance (3 copies)

i) Inspection Certificate, issued by the nominated inspection agency, Supply Contractor's factory inspection report and Material Despatch Clearance Certificate (MDCC) issued by the Owner/ Project Manager

j) Any other Documents needed for import clearance.

3.8.5 The Contractor shall be responsible for the timely clearance through customs of any part of the Relevant Package or Works for all necessary documentation and procedural matters associated therewith. The Contractor shall be responsible for meeting the agreed contractual time not withstanding any customs delays and will not be entitled to extend the time for completion, it being the Contractor's responsibility to allow sufficient time for clearance through customs and the like.

3.8.6 The Contractor's Scope of Work shall include obtaining all customs clearance, completing all clearance formalities and handling at all ports of all equipment and material of non–Indian origin, including those where Owner/Project Manager is named importer, transportation to Site and transit insurance in India from the respective Indian ports of disembarkation and / or the respective Manufacturer's Works upto the Project Site, receipt, handling, and storage of all equipment and Material at Project Site and other items necessary or desirable for the Project or the performance of the Work.

3.8.7 Contractor shall be responsible for examining all the shipment and notify the Owner's Representative immediately of any damage, shortage, discrepancy, etc. for the purpose of Owner's Representative's information only. The Contractor shall submit to the Owner's Representative every week a report detailing all the receipts during the week. However, the Contractor shall be solely responsible for any shortages or damage in transit, handling and/or in storage and erection / Commissioning of the equipment at Site till the Relevant Package is finally accepted by the Owner/Project Manager.

3.8.8 All demurrage, wharfage and other expenses if any incurred due to delayed clearance of the material or any other reason shall be to the account of the Contractor.

3.8.9 Contractor shall warehouse or otherwise provide appropriate storage in India (in accordance with Manufacturer's recommendation and taking into account climatic and other relevant conditions at the warehousing site) for all equipment and construction equipment and shall take preservation measures wherever necessary.

3.8.10 All equipment / systems, maintenance tools and tackles and spares which are stored at a location other than on the plant site shall be

a) Stored at other appropriate location approved in advance by Owner/Project Manager (to the extent reasonably possible),

b) Properly tagged and identified for the plant and segregated from other Goods (to the extent reasonably possible).

c) Duly insured for such storage against all risks.

However, such approval of location by the Owner/Project Manager shall not absolve the Contractor of his obligations under the Contract.

3.8.11 All equipment shall be labelled with permanently affixed durable nameplates, which will include the Manufacturer's, name, equipment model number, equipment serial number and all appropriate design parameters.

3.8.12 Contractor shall arrange and be responsible on a continuous basis (i.e. not limited to normal working hours) for safety and security of all items and equipment to be incorporated in or forming part of the Relevant Package or are required to be delivered to the Owner/Project Manager under the Contract, while in clearing, transport or storage or during erection/Commissioning or in his custody prior to delivery / Take Over by the Owner/Project Manager. In the event any equipment or item is damaged, lost, stolen, destroyed or otherwise impaired while in storage or transit or during erection/Commissioning or in his custody, the Contractor shall at its own expense and cost, restore or replace such affected equipment or item before Taking-Over by the Owner/Project Manager.

3.9 Erection, Pre-operational Testing, Initial Operation and Pre-commissioning checks

Work shall include the erection, Commissioning of components/ systems, calibration of controls and equipment, tuning, start-up, all functional and verification Tests, and all other Commissioning, Testing and Initial Operations prior to pre-commissioning checks. The requirements are further detailed in the Technical Specifications. At all times during the performance of the Work, Contractor shall avoid wasteful consumption (consistent with Prudent Utility, Good Engineering Practices and the terms of the Contract) of fuels, utilities, supplies, Materials, equipment, consumables, waste disposal services, electricity, water and chemicals.

3.10 Performance Guarantee Testing

3.10.1 Contractor shall perform, and re-perform if required, the Performance Tests in accordance with the Contract, in order to demonstrate achievement of the Performance Guarantees as set forth in the Technical Specifications and guaranteed by Contractor. If the Relevant package does not meet the Performance Guarantees, the Contractor shall at no extra cost to Owner/Project Manager redesign, modify, remedy repair or replace the Relevant package or any part or section thereof including any component, equipment or system with one which meets the requirements and again demonstrate achievement of the Performance Guarantees as set forth in the Technical Specifications.

3.11 Construction Facilities, Construction Power, Construction Water Facilities, Sanitary Facilities, Telecommunication Facilities, Mail Service & Catering

3.11.1 During the Contract Period, the Contractor shall arrange and pay for construction water necessary for the performance of the Work till the Take-over of the Relevant Package. However, Plant start-up power and fuel for Commissioning, start-up, Initial Operation, Reliability Operation, Performance Tests and other Tests before Take-Over of the Relevant Package, will be arranged by the Owner/Project Manager. Contractor shall arrange and pay for lubricants, chemicals, and other consumables in sufficient quantities, and the disposal of sewage and Other Contractor generated and Sub-contractor generated wastes, as necessary, to enable Contractor and each Sub-contractor to perform the Work until takeover of the Relevant Package.

Contractor shall strive towards Conversation of Energy, Water and Solid Waste reduction and optimize transportation of Men and Materials to minimize environmental impact and carbon footprint.

3.12 Construction Power Supplies

3.12.1 Unless specifically agreed by the Owner otherwise, the Contractor shall arrange and pay for Construction Power necessary for the performance of the Work till the Take-over of the Relevant Package. Construction power if arranged by the Owner may be made available at the proposed Site at 415V level as available within the plant boundary at one point and the Contractor shall make his own arrangements for further distribution & metering and shall be responsible for the maintenance of his distribution system. The Contractor shall be responsible for payment of Energy Bills at prevailing/agreed rates of such Construction Power till issue of Final Acceptance Certificate. The Construction Power system by its design and nature shall be a temporary system and not part of the permanent power supply.

3.12.2 Contractor shall be responsible for making its own assessment of the quantum of Construction Power required and shall furnish the information in accordance with Technical Specifications. The Contractor acknowledges that electricity sourced from a distributing Licensee in that area through the Owner's network / discom may be subject to disturbances, and its interruption or non-availability for any reason shall not constitute a condition for claim of extra time or costs on part of Contractor. The Contractor shall make adequate provision for D.G. sets as a stand-by power source for all the activities/process, which requires uninterrupted power.

3.13 Construction and Drinking Water Facilities

3.13.1 Construction water will be provided by Owner/Project Manager at one place within battery limit at chargeable basis. Metering and further distribution will be by Contractor at his cost.

3.13.2 Cost of all connected Works such as, but not limited to, pumps, pipeline, ground water reservoir etc are to be borne by the Contractor.

3.13.3 If required by Owner/Project Manager, the Contractor will provide water supply and where required potable water also to the Owner/Project Manager's facilities at the Project Site and the Owner/Project Manager shall pay for the same accordingly. If construction water is provided by the Owner, the same will be provided at one point within plant boundary on chargeable basis. Metering and further distribution will be provided by the Contractor at his cost.

3.14 Sanitary Facilities

3.14.1 Adequate sanitary facilities inside the Plant boundary for the use of persons employed by the Contractor at the construction Site shall be provided and maintained by the Contractor to the extent and in such manner and at such places as shall be acceptable to the Owner/Project Manager. Separate Toilet facilities for both gents and ladies shall be provided.

3.14.2 Contractor shall make all temporary arrangements for the treatment and discharge of sewage and drainage from or in connection with the construction and Work Site and shall maintain the same to the satisfaction of the Owner/Project Manager as long as they may be required. All sanitary waste shall be treated in accordance with the Applicable law including applicable local regulations.

3.14.3 In this regard, Contractor shall prohibit the committing of nuisance on the site or upon the land of the Owner/Project Manager or of adjacent land owners and any employee of Contractors or his Sub-contractors found violating this provision shall be liable to immediate dismissal.

3.15 Mail Service

A central mailing office shall be established and manned by the Contractor at Site.

3.16 Catering

The Contractor shall arrange for catering services (layout, and facility & food quality as approved by the Owner) for all on-Site construction and management personnel. Costs of catering services towards Owner/Project Manager's/Owner's Representative's Site staff would be borne by Owner/Project Manager/Owner's Representative if services are availed.

3.17 Personnel Training

3.17.1 Well in advance of and prior to Commissioning, start-up and testing operations and commencing Initial Operation, the Contractor shall arrange for adequate and requisite trainings at Manufacturer's works of Owner's and its designated personnel in the operation, maintenance and repair of the Relevant Package, including classroom or at actual project sites where such Relevant packages are operating, on-the-job and safety training. The number of days / number of personnel for such training shall in no case lower than those as specified in the Technical Specifications and shall be mutually agreed depending on the complexities and nature of the Relevant Package so as to enable Owner to independently operate and maintain the complete Relevant Package by himself.

3.17.2 Such training shall be designed to offer instruction and training to both inexperienced personnel and personnel with a reasonable level of experience in power plant operations, and shall be of such quality so as to provide Owner's or its designates operation, maintenance and repair personnel with a comprehensive working understanding of all operational, maintenance and repair aspects of the Relevant Package so as to enable such persons to operate, maintain and repair the Relevant Package in accordance with Prudent Utility Practice, Good Engineering Practices, Applicable Laws, Applicable Permits, Manufacturer's and supplier's recommendations and applicable insurance requirements, and shall include instruction and training from all Sub-contractors.

3.17.3 All training personnel of Contractor shall be fluent in English who will provide facilities such as laptops, LCD projector, and stationery for taking notes etc. Further, "classroom" training (including specific "at equipment" training) shall commence approximately four Months prior to the scheduled start of commissioning, of the Relevant Package and shall take place in the administration building or in a temporary structure furnished by Owner/Project Manager. The duration of this training sessions shall not be less than three (3) months and shall be in accordance with the training Schedule as mutually agreed between the Owner/Project Manager and the Contractor no later than 180 (One hundred and eighty) Days from the LOI Date.

3.17.4 Apart from the above mentioned training, the contractor shall also provide specialised training of not less than 30 (thirty) man months duration to Owner's designated personnel at Manufacturer's Work for system, all major equipments, etc, Cost of travel and incidental expenses of Owner's personnel for training pursuant to this Sub-clause would be borne by the Owner/Project Manager.

3.17.5 Contractor shall provide a copy of Training Manual and other written material to each of Owner's personnel participating in the programme, and shall provide additional 10 (Ten) copies and 1 (One) soft copy of the Training Manuals and other written Materials as part of the training program, all of which Materials shall be in the English language. Training provided by Contractor to Owner's personnel pursuant to the Contract including this clause no. 3.17 shall not be a condition for any Warranty.

3.18 Access: Office Accommodations

3.18.1 Contractor shall provide Owner/Project Manager and its designees (including the Owner/Project Manager/Owner's Representative and the Financing parties) with reasonable access to Contractor's home office and Contractor's offices at the Site and at all design, engineering, fabrication, manufacturing, construction and other premises of Contractor and its Sub-contractors where activities relating to Works is carried on at all times upon reasonable prior notice, including access to design, engineering, fabrication, and testing, construction facilities, Drawings, Documents sufficient to permit Owner/Project Manager/Owner's Representative to inspect Work being performed and to monitor compliance by Contractor and the Sub-contractors with the terms of the Contract and directions of Contractor.

3.18.2 Contractor shall provide to Owner/Project Manager/Owner's Representatives as and when required appropriate office facility at the home office of Contractor.

3.19 Clean-Up and Waste Disposal

3.19.1 The Contractor shall be responsible for keeping the entire area allocated to him clean and free from accumulation of waste Materials, rubbish/debris/etc. at all times during the period of Contract.

3.19.2 The Contractor shall employ enough number of specialised personnel to thoroughly clean his Work area at least once a Day and dispose of the rubbish. All such rubbish and scrap material shall be scrapped or disposed in a place to be identified by the Owner's Representative.

3.19.3 Materials and stores shall be so arranged as to permit easy cleaning of the area. In areas where equipment might drip oil and cause damage to the floor surface a suitable protective cover of flame resistant, oil proof sheet shall be provided to protect the floor from such damage. Also spillage of oil and its soaking into soil shall be prevented. In case garbages are found disposed in areas other than allotted to the contractor, then the same shall be cleared by the Owner/Project Manager and the charges debited to the concerned Contractor.

3.19.4 Contractor's labour camp and housing colony shall be maintained to the good standards of hygiene and shall be kept reasonably free of debris, litter and mal-odour.

3.19.5 Similarly, the labour colony, offices and residential areas of Contractor's employees and workmen shall be kept clean and neat to the entire satisfaction of the Owner's Representative. Proper sanitary arrangements shall be provided by the Contractor in the Work areas, office and residential areas of the Contractor.

3.19.6 The Contractor shall cause all Sub-contractors, at all times to keep the Site reasonably clean and otherwise free from accumulation of waste materials, rubbish, other debris resulting from performance of the Work. In case Owner/Project Manager is not satisfied regarding contractor his subcontractors cleanliness at site, Owner/Project Manager will notify regarding the same to the Contractor. In case of non-improvement / satisfaction, Owner/Project Manager will get the site cleaned and the charges of the same will be debited to Contractors account / deducted from Contractor's dues / payments.

3.19.7 On or before Acceptance of Relevant Package or the earlier termination of the Contract or, if earlier, upon Owner/Project Manager taking custody and control of the Relevant Package, Contractor shall use its reasonable efforts to remove, but in any event prior to Final Performance Acceptance or earlier termination, from the Site all petroleum, waste materials, rubbish, other debris and Hazardous materials, as well as all construction equipment and other surplus material and substances to which Owner/Project Manager does not hold title, and shall leave the Site in a neat, clean and usable condition.

3.19.8 Contractor shall remove, transport and dispose of any hazardous material transported onto the Site by Contractor or any Subcontractors, or created, used or handled as part of Contractor's or any Sub-contractors construction activities at the Site. The Contractor shall ensure proper housekeeping at the work sites, ensure segregation of waste at prior identified locations

3.19.9 Contractor shall notify Owner/Project Manager immediately upon the discovery of presence of any hazardous material on, or the release of hazardous material on or from, the Site and shall promptly and forthwith take steps to remove such hazardous material or curtail the ill effects that may be caused by such release of hazardous material. All clean up and disposal activities are in the scope of Contractor's obligations under this Contract (including the transportation) and shall be at the Contractor's own cost and expense.

3.19.10 The Owner/Project Manager and the Contractor also recognize that the creation of dust is inevitable in construction of a Project of this nature. The Contractor shall take reasonable steps to ensure, by watering and such other temporary means as are necessary, that dust caused by the Works is minimised.

3.20 Real Estate and Contractor's Field Operation

3.20.1 **Real Estate**

3.20.1.1 Contractor has reviewed the Site real estate as delineated on the Site Plan enclosed with Specification ("Real Estate") and acknowledges that it does not require rights to use any real estate, including without limitation any easements or access rights for other property, which are not included in the Real Estate, in order to perform the Work or supply of Goods.

3.20.1.2 If Contractor at any time after the Effective Date becomes aware that it requires the use of any real estate that is not included in the Real Estate, Contractor shall immediately give notice thereof to Owner/Project Manager, and Contractor shall be responsible for obtaining rights to use such additional real estate at its own expense and shall indemnify, save harmless and defend Owner/Project Manager from and against all damages, loss, action, proceedings, claims, cost and expense arising out of securing of rights to use such real estate or the failure to secure such right of use of such real estate by the Contractor; provided, however, that, without limiting the foregoing, the Owner/Project Manager shall apply for rights to use such additional real estate from the Person from whom such right is to be secured if such right is of the type customarily obtained by Owner of similar Project and is in the Owner's opinion, justified.

3.20.2 **Contractor's Field Operation**

3.20.2.1 The Contractor shall keep the Owner's Representative informed in advance regarding his field activity plans and schedules for carrying out each part of the Works. Any review of such plan or Schedule or methods of Work by the Owner's Representative shall not relieve the Contractor of any of his responsibilities towards the field activities.

3.20.2.2 Such reviews shall also not be considered as an assumption of any risk or liability by the Owner's Representative and no claim of the Contractor will be entertained because of the failure or inefficiency of any such plan or Schedule or method of Work reviewed.

3.20.2.3 The Contractor shall confine all his field operations to those Works which can be performed without subjecting the equipment and Materials to adverse effects during inclement weather conditions, like monsoon, storms, etc., and during other unfavourable construction conditions.

3.20.2.4 No field activities shall be performed by the Contractor under conditions which might adversely affect the quality and efficiency thereof, unless special precautions or measures are taken by the Contractor in a proper and satisfactory manner in the performance of such Work and with the concurrence of the Owner's Representative. Such unfavourable construction conditions will in no way relieve the Contractor of his responsibility to perform the Work or supply of Goods as per the Schedule.

3.20.2.5 After the completion of the Works, the Contractor shall remove from the Site under the direction of the Owner's Representative the Materials such as construction equipment, erection tools and tackles, scaffolding, etc., not forming part of such Works, with the written permission of the Owner's Representative. If the Contractor fails to remove such Materials, within 7 (seven) days of issue of notice by the Owner's Representative to do so then the Owner's Representative shall have the liberty to dispose of such Materials and credit the proceeds thereof to the account of the Contractor.

3.21 Reporting Requirements

3.21.1 Contractor shall deliver to Owner/Project Manager/Owner's Representative computer-based network Schedule in hard copy as well as a soft copy of Primavera (XER format) / any other mutually agreed electronic format during the Kick-off Meeting in accordance with the Contract.

The Contractor will provide / arrange Video Conferencing facility at his Head Office and manufacturing plants for project status reviews / discussions. Contractor and his sub-contractors will also comply & follow the online document management systems requirements of the Owner/Project Manager

3.21.2 Progress scheduling report shall be provided by the Contractor to the Owner/Project Manager in accordance with the Contract including, but not limited to, requirements indicated in the Specification. Contractor shall be responsible for

a) Ensuring that performance of the Work proceeds in accordance with the network Schedule and

b) Co-ordinating the activities of all Sub-contractors.

3.21.3 In the event of a disruption (other than suspension by Owner/Project Manager) to the Schedule and Contractor asserts that it is not the responsibility of Contractor or any Sub-contractor and that Contract entitles Contractor to additional compensation and / or other relief from Owner/Project Manager, the Contractor shall notify the Owner/Project Manager within twenty four (24) hours and provide a written report (to the best of Contractor's knowledge at the time) of the disruption within 72 (Seventy Two) Hours of Contractor's learning of the disruption and such report shall be supplemented on a prudent, informative and timely basis thereafter not later than 14 (Fourteen) Days from the date of Contractor's first learning of such disruption. In such an event the Contractor may modify and resubmit for approval to Owner/Project Manager/Owner's Representative computer based network schedule and modifications if any required to the Schedule.

3.21.4 The Contractor shall provide / arrange Video Conferencing facility at his Head Office and manufacturing plants for project status reviews / discussions. Contractor and his Sub-contractors will also comply & follow the online document management systems requirements of the Owner/Project Manager

3.22 Progress Reports

3.22.1 Monthly progress reports shall be prepared by the Contractor in the format mutually agreed between the Owner/Project Manager and the Contractor and distributed as per Document Distribution Schedule in Technical Specifications. The first report shall cover the period up to the end of the calendar Month in which the Commencement Date occurred and subsequent reports shall be submitted Monthly thereafter, each within 3 (three) Days of the last Day of the period to which it relates. Reporting shall continue until the Contractor has supplied all the Goods and / or completed all Works, which is known to be outstanding at the completion date stated in the Take-Over Certificate for the Works. Each progress report shall include:

a) Photographs and detailed descriptions of progress including each stage of design, procurement, Manufacture, delivery at Site, construction, erection, testing and Commissioning;

b) Charts showing the scheduled and actual status of design/ construction Documents, purchase orders, Manufacture, receipt at Site construction, erection, testing and commissioning. A detailed description of the milestones achieved and the Work/ Services performed as well as the details of Goods supplied or in transit prior to the date of the Monthly Progress Report and the extent to which Scheduled Payments therefore have been received. Appropriate weightage system for percentage progress shall be developed by Contractor and submitted to Owner/Project Manager/Owner's Representative for its approval no later than 30 (thirty) Days of Commencement Date and upon approval with or without modification by the Owner/Project Manager/Owner's Representative, the same shall be binding on and be followed by the Contractor and shall not be modified save and except with the prior consent of the Owner/Project Manager.

c) A description of the current status (the name of Manufacturer, manufacture location, percentage progress, and the actual or expected dates of commencement of manufacture, Contractor's inspections, Tests and delivery) of supplies and Equipment and of Contractor's and all Major Sub-contract activities and engineering, manufacturing, construction and installation progress as compared with the Project Schedule (and, at the request of Owner/Project Manager/Owner's Representative, an updated schedule),

d) Records of personnel and Contractor's equipment on Site and details of equipment in working condition,

e) Copies of quality assurance reports including Test results (i) from the manufacturing and fabrication facilities of all Sub-contractors and (ii) with respect to all construction activity at the Facility Site,

f) Safety statistics required under Applicable Laws, including details of any hazardous incidents and activities relating to environmental aspects and public relations,

g) Comparisons of actual and planned progress, with details of any aspects which may jeopardise the completion in accordance with the Contract, including Project Schedule and the measures / catch-up plan being (or to be) adopted to overcome such aspects. It shall include a clear identification and evaluation of problems and deficiencies in the Services (including but not limited to, an evaluation of any factors which are anticipated to have a material effect on the quality of Work and Project Schedule),

h) Certification that all amounts due to all Sub-contractors prior to the date of the Monthly Progress Report have been paid,

i) All other information reasonably requested by Financing Parties and Owner/Project Manager/Owner's Representative,

j) A man power status to the Owner's Representative, on the first Day of every Month, a manpower Schedule for the Month detailing the man hours scheduled for the Month, skill wise and area wise.

3.22.2 The Contractor shall also submit to the Owner's Representative on the Seventh Day of every Month a manpower report of the previous Month detailing the number of persons scheduled to have been employed and actually employed skill wise and areas of employment of such labour.

3.22.3 A brief weekly report shall also be prepared by the Contractor and distributed as per Distribution Schedule in Technical Specifications, applicable for Monthly reports. This report shall be submitted on every Monday. The following shall be clearly reflected in the report.

a) Anticipated delays in the schedule for the month and action plan to overcome them.

b) Details of accidents, whether major or minor.

c) Any deviation in regard to quality/process.

d) Any industrial relations problem.

3.22.4 Contractor shall submit a daily progress report to the Owner/Project Manager/Project Manager indicating the progress at various fronts, manpower, machinery and material availability, look ahead schedule, catch up plan etc.

3.23 Schedule

3.23.1 The Contractor shall provide to the Owner/Project Manager for approval within the time stated in clause 3.21.1 the programme for the execution of the contract, showing (a) the sequence and timing of activities by which the contractor proposes to carry out the work (b) the times by which the Contractor requires the Owner/Project Manager to furnish any Owner/Project Manager's inputs as set forth in the specifications(c) provide a consolidated and a comprehensive manpower & machinery deployment schedule and (d) activity network schedule as intimated in clause 3.21.1 indicating the monthly/quarterly planned deployment across the project life span.

It is the sole responsibility of the Contractor to submit the revised Schedule within 15 days of receiving comments from the Owner/Project Manager/Owner's Representative and to obtain the final approval from the Owner's Representative.

3.23.2 Without prejudice and in addition to the foregoing the Contractor shall prepare and furnish to Owner/Project Manager updated monthly schedules of the Work to be performed or Goods to be supplied, including a critical path schedule.

3.23.3 Contractor shall be responsible for ensuring and performing the Work and supplying the Goods in conformity with the Schedule as updated from time to time. The Schedule shall be updated on a fortnightly basis as the Work and supply of Goods progresses and shall include delay and acceleration analyses where appropriate together with steps being taken as per sub clause 9.5 of this section.

3.23.4 Contractor acknowledges and agrees that payments on account of Contract Price shall be subject to the limits of the Milestone Payment Schedule.

3.23.5 The Schedule that is updated on a Monthly basis shall be done from the basic schedules which together with the updated monthly Schedule shall be available in a computer system to which the Owner/Project Manager/Owner's Representative will have access to facilitate the Owner/Project Manager to drill down to the various levels to independently analyse the relevant information. This, however, does not take away the responsibility of the Contractor to fulfil all his obligations under the Contract, including informing the Owner/Project Manager/Owner's Representative about the delays as also the expected delays and the actual plans to overcome such delays.

3.24 Taxes, Duties and Levies <u>(As Applicable)</u>

Unless specifically mentioned in the Special Conditions of Contract, Contractor shall not assume any duty concessions / exemptions of any nature whatsoever and shall consider all Taxes, Duties and Levies at the full rate without any concessions while submitting the Price Bid and all Taxes, Duties and Levies shall be deemed to be included in the Contract Price at the applicable full rate without any exemption or concessions. Owner shall not be liable to provide any document for availing any exemption or concessions on Taxes, Duties and Levies.

In case the Project / Relevant Package is conceived under any special taxation scheme (e.g. Deemed Export Benefit (FTP) of Government of India / International Competitive Bidding Process / Mega Power Project etc., the same shall be specifically stated under Special Conditions of Contract. In such cases, the Contractor shall obtain/consider all the tax exemptions as applicable under Govt. of India / State Govt. (Project Authority /Essentiality Certificate) while submitting the Price Bid.

3.25 Taxes to the Contractor's Account

(i) Except as otherwise specifically provided in the Contract irrespective of the mode of Contracting, the Contractor shall bear and pay all taxes, duties, levies, charges, interest and penalties and the like levied and /or assessed on the Contractor, its Sub-contractors, or their employees, by all municipal, local bodies, state or national government authorities or any other Government Instrumentality in connection with the Work and Supply of Goods in and outside of the Country.

In case of all Offshore Supplies by the Contractor, all duties, taxes, levies, charges, interest and penalties and the like levied and / or assessed, etc. outside India are to be borne by the Contractor and are to be included in the fixed Contract Price and no variation shall be allowed on this account. The Contractor shall be responsible for timely and prompt filing of all returns, Documents, accounts etc which are complete and accurate in accordance with laws.

(ii) Each Party hereto, hereby agrees to indemnify and keep indemnified and saved harmless at all times the other Party against any loss, Cost, expenses or damages suffered or incurred by it, by reason of its failure to pay taxes, duties, etc which it is obliged to pay pursuant to the provisions of this clause and / or arising out of its failure to comply with its obligations under this clause.

(iii) The Owner/Project Manager shall recover from the Contractor and / or adjust from the Contract Price all taxes, duties, levies, charges, interest and penalties and the like leviable and / or assessable on the Contractor, its Sub-contractors or their employees but levied and / or assessed on the Owner/Project Manager as a representative assessee / agent of the Contractor, its Sub-contractors or their employees, by all municipal, local, state or national government authorities or any other Government Instrumentality in connection with the Work and supply of Goods in and outside of the Country.

(iv) Further the Owner/Project Manager shall recover from the Contractor and / or adjust from the Contract Price, simple interest at the Base Rate of State Bank of India from the date of payment of all taxes, duties, levies, charges, interest and penalties and the like leviable and / or assessable on the Contractor, its Sub-contractors or their employees but levied and / or assessable on the Owner/Project Manager as a representative assessee/ agent of the Contractor, its Sub-contractors or their employees, by all municipal, local, state or national government authorities or any other Government Instrumentality in connection with the Work and supply of Goods in and Outside of the Country where the Site is located till the date of recovery and / or adjustment by the Owner/Project Manager.

3.26 Variation in Tax or Applicable Taxes or Introduction of New Taxes

(i) Any statutory variation in rate of applicable Indian taxes, duties, levies etc. as set forth in “Schedule of Prices” or any variation in applicable taxes or interpretation/enforcement of the same or introduction of new taxes or the introduction/amendment of any exemptions (other than Direct taxes i.e. Income Tax, corporate tax etc), levied in India, starting from 7 (Seven) Days prior to the Closing Date for submission of Bid but within the Guaranteed Completion Date of Works, shall be to the account of the Owner/Project Manager. Such adjustment shall be limited to direct transactions between the Owner/Project Manager and the Contractor and no amounts shall be payable on account of variation on taxes, duties and levies between the Contractor and its sub vendors/Sub-contractors/suppliers.

(ii) Any statutory variation on account of aforementioned factors shall be reimbursed by Owner/Project Manager to Contractor or by the Contractor to the Owner/Project Manager, as the case may be, against submission of documentary evidence in support thereof. However, in case of delay, from the originally prepared network Schedule, Schedule and Guaranteed Completion Dates as may be relevant for the computation thereof, due to reasons not attributable to the Owner/Project Manager, any statutory variation adverse to the Owner/Project Manager over and above those specified under Clause 3.26. (i) and "Schedule of Prices" including Goods and Services Tax (GST) any such taxes, duties and levies during the delayed period shall be to the Contractor's account and the Owner/Project Manager shall not be liable for the same in any manner whatsoever.

(iii) The Contractor is obligated to keep the Owner/Project Manager/Owner's Representative notified of the aforesaid statutory variations within 15(fifteen) days of such variation coming into effect.

(iv) The Contract Price and other prices given in the "Schedule of Prices" are based on the applicable tariff as indicated by the Contractor in the Schedule of Prices. In case this information subsequently proves wrong, incorrect or misleading, the Owner/Project Manager shall have no liability to reimburse/pay to the Contractor the excess taxes, fees etc; if any finally levied/imposed under the statutes except as provided in this clause. However, if the taxes/fee levied/imposed are lower than the amount indicated in the Schedule of Prices, the Owner/Project Manager shall be entitled to recover the difference from the Contractor.

(v) Anti-Profiteering Clause: Notwithstanding anything contained in the Contract, in the event of introduction of any new legislation or any change or amendment or enforcement of any Act or Law, or any change in the interpretation by the Supreme Court of India of any said Act or law, rules or regulations of Government of India or State Government(s) or Public Body which becomes effective after the Bid Submission Due Date up to the FAC, if any, which results in any decrease in the cost of the Works / Relevant Package through reduced liability of taxes & duties, increase in the input tax credits, Contractor shall pass on the benefits of such reduced cost, taxes or duties to Owner, to the extent which is directly attributable to such introduction of new legislation or change or amendment as mentioned above as per Anti-profiteering Rules, 2017, hereby, "Tax" or "tax" shall include taxes, duties, levies, cess and similar imposts by whatever name called whether in the nature of indirect tax or direct taxes and whether or not imposed by the central government, state government, local or municipal authority or any other statutory body.

3.27 Supply under Guaranties/Warranties

3.27.1 Notwithstanding anything to the contrary contained in these General Conditions of Contract, any taxes, duties and levies including the stamp duty levied by the Government of India or any State Government in India or local authorities or any Government Instrumentality or outside India on the equipment and Materials to be provided by the contractor in pursuance of any Guarantees/Warranties under the Contract including any replacements and / or repairs to be carried out under such Guarantee / Warranty, which the Contractor is required to supply free of Cost to the Owner/Project Manager, shall be to the Contractor's account.

3.28 Custom Duty – Contractor's Equipment

All custom duties and other levies, if any payable in India including any state thereof or outside India, in respect of Contractor's equipment which may be imported by the Contractor for performing any portion of the scope of Work, to be done in India and which are not envisaged to become the property of the Owner/Project Manager as per the terms of the Contract, shall be to the Contractor's account and the Owner/Project Manager shall not be liable for the same in any manner whatsoever.

3.29 Foreign Trade Policy (FTP) - Deemed Export Benefits (Applicable only if specified in SCC)

(i) In accordance with the FTP of the Government of India, Deemed Export benefits are available to Indian Suppliers for supplies made to the Power Project in India under the International Competitive Bidding (ICB) procedure. The same shall be considered by the Contractor in his price Bid. Further in the course of performance of the Contract, if additional benefits are declared by the Government of India, the same shall be availed by the Contractor and the benefits shall be passed on to the Owner/Project Manager.

(ii) Contractor acknowledges that it has ascertained availability of Deemed Export Benefits as per the current FTP and acknowledges that it shall be solely responsible for obtaining such benefits and that the Owner/Project Manager shall not be liable to the Contractor for the failure of the Contractor to receive the same in any manner whatsoever.

(iii) The Contractor shall furnish to the Owner/Project Manager within 15 (fifteen) Days of the Effective Date, all information required for organising Project Authority/ Payment Certificate in terms of FTP. The Project Authority/Payment Certificate will be organised on this basis only and no subsequent change will be permitted. Owner/Project Manager shall not be liable to reimburse the Contractor any taxes, duties and levies in the event of the failure of the Contractor to provide the Owner/Project Manager the information pursuant to this clause. In addition, where the Owner/Project Manager organises such certificate, any additional taxes, duties and levies on such taxes, duties and levies will not be reimbursed by the Owner/Project Manager to the Contractor.

(iv) It is expressly understood and agreed that no deviation to the instructions given in this clause is permissible and in such an event Owner/Project Manager shall not be responsible or liable for any taxes, duties and levies.

(v) The Contractor shall disclose the import content in respect of supply of Goods for which Deemed Export Benefits shall be availed as part of the "Schedule of Prices".

(vi) The Owner/Project Manager shall not be responsible or liable in any manner whatsoever for payment to the Contractor of any taxes, duties and levies, if not applicable, on Goods procured from within India by the Contractor and the taxes, duties and levies shall not form part of the sale price with respect to transaction between the Contractor and the Owner/Project Manager and as such no taxes, duties and levies will also be payable on any component by the Owner/Project Manager.

(vii) Owner's/Project Manager's responsibility shall be limited to the organising of necessary Project Authority Certificate provided the Contractor has furnished to the Owner/Project Manager information to above and making of claims under duty drawback or refund of terminal taxes, duties or levies and obtaining the benefits thereof shall be the sole responsibility of the Contractor/Sub-contractor and the Owner/Project Manager shall not be liable in any manner whatsoever.

3.30 Tax-Forms

Unless specifically mentioned in SCC, Owner/Project Manager shall not be liable to issue any tax declaration forms to the Contractor in order to get any benefit or concession in the rate of taxes, duties and levies.

3.31 Taxable Services by non-resident Contractor / Sub-contractor:

3.31.1 In case any taxable service is provided by any Contractor who is a non-resident or who does not have an office in India, then notwithstanding the fact that Owner/Project Manager may be the Person liable to pay tax, the Contractor shall undertake to appoint a representative to whom monies would be remitted by the Contractor to effect payment of such tax or Owner/Project Manager shall recover such taxes, duties and levies as paid by Owner/Project Manager in relation to the taxable services provided by the Contractor.

3.31.2 On the basis of documentary proof of such payment of tax, the Owner/Project Manager would be entitled to declare the particulars thereof in his tax return.

3.31.3 Value of such Services as set forth in the “Schedule of Prices” shall be deemed to be inclusive of such taxes, duties and levies.

3.32 Withholding taxes

3.32.1 The Owner/Project Manager shall pay**,** out of the Contract Price**,** any withholding tax charged by any Government Instrumentality including the Government of India or any Indian State Government on the Contract or the performance of the Work or supply of Goods pursuant to or under the Contract. The Owner/Project Manager shall furnish to the Contractor appropriate documentation / certificates/ challans evidencing payment of any such withholding tax.

3.32.2 Should any tax benefit accrue to the Contractor in Country of the Contractor / or Owner/Project Manager by way of deduction as expenses or as tax credit or otherwise against its tax liability, or on account of any taxes paid in India by the Owner/Project Manager pursuant to the Contract or any Applicable Law on account of this Contract, the Contractor shall forthwith pay the same to the Owner/Project Manager. The Contractor agrees and undertakes to furnish to the Owner/Project Manager every year till the end of the period during which the Contractor is entitled to any tax benefit in India or elsewhere pursuant to this clause or completion of its tax assessment whichever, is later, a Certificate from its independent Auditors or an independent certified public accountant acceptable to the Owner/Project Manager, the quantum of such tax benefit, if any, and basis for arriving at such tax benefits.

3.33 Benefit of credit for tax

3.33.1 For tax, levy, duty concessions Owner/Project Manager will initiate necessary applications & the procedures and will expedite the documentation / certification required in time for availing the benefits. In case of unforeseen delays from the approving authorities, contractors shall manage the implications and will carry out necessary documentation / submissions to avail these benefits at a later date once the Owner/Project Manager is in receipt of the required certificate.

3.33.2 If, as a result of any agreement, whether existing or modified or signed in future on avoidance of double taxation between the Government of India and the Government of the Contractor's Country or under any law, any tax benefit shall accrue to the Contractor in Country of the Contractor or by way of deduction as expenses or as tax credit or refund or otherwise against its tax liability or on account of taxes, which are paid in India by the Owner/Project Manager pursuant to this Contract, the benefit of such credit, deduction as expense or refund along with details shall be passed on to the Owner/Project Manager within 15 (fifteen) days of the receipt of such credit / refund/deduction as expense or otherwise by the Contractor/expatriate. The Contractor/its expatriates shall take immediate and appropriate action for obtaining the admissible credit or refund from such Country's authorities and payment of the same to the Owner/Project Manager. The Contractor shall keep the Owner/Project Manager informed about the same at all times. The Contractor shall furnish on an annual basis, a certificate from an independent Chartered Accountant confirming:

a) The amount of credit or refund or deduction as expense or otherwise that may be due, if any, to it on account of tax paid by the Owner/Project Manager in India in respect of payments under the Contract to the Contractor; and

b) Amount of credit or refund that may be obtained or deduction as expense that may be permissible, if any, during the relevant period.

3.33.3 No such annual certificate is required with regard to expatriates' tax credit or refund. However, the Contractor will inform the Owner/Project Manager of all such credits or refunds obtained by its expatriates as aforesaid.

3.34 Employee Identification, Plant Site Security and Protection of Plant Site

3.34.1 Contractor shall provide a method which shall be subject to the reasonable approval of Owner/Project Manager, of checking the employees of Contractor, the Subcontractors, Owner/Project Manager and Owner's/Project Manager's other suppliers and Contractors in and out of the areas in which the Work is to be performed under the Contract.

3.34.2 Contractor's employees shall wear identification badges provided by the Owner's Representative while on Work at Site.

3.34.3 Contractor shall be responsible for the security of the Relevant Package and the Site at all times and the Goods therein while the Work is being performed or Goods are being supplied up to the earliest of:

a) Final Acceptance of Relevant Package

b) The transfer of care, custody and control of the Relevant Package as a whole to Owner /Project Manager with the concurrence of the Owner/Project Manager, or

c) Termination of the Contract;

3.34.4 Contractor shall do all things necessary or expedient to protect any and all parallel, converging and intersecting electric lines and poles, highways, access or other roads, bridges, waterways, railroads, sewer lines, natural gas pipelines, drainage ditches, culverts, fences, walls, and water lines, power or communication cables or lines and any and all physical property of others, from damage resulting directly or indirectly from performance of the Work or in supply and transport of Goods. Without limiting the generality of the foregoing, Contractor shall maintain the access roads to the Site and all access roads within the Site, in good repair and passable at all times as well as proper drainage system. In the event that any such physical property is damaged or destroyed in the course of the performance of the Work or in supply and transport of Goods, Contractor at his cost shall rebuild, restore or replace such damaged or destroyed physical property to full satisfaction of Owner/Project Manager.

3.34.5 Contractor shall provide, and shall ensure that its Sub-contractors provide, proper and ample protection from damage or loss to the Relevant Package, the Site, equipment and construction equipment during its performance of the Work.

3.34.6 In the event that any of the Relevant Package are damaged or destroyed for any reason prior to acceptance of such Relevant Package, Contractor shall rebuild, restore or replace the Relevant Package or such items, subject to and in accordance with the Contract. All costs irrespective of reimbursement of claims from Insurance shall be to Contractor's account.

3.35 Royalties and License Fees

3.35.1 Contractor shall pay all required royalties and license fees with respect to proprietary rights, intellectual property licenses and agreements, and shall procure, as required, the appropriate proprietary rights, intellectual property licenses and agreements, for Materials, methods, processes, systems and Services incorporated into the Relevant Package or the Project or otherwise relating to the performance of the Work and thereafter for the purpose of operation & maintenance of the Plant. Contractor should possess the valid license for their main equipment and plant for technology supply in India from their principals/ technology providers. Contractor shall also arrange backup guarantees from their principals/ technology providers as required by the Owner/Project Manager.

3.35.2 In performing the Work, Contractor shall not incorporate into the Relevant Package, or use in connection with the Relevant Package or the performance of the Work, any Materials, methods, processes, systems or service that involve the use of any confidential information, intellectual property or proprietary rights that Owner/Project Manager does not have the right to use or incorporate or which may result in claims or suits against Owner/Project Manager, Contractor or any subcontractor arising out of claims of infringement of any third party domestic or foreign patent rights, copyrights, other proprietary rights, or intellectual property rights, licenses or agreements, or applications for any thereof, or rights of use of confidential information.

3.36 Commencement of the Work or Supply of Goods

3.36.1 Subject to the provisions of this section, Contractor shall commence the Work or supply of Goods on the date as per sub-clause 9.2.

3.37 Releases and Waivers

3.37.1 At the time of each Scheduled Payment or portion thereof as per the payment terms of Contract subject to Milestone Payment Schedule under the Contract, the Contractor shall:

a) Certify and provide to Owner/Project Manager sufficient documentation (including, without limitation, an interim lien waiver and release) in the form prescribed by the Owner/Project Manager to establish that all Materials and equipment that comprise or will comprise as part of the Relevant Package, and all property of Owner/Project Manager, are free from any and all claims, liens, security interests or encumbrances in the nature of mechanics, labour or Material or otherwise, arising out of or in connection with performance by Contractor, or any Sub-contractor, of the Work or supply of Goods under or pursuant to the Contract, and

b) Provide, if requested by the Financing Parties prior to disbursement of funds required to make such Scheduled Payments, copies of such releases and waivers from Sub-contractors under Sub-contracts each of value more than the amount specified by the Owner/Project Manager as are necessary to support Contractor's certificate.

3.37.2 If any claim, lien, security interest or encumbrance is filed or notification of withholding money for labour or material furnished under the Contract is served on Owner/Project Manager or any Party providing Real Estate for the Project, Owner/Project Manager may withhold (without being liable to the Contractor in any manner whatsoever) from any Scheduled Payment or any other amount payable to Contractor under the Contract or otherwise, an amount sufficient to discharge any or all such liens or claims and, after 30 (thirty) Days from the time a lien is filed or otherwise attaches or after 180 (one hundred eighty) Days from the time a claim is made, may discharge such lien or claim with the moneys withheld, whereupon for purposes of the Contract such moneys shall be deemed to have been paid to Contractor under the Contract on account of the next Scheduled Payment to become due and payable.

3.37.3 In addition, Contractor shall deliver to Owner/Project Manager a copy of a final release, assignment and waiver of all liens, in the form prescribed by the Owner/Project Manager from each Sub-contractor that would otherwise have had the right to place a lien or encumbrance on any Materials and equipment that comprise or will comprise a part of the Relevant Package, or any property of Owner/Project Manager, on the payment date next following the date on which final payment to such Sub-contractor is made.

3.37.4 Furthermore prior to final acceptance / Take-over, Contractor shall provide to Owner/Project Manager final releases and waivers in the appropriate form acceptable to the Owner/Project Manager of all liens, charges and encumbrances of whatever nature, legal and equitable, against Owner/Project Manager, the Relevant Package, the Project, the Site and all other Project property and equipment arising out of or in connection with the Work performed or Goods supplied under the Contract.

3.37.5 Notwithstanding anything to the contrary contained herein above, if Contractor fails to deliver any required release or waiver whether of the Contractor or a Subcontractor, Contractor may provide to Owner/Project Manager, in lieu thereof, a bond or stand by letter of credit in form and content acceptable to Owner/Project Manager, to fully indemnify Owner/Project Manager against any loss resulting from claims, liens or other interests of the Contractor or such Sub-contractor, and Owner/Project Manager shall draw on such bond or stand by letter of credit as the case may be to satisfy the Contractor's or such Sub-contractor's claim, lien or other interest prior to exercising Owner's/Project Manager's set-off rights under the Contract.

3.38 Further Assurances

3.38.1 Contractor shall execute and deliver all further Documents and instruments, and provide such further assistance, including assistance to Owner/Project Manager in filing a notice of completion with the appropriate state and local and other Government Instrumentalities and recording offices, that may be necessary or desirable in the reasonable opinion of Owner/Project Manager to complete performance of the Work or supply of Goods or to effectuate the purposes or intent of the Contract.

3.38.2 Any item not specifically described in the contract shall be provided by the Contractor if the providing of such additional item is necessary in order for Contractor to satisfy Performance Guarantees and the Warranties and to make the plant complete in all respects and to make the Plant safely and reliably operable and capable of performing efficiently and smoothly as specified in the Contract. Work undertaken and additional items provided pursuant to this sub-clause shall not give rise to any adjustment in the Contract Price.

3.39 Standard for Supplies and Performance

3.39.1 Without limiting any other provision of Contract including Specifications, Contractor shall perform the Work and cause his Sub-contractors to manufacture and supply or perform their Work hereunder in accordance with Good Engineering Practices and standards of professional care, skill, diligence and competence generally accepted in the independent power industry applicable to engineering and construction and Project management practices for power stations of similar size and type as the Plant that are intended to have a 30 (thirty) year useful life when operated in accordance with the Operating Manuals, all Applicable Laws, all Applicable Permits, Prudent Utility Practices, all Manufacturer's and vendor's guarantees and Warranties, all applicable insurance policies, the safety precautions set forth in this section and the provisions of Contract including Specifications.

3.39.2 Contractor shall arrange and ensure that all design, engineering, fabrication, manufacture, construction, installation, commissioning, start-up and testing work requiring certification from any Government Instrumentality are properly certified.

3.40 Compliance with Applicable Laws

Contractor shall comply with and require the Sub-contractor to comply with and shall cause the Relevant Package and all components thereof (including the design, engineering, procurement, manufacture, fabrication, supply, erection, construction, commissioning, start-up, testing, operation, maintenance and repair of the Relevant Package) and the performance of the Work or supply of Goods, to comply, or be capable of complying, including after Final Acceptance, with all Applicable Laws and Applicable Permits as they may be in effect from time to time during Contractor's performance of Work under the Contract up to date of Final Acceptance, assuming Owner/Project Manager has met his obligations, and thereafter if and so long as Contractor shall have obligations under the Contract.

3.41 Fire Protection

3.41.1 The Work procedures that have to be used during the erection shall be those, which minimize fire hazards to the extent practicable. Combustion materials, combustible waste and rubbish shall be collected and removed from the Site at least once each Day. Fuels, oils and volatile of flammable Materials shall be stored away from the construction and equipment and material storage areas in safe containers. Untreated canvas, paper, plastic or other flammable flexible Materials shall not at all be used at Site for any other purpose unless otherwise specified. If any such Materials are received with the equipment at Site, the same shall be removed and replaced with acceptable material before moving into the construction or storage area.

3.41.2 Similarly, corrugated paper fabricated cartons, etc. will not be permitted in the construction area either for storage or for handling of Materials. All such Materials used shall be of waterproof and flame-resistant type.

All other Materials such as working Drawings, plans, etc. which are combustible but are essential for the Works to be executed shall be protected against combustion resulting from welding sparks, cutting flames and other similar fire sources.

3.41.3 All the Contractor's supervisory personnel and sufficient number of workers shall be trained for fire-fighting and shall be assigned specific fire protection duties. Enough of such trained personnel must be available at the Site during the entire period of the Contract.

3.41.4 The Contractor shall provide enough fire protection equipment of the types and in enough numbers for the ware-houses, office, temporary appropriate structures, labour colony area, etc. Access to such fire protection equipment, shall be easy and be kept open at all times.

3.41.5 Owner/Project Manager shall insure the works and keep them insured until the completion of the Contract against loss or damage by fire. Such policy shall cover the property of the Owner/Project Manager only and shall not cover any property of the Contractor or of any of his approved Sub-contractor or employees. The Contractor, in case of rebuilding or reinstatement after fire, shall be entitled to such extension of time for completion, as the Project Manager may deem fit.

3.41.6 In the event of occurrence of fire being attributable in the opinion of the Owner / Project Manager to the contractors' negligence no extension of time will be granted.

3.42 Contractor's Equipment and Owner's/Project Manager's rights thereof

3.42.1 All equipment provided by the contractor & his Sub-contractors shall be certified, tested & valid by the competent person. The Contractor shall provide all Contractors' equipment necessary to perform the Work and complete the Works. All Contractors' equipment shall, when brought on to the Site, be deemed to be exclusively intended for the execution of the Works and performance of Services. The Contractor shall not remove from the Site any such Contractor's Equipment without the consent of the Owner/Project Manager/Owner's Representative. The Contractor shall nevertheless be solely liable and responsible for any loss or destruction thereof and damage thereto. All equipments provided by the Contractor and his Sub-contractors shall be certified, tested and periodically made valid by the Contractor from the competent authority.

3.42.2 The Owner/Project Manager shall have lien on such goods for any sum or sums, which may at any time, be due or owing to him by the Contractor, under, in respect of or by reasons of the Contract. After giving a fifteen (15) Days' Notice in Writing of his intention to do so, the Owner / Project Manager shall be at liberty to sell and dispose of any such goods, in such manner as he shall think fit including public auction or private treaty and to apply the proceeds in or towards the satisfaction of such sum or sums due as aforesaid.

3.43 Access Route (to and within site)

3.43.1 The Contractor shall be deemed to have satisfied himself as to the suitability and availability of the access routes he chooses to use. The Contractor shall (as between the Parties) be responsible for the maintenance of access routes. The Contractor shall provide any signs or directions, which he may consider necessary for the guidance of his staff, labour and others. The Contractor shall obtain any permission that may be required from the relevant authorities for the use of such routes, signs and directions.

3.43.2 The Owner/Project Manager will not be responsible for any claims which may arise from the use or otherwise of any access route. The Owner/Project Manager does not guarantee the suitability or availability of any particular access route, and will not entertain any claim and shall not be liable for any non-suitability or non-availability for continuous use during construction of any such route.

3.44 Rights of Way and Facilities and Extraordinary Traffic

3.44.1 The Contractor shall bear all costs and charges for special or temporary rights-of-way required by him for access to the Site. The Contractor shall also provide, at his own cost, any additional facilities outside the Site required by him for the purposes of the Works or Services. Contractor shall carry out a detailed route survey for assessment of transportation of heavy and large equipment to Site.

3.44.2 The Contractor shall, whenever required by the Owner/Project Manager/Owner's Representative, provide in Writing, for information, a detailed description of the arrangements and methods, which the Contractor proposes to adopt for the supply of Goods, execution of the Works and performance of Services.

3.44.3 No significant alteration to the programme, or to such arrangements and methods, shall be made by the Contractor without informing the Owner/Project Manager/Owner's Representative. If the progress of the work does not conform to the programme, the Owner's Representative may instruct the Contractor to revise the programme, showing the modifications necessary to achieve completion within the time for completion. Providing such information to the Owner/Project Manager/Owner's Representative shall however not relieve the Contractor from any of its responsibilities.

3.45 Extraordinary traffic

The Contractor shall use all reasonable endeavours to prevent damage to any of the highways or bridges on the routes to the Site by any traffic of the Contractor or its Subcontractors. If and to the extent that such damage is caused to any highway or bridges by the Contractor or its Sub-contractors, the Contractor shall immediately take remedial measures to make good such damages/losses at its own expense.

3.46 Special Loads

3.46.1 Should the Contractor consider that the moving of one or more loads of Relevant Package or Contractor's Equipment is likely to damage any highway or bridge unless special protection or strengthening is carried out, then the Contractor shall before moving the load submit to the relevant competent authority its proposals as to moving the load, including details of the weight and other particulars of the load to be moved and execute its proposal for protecting or strengthening and shall obtain permission from such authorities for such movement.

3.46.2 **Extraordinary traffic Claims**

3.46.3 If the Owner/Project Manager shall receive claim in respect of damage or injury to highways or bridges arising out of supply of Goods or execution of the Work, it shall immediately report the claim to the Contractor. The Contractor shall then negotiate the settlement of and pay all sums due in respect of such claim and shall reimburse to the Owner / Project Manager all Costs, charges and expenses incurred by the Owner/Project Manager in relation thereto.

3.47 Non-interference with Local Traffic

The Contractor shall take all such measures as may be reasonably necessary to ensure that its arrangements and those of its Sub-contractors with respect to the transport of Goods, Material and labour to the Site do not interfere with local traffic in the vicinity of the Site and where such interference is unavoidable shall make such special arrangements as may be reasonably required to minimise the effect of such interference.

3.48 Waterborne Traffic

To the extent that the Contractor uses waterborne transport the foregoing provisions of this Clause shall be construed as though the word “highway” included a lock, dock, sea wall or other structure relating to a waterway.

3.49 Matters Affecting Execution of the Works or Supply of Goods

The Contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Contract Price. Unless otherwise expressly agreed or provided in the Contract, the Contract Price shall cover performance of all of the Contractor’s obligations, supply of Goods and Work under the Contract (including those under provisional sums, if any) and all things necessary or required for correct engineering the proper design, execution and completion of the Works in all respects and the remedying of defects and deficiencies, if any in accordance with Good Engineering Practices and Prudent Utility Practices.

3.50 Insurance

Contractor shall obtain and maintain all insurance required to be obtained by Contractor as per the Contract including clause no. 6.0 hereof. However, the Owner reserve the right to take insurance for the full value of the plant to be supplied erected and commissioned and the Contractor will be co-beneficiary. In the event of any damage etc. which may take place, the Contractor will make all necessary claims and the Owner will support him in documentation. Any difference between the claims settled and the actual value shall be borne by the Contractor. The Contractor will bear additional cost and ensure timely delivery in case of damages to maintain the agreed Project Schedule.

3.51 Schedule for supply of Goods / Work

3.51.1 **Milestones**

3.51.2 Time is of the essence and those obligations of Contractor referred to as "Milestones" herein shall be accomplished on or before the dates fixed therefor in the milestone / Schedule as proposed by the Contractor in “Overall Time Schedule” / Special Conditions of Contract and approved by Owner/Project Manager or in the event only a Month is specified therefor, on or before the last day of such Month. If any major milestone is not completed on or before the respective date or last Day of the respective Month indicated, as the case may be, then, and in addition to any other rights which Owner/Project Manager may have under this Contract, Owner/Project Manager shall be excused from making any further payments to Contractor of the Contract Price until such time as all milestones which have not been completed on the Date required have been properly completed. If Contractor believes that any milestone may not be or has not been completed by the date required it shall forthwith give Written Notice thereof to Owner/Project Manager specifying the reason therefor and what remedial action Contractor proposes to take.

3.51.3 The Contractor guarantees to the Owner/Project Manager that the Contractor shall supply Goods or perform the Work and complete the Work of the Relevant Package in a timely manner so as to achieve Provisional Performance Acceptance on or before Guaranteed Completion Dates under the Contract.

3.52 Priority of Supply of Goods / Work

The designation herein of certain obligations of Contractor as milestones shall not reduce or in any way or manner dilute the responsibility of Contractor to complete the Work in the shortest practicable time. To this end, Contractor shall give the supply of Goods / Work the highest priority; that is, no other job of Contractor shall take precedence over the Supply of Goods or Work nor shall Contractor make any allocation of its resources, which would have the effect of delaying the timely performance of the Work or supply of Goods.

Also the Contractor shall ensure that the supplies / services are sequenced to meet the milestone targets. Non-sequential deliveries unrelated to accomplishment of milestones shall not be permitted and not considered for payments. Any non-sequential delivery / works which results in re-work for any contractors at site shall be to the account of the Contractor and Owner / Project Manager shall recover the same from the amounts due from the Contractor

3.53 Maintenance of Schedule and Milestone Schedule

If Contractor is not performing the Work or supply of Goods at a rate which will maintain the Schedule or the Milestone Schedule, Contractor shall at its expense cause Contractor's personnel, to work such overtime and furnish such additional personnel and construction equipment and resources as may be required to comply with the Schedule or the Milestone Schedule (as the case may be).

3.54 Work and Safety Regulations

3.54.1 The Contractor shall ensure proper safety of all the workmen, Materials and equipments belonging to him or to Owner/Project Manager 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 Owner's Representative, as he may deem necessary. The Contractor shall be responsible for maintaining average severity index for its packages as specified by Owner/Project Manager time to time. The Contractor shall thoroughly assess the work scope, properly understand the hazards and risks associated with the job and carry out risk mitigation measures.

3.54.2 The Contractor shall notify well in advance to the Owner's Representative of his intention to bring to the Site Container filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals, which may involve hazards. The Owner's Representative shall have the right to prescribe the conditions, under which such container is to be stored, handled and used during the performance of the Work and the Contractor shall strictly adhere to and comply with such instructions. The Contractor shall carry out proper safety planning for the work scope involved, which includes but not limited to proper access, proper egress, lay down areas, storage areas, waste disposal, movement of manpower and equipment, inspection schedules of plant and machinery, rigging plans etc

3.54.3 The Owner's Representative 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 Owner/Project Manager and the Owner/Project Manager shall not entertain any claim of the Contractor towards additional safety provisions / conditions to be provided for / constructed as per Owner's Representative's Instructions.

3.54.4 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 as well as other relevant and Applicable Laws, rules and regulations. All such storage shall have prior approval of the Owner's Representative. In case, any approvals are necessary from the Chief Inspector (Explosives) or any statutory authorities, the Contractor shall be responsible for obtaining the same.

3.54.5 All equipment used in construction and erection by Contractor or his Sub contractors shall meet Indian and International Standards of safety 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 or his Sub contractors in accordance with Manufacturer's operation manual and safety instructions and as per Guidelines and Rules of the Owner/Project Manager in this regard.

3.54.6 Periodical Examinations and all Test for all lifting/hoisting equipment and tackles shall be carried out in accordance with the relevant provisions of Factories Act 1948, Indian Electricity Act 2003 and all relevant Law/Rules in force from time to time. A register of such examinations and Test shall be properly maintained by the Contractor and will be promptly produced as and when desired by Owner's Representative or by the Person authorised by him.

3.54.7 The Contractor shall be fully responsible for the safe storage of his and his Sub-contractor's radioactive sources in accordance with Bhabha Atomic Research Center/ Department of Atomic Energy 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 Contractor.

3.54.8 The Contractor shall provide suitable safety equipment of prescribed standard to all employees and workmen according to the need, as may be directed by Owner's Representative who will also have right to examine these safety equipment to determine their suitability, reliability, acceptability and adaptability. The Contractor shall submit work method statements, safe operating procedures and Hazard Identification Risk Assessment (HIRA) to Owner for review and approval. Contractor shall ensure that all of his workforce are provided with approved PPE.

3.54.9 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 Practices/Rules framed under relevant laws, rules and regulations not restricted to Indian Explosives Act pertaining to handling, storage and use of explosives.

3.54.10 The Contractor shall provide safe working conditions to all workmen and employees at the Site including safe means of access, railings, stairs, ladders, use of Harsco scaffoldings, etc. The scaffoldings shall be erected under the control and supervision of and experienced and competent Person. For erection, good and standard quality of material only shall be used by the Contractor. The Contractor shall provide orient / induction training to all his and his Sub-contractors work force before deploying them on the job. The contractor shall conduct weekly safety meetings, daily tool box meetings, monthly gate meetings as per the requirements of the Contractor Safety Terms & Conditions & Project Safety Plan. The Contractor shall ensure that all of his workforce working at heights are specifically trained and have been medically certified. The Contractor shall ensure that their workforce shall use proper scaffolds of approved quality and not using temporary work platforms.

3.54.11 The Contractor or his Sub-contractors shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to the Owner/Project Manager or Other Contractors under any circumstance, whatsoever, unless expressly permitted in Writing by the Owner/Project Manager to handle such fuses, wiring or electrical equipment.

3.54.12 Before the Contractor or his Sub contractors connects any electrical appliances to any plug or socket belonging to the other Contractor or Owner/Project Manager, he shall:

a) Satisfy the Owner's Representative that the appliance is in good working condition.

b) Inform the Owner's Representative of the maximum current rating, voltage and phases of the appliances;

c) Obtain permission of the Owner's Representative detailing the sockets to which the appliance may be connected.

3.54.13 The Owner's Representative will not grant permission to connect until he is satisfied that:

a) The appliance is in good condition and fitted with a suitable plug.

b) The appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores.

3.54.14 No electric cable used by the Other Contractor/Owner/Project Manager 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.

3.54.15 No repair work shall be carried out on any live equipment. The equipment shall/must be declared safe by Owner's Representative and a permit to Work shall be issued by Owner's Representative before any repair work is carried out by the Contractor or his Sub contractors. While working on electric lines/equipment whether live or dead, suitable type and sufficient quantity of tools will have to be provided by Contractor or his Subcontractors to electricians/workmen/officers.

3.54.16 The Contractor shall employ necessary number of qualified, full time Electricians/Electrical Supervisors to maintain his temporary electrical installations. The Contractor shall ensure deployment of skilled and competent personnel for welding, crane operations, equipment operators, riggers, electricians etc.

3.54.17 The Contractor employing more workmen than specified under Factories Act 1948 whether temporary, casual, probationer, regular or permanent or on Contract, shall employ at least required numbers of full time officers exclusively as Safety Officer to supervise the safety aspects of the equipment and workmen who will coordinate with the Project Safety Officer and Owner's Representative. In case of Work being carried out through Sub-contractors, the Sub-contractor's workmen/employees will also be considered as the Contractor's workmen/employees for above purpose.

3.54.18 The name and address of such Safety Officers of Contractor will be promptly informed in Writing to Owner's Representative 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.

3.54.19 In case any accident occurs during the construction/ erection or other associated activities undertaken by the Contractor thereby causing any minor, major or fatal injuries to his employees due to any reason, whatsoever, it shall be the responsibility of the Contractor to promptly inform the same to the Owner's Representative in prescribed form and also to all the authorities envisaged under the Applicable Laws.

3.54.20 The Owner's Representative shall have the right at his sole discretion to stop the Work or supply of Goods, if in his opinion the Work or supply of Goods 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 with the instructions of the Owner's Representative including removal of shortcomings promptly. The Contractor after stopping the specific Work or supply of Goods, can, if felt necessary, appeal against the order of stoppage of Work within 3 (three) Days of such stoppage of Work and Owner's/Project Manager's decision in this respect shall be conclusive and binding on the Contractor.

3.54.21 The Contractor shall not be entitled for any damages/compensation for stoppage of Work or supply of Goods due to safety reasons as provided in clause 3.54.20 above and the period of such stoppage of Work will not be taken as an extension of time for completion of Work or supply of Goods and will not be the ground for waiver of levy of Liquidated Damages,

3.54.22 The Contractor and his Sub-contractors shall follow and comply with all Safety Rules, relevant provisions of Applicable Laws pertaining to safety of workmen, employees, Relevant Package and equipment as may be prescribed from time to time without any demur, protest or contest or reservation.

3.54.23 Training of work force deployed by the Contractor / his Sub-contractors at TPSDI:

Tata Power has established state-of-the-art vocational / skills development training facilities at its major facilities like Trombay, Mundra, Maithon etc. under the entity The Tata Power Skill Development Institute (TPSDI) as a Corporate Social Responsibility endeavour to empower youth and others with employable skills, especially in the Power and allied sectors, and to address the skill gap challenge faced by the Indian Power Sector.

The TPSDI program is in congruity with the National Skill Quality Framework (NSQF). The TPSDI Competency Framework allows participants to swiftly pick up readily deployable skills and continue upgrading their skills after convenient intervals over a period of time.

In order to improve work safety and to ensure that all work force deployed at Owner premises have the right orientation / induction and skills training before they undertake any work, Owner has embarked upon the following road-map to be complied by all its Contractor / his Sub-contractors:

a) For the financial year 2018-19, it is mandated that minimum 50% of all work force employed by Contractor / his Sub-contractor are TPSDI qualified in work safety and their respective skills / crafts
b) Post 31st Mar 2019, all work force employed by Contractor / his Sub-contractor shall have to be TPSDI qualified in work safety and their respective skills / crafts

The Contractor shall accordingly plan and enrol his and Sub-contractors work force to the respective skills / crafts training offered by TPSDI at its own cost and without any recourse to the Project Contractual Time for Completion.

3.55 Safety Programme and Policy

3.55.1 All requirements in the Tata Power Contractor Safety Terms & Conditions enclosed with the tender document are mandatory and to be adhered by the contractor in totality. Contractor shall, and shall cause all Sub-contractors to, implement and administer a safety program for the Relevant Package, subject to the approval of the Owner/Project Manager (which shall not be unreasonably withheld), which shall include:

a) Development of a safety manual (the "Safety Manual") establishing safety guidelines and requirements for Contractor, Sub-contractor (including a fall prevention program). Copies of this manual shall be provided to Owner/Project Manager and Owner's Representative immediately upon its development as per Document Distribution Schedule in Technical Specifications and Contractor shall incorporate into such Safety Manual any and all reasonable comments of Owner/Project Manager;

b) Conducting of weekly safety meetings with the employees and agents of Owner/Project Manager, Contractor, Sub-contractor and Owner's Other Contractors and their Sub-contractors;

c) Development, implementation and enforcement of procedures for advising employees and agents of Owner/Project Manager, Contractor, Sub-contractor and Owner's Other Contractors and their Sub-contractors of, and correction of, safety violations and deficiencies;

d) Taking of all other actions necessary to provide a safe Work environment in accordance with Applicable Laws and Applicable Permits. Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to avoid damage, injury or loss to:

(i) All persons employed by the Owner/Project Manager, Contractor and its Sub-contractors and Owner's other Contractors and their Sub-contractors in connection with the Work or supply of Goods or Owner/Project Manager and its Contractors and Sub-contractors (whether in the performance of their obligations under the Contract or otherwise) and all other persons who may be affected by the performance of the Work or supply of Goods or any of such persons.

(ii) All supplies used in connection with the Relevant Package and all equipments to be incorporated into the Relevant Package, whether in storage on or off the Site under the care, custody or control of Owner/Project Manager, Contractor, any Sub-contractor or Owner's Other Contractors and their Sub-contractors.

e) At all times (including during Commissioning, start-up, testing and Initial Operation, and Tests before Take Over including Performance Tests) Contractor shall require all Sub-contractors working on or supplying equipments or construction equipment to the Site to comply with all safety requirements in effect at all such times and of all Applicable Laws and Applicable Permits. Contractor shall, and shall cause the Sub-contractors to, comply with all Applicable Laws and Applicable Permits.

Contractor shall comply with the Owner's/Project Manager's Contract Safety Manual document.

3.55.2 Contractor shall submit list of tools & tackles with details of make, year of manufacturing, valid certification to the Project Manager/ User for their approval

Project Manager may during the execution of project inspect & verify that the tools & tackles are as per the qualification requirements approved by him and will have right to seek replacements in case of any discrepancies. The Contractor shall always comply with such directives

3.55.3 The Contractor shall comply with the Owner's Contractor Safety Policy and Safety Terms and Conditions. Any misconduct and/or violations with respect to the Owner's Contractor Safety Policy and Safety Terms and Conditions. or any other legal and statutory provisions pertaining to Safety, Health and Environment shall be dealt with as per the Safety Terms and Conditions

3.55.4 The Contractor shall have a valid ISO 14001/ OHSAS certification. In absence of the same, the Contractor shall obtain the same within 6 months from the date of the Effective Date of the Contract

3.56 Additional Obligations of Supply Contractor

The Supply Contractor shall fulfil the following additional obligations:

3.56.1 **Country of Origin**

3.56.1.1 All Goods supplied under the Contract shall have their origin in the eligible countries and territories.

3.56.1.2 For purposes of this Clause, "origin" means the place where the Goods were mined, grown, produced or manufactured and from where services are supplied. Goods are produced when, through manufacturing, processing, or substantial and major assembly of components, a commercially recognised new product results that is substantially different in basic characteristics or in purpose or utility from its components.

3.56.1.3 The origin of Goods is distinct from the nationality of the Supply Contractor.

3.56.2 **Packing**

3.56.2.1 The Supply Contractor shall provide such packing of the Goods' as is required to prevent their damage or deterioration during transit to Site, as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the Goods' final destination and the absence of heavy handling facilities at all points in transit.

3.56.2.2 The packing, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the Contract, including additional requirements, if any, in any subsequent instructions ordered by the Owner/Project Manager

3.56.2.3 The Contractor wherever applicable shall, after proper painting, pack and create all equipment for sea shipment in a manner suitable for export to a tropical, humid climate region in accordance with internationally accepted export practices and in such manner so as to protect it from damage and deterioration in transit by road, rail and or sea and during storage at the Site till the time of erection. The Contractor shall be held responsible for all damages due to improper packing.

3.56.2.4 The ownership of the material used for packing of the Goods shall rest with the Owner and the Contractor shall handover the packing materials to the Owner at the designated place

3.56.3 **Spares**

(i) All the spares for the equipment under the Contract provided by the Supply Contractor will strictly conform to the Specifications and Documents and will be identical to the corresponding main equipment/components supplied under the Contract

(ii) All the mandatory spares (also referred as “essential spares” – both terms meaning the same and being used interchangeably) covered under the Contract shall be delivered by the target date for completion of delivery of the mandatory spares at Project Site as per agreed despatch schedule.

(iii) All erection and Commissioning spares shall be delivered at the Site at least one (1) Month prior to Schedule of erection of the Relevant Package or equipment.

(iv) The quality plan and the inspection requirement finalised for the main equipment will also be applicable to the corresponding spares.

(v) The Supply Contractor will provide the Owner/Project Manager with the manufacturing Drawings, catalogues, assembly Drawings and any other information Document required by the Owner/Project Manager so as to enable the Owner/Project Manager to identify the recommended spares and identify the quality thereof. Such details will be furnished to the Owner/Project Manager as soon as they are prepared but in any case not later than 6 (six) Months prior to commencement of manufacture of the corresponding main equipment and within 30 (thirty) Days from the date of request by the Owner/Project Manager. The Owner/Project Manager will have access to manufacturing drawings to determine the need and quality of spares.

(vi) The offer for recommended O&M spares shall be provided by the Contractor along with the Price Bid. For the effective performance Contractor shall indicate spares required for two (2) years O&M and indicate valid pricing with contract terms valid up to Latent Defect Liability period.

(vii) The delivery of recommended spares will be effected by the Supply Contractor in line with the Specifications, provided the order is placed by the Owner/Project Manager within such validity period of those spares.

(viii) The Supply Contractor will provide the Owner/Project Manager with all the addresses and particulars of his Sub-suppliers while placing the order on vendors for items/components/equipment covered under the Contract and will further ensure with his vendors that the Owner/Project Manager, if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.

(ix) **Warranty for Spares**

The Supply Contractor warrants:

a) That all spares supplied will be new and in accordance with the specification and will be free from defects in design, Material and workmanship for a period of 24 months from date of Take Over of the Relevant Package and shall further Guarantee as under:

b) In case of any failure in the original component/equipments due to faulty designs, Materials and workmanship, the corresponding spare parts if any, supplied will be replaced without any extra cost to the Owner/Project Manager unless a joint examination and analysis by the Owner/Project Manager and the Supply Contractor of such spare parts prove that the defect found in the original part that failed can safely be assured not to be present in spare parts.

c) In addition to the spares recommended by the Supply Contractor, if the Owner/Project Manager further identifies certain particular items of spares the Supply Contractor will submit the prices and delivery quotation for such spares within thirty (30) Days of receipt of such request with a validity period of 6 (Six) Months for consideration by the Owner/Project Manager and placement of order for additional spares if Owner/Project Manager so desires.

d) The long term availability of spares to the Owner/Project Manager for the full life of the equipment covered under the Contract and that before going out of production of spare parts of the equipment covered under the Contract, he and his Sub Contractors shall give the Owner/Project Manager at least 24 (Twenty Four) Months advance notice so that the latter may order his bulk requirements of spares, if he so desires. The same provision will also be applicable to Sub-contractors. Further, in case of discontinuance of manufacture of any spares by the Supply Contractor or his Sub-contractors, the Supply Contractor or his Sub-contractors, will provide the Owner/Project Manager, 2 (two) years in advance, with full manufacturing Drawings, material specifications and technical information required by the Owner/Project Manager for the purpose of manufacture of such items and also the right to manufacture such spares for his own requirements.

e) Further in case of discontinuance of supply of spares by the Supply Contractor or his Sub-contractors, the Supply Contractor will provide the Owner/Project Manager with full information for replacement of such spares with other equivalent makes, if so required by the Owner/Project Manager.

f) Notwithstanding the above, the Contractor shall be responsible for supply of spares for the lifetime of the Relevant Package at reasonable prices. The prices of all future requirements of spares shall be derived from the corresponding ex-works price at which the orders for such spares have been placed by Owner/Project Manager as a part of Mandatory, recommended spares. The base indices for calculating ex-works price shall be commissioning of last equipment under main contract.

(x) The Supply Contractor will indicate the delivery period of the spares, which the Owner/Project Manager may procure in accordance with this clause.

(xi) In case of emergency requirements of spares, the Contractor will make every effort to expedite the manufacture and delivery of such spares on the basis of mutually agreed time Schedule.

(xii) In case the Supply Contractor fails to supply the mandatory, recommended or long term spares on the terms stipulated above, the Owner/Project Manager shall be entitled to purchase the same from the alternate sources at the risk and the cost of the Supply Contractor and recover from the Supply Contractor, the excess amount paid by the Owner/Project Manager over the rates as per the Contract. In the event of such risk purchase by the Owner/Project Manager, the purchases will be as per the Works and procurement policy of the Owner/Project Manager prevalent at the time of such purchases and Owner/Project Manager at his option may include a representative from the Supply Contractor in finalising the purchases.

(xiii) It is expressly understood that the final settlement between the parties in terms of relevant clauses of the Tender Document shall not relieve the Supply Contractor of any of his obligations under the provision of long term availability of spares and such provisions shall continue to be enforced till the expiry of 30(thirty) years period reckoned from the scheduled date of completion of Trial Operation of the Relevant Package and equipment unless otherwise discharged expressly in writing by the Owner/Project Manager.

4.0 SUB-CONTRACTORS

4.1 Subcontractors and Suppliers

4.1.1 All vendors, suppliers, and Sub-contractors providing equipment, Materials, construction equipment, or Services to Contractor under a Subcontract purchase order or similar purchase form or arrangement with Contractor for the performance of the Work or supply of Goods under this Contract are herein referred as "Sub-contractors", and any such sub-contracts, purchase orders and similar purchase forms and arrangement entered into by or on behalf of Contractor with Sub-contractors are herein referred to as "Subcontracts" provided that none of Owner's Other Contractors or their subcontractors shall be deemed to be subcontractors under the Contract of the Contractor.

Technical & Safety evaluation of Contractor's Sub-contractors / Sub-contractors' suppliers shall be done jointly with the Owner/Project Manager. The Contractor shall be obligated to select Subcontractors it retains in connection with the performance by Contractor of the Work or supply of Goods from a subcontractors list, which would be finalised and approved by the Owner/Project Manager on or before issue of Notice to Proceed by the Owner/Project Manager to the Contractor. Owner/Project Manager and Contractor may by mutual agreement add to or delete from such list from time to time and approve any successor or replacement of any person listed on such list or any other vendor, supplier, material-man, Consultant or Subcontractor. Also prior approval of the Owner/Project Manager has to be taken before subcontracting major Work (in the Electrical, instrumentation & control and mechanical areas) with regard to construction, installation, erection and commissioning activities.

4.1.2 The Contractor shall be solely liable for the performance of the subcontract work by his Subcontractors, for any and all liabilities arising there from and shall hold the Owner/Project Manager indemnified and harmless there against. None of the subcontractors of the Contractor shall have any contractual relationship with the Owner/Project Manager, nor shall they be entitled to prefer any claims against the Owner/Project Manager. All the subcontracts of the Contractor shall be subject to assignment to the Owner/Project Manager upon his written request.

4.1.3 Contractor shall provide to Owner/Project Manager unpriced copy of all Sub Contracts and other such information concerning the Subcontractors as Owner/Project Manager may from time to time reasonably request and shall ensure that each Subcontract contains provisions in all material respects not less stringent than the provisions of the Contract and shall include terms and provisions required to be included pursuant to the Contract. In the event of termination of the Contract under clause no. 15.2 or clause no. 16.2, Contractor shall forthwith deliver to Owner/Project Manager a copy of each Subcontract.

4.1.4 Each Subcontract shall contain a price list (which shall be binding to the extent reasonably feasible for a period of three years from the date of Take-over) covering all recommended spare parts and replacement parts pertaining to the subject matter of such Subcontract. Each Subcontract shall contain a certification by the Subcontractor analogous to Contractor's specific indemnification and patent and copyright indemnification as per clause no. 17.2 and 17.3.

4.1.5 Contractor shall supervise and direct the Work of all Subcontractors and shall be responsible for all supply of Goods, design; engineering; procurement; manufacturing; transportation; delivery; fabrication; construction; erection; installation; commissioning; start-up, Initial Operation, Reliability Operation and Tests before Taking over including Performance Tests; maintenance, repair; methods; techniques; sequences and procedures of and for co-ordinating the work of Subcontractors.

4.1.6 If Contractor fails to correct, or commence to correct and execute the correction with due diligence of deficient or defective Work performed by any Subcontractor within 7 (seven) days, after receipt by Contractor of a notice from Owner/Project Manager with respect thereto, Owner/Project Manager may (but shall not be obligated to), after 7 (seven) days following receipt by Contractor of an additional notice, and without prejudice to any other right or remedy take all reasonable steps to remedy such defective or deficient Work at risk and Cost of Contractor.

4.1.7 Contractor shall require all Subcontractors to perform the Subcontracts in accordance with the relevant requirements of the Contract including Specification, all Applicable Laws, Applicable Permits, Prudent Utility Practice, Good Engineering Practices, and all Warranties of Vendors and Manufacturers and all insurance policies relating to the Relevant Package or the supply of Goods or the Work.

4.1.8 Contractor shall be solely responsible for paying each Subcontractor and any other Person to whom any amount is due from Contractor for Services, equipment, construction, equipment, Materials or supplies otherwise related to or in connection with the Relevant Package or the Work or supply of Goods. Contractor shall take all reasonable steps and actions to ensure that such Services, equipment, construction equipment, Materials and supplies and the like have been or will be received, inspected and approved and that such Services have been or will be properly performed.

4.1.9 In performing the duties incidental to its responsibilities hereunder, Contractor shall issue to the Subcontractors such directives and impose such restrictions as may be required to obtain such compliance herewith and with the terms of the subcontracts.

4.1.10 Owner/Project Manager has the right to examine, review progress and control the supply / value chain of the contractor. The Contractor will direct the supply / value chain constituents and provide required all necessary assistance to the Owner/Project Manager in exercising the above right.

4.2 Sub-contractors and Manufacturer Warranties

4.2.1 Contractor shall, for the protection of Owner/Project Manager, obtain from all Subcontractors, including all vendors, and Manufacturers of equipment, all the required Warranties on all Goods and other items used in connection with the performance of the Work or incorporated in or forming part of the Relevant Package (other than minor items) and workmanship of the plant and equipment supplied and executed and such Warranties shall not be amended, modified or otherwise discharged without the prior written consent of Owner/Project Manager. Warranties shall be in the joint names of Owner/Project Manager and Contractor. Such Warranties shall nevertheless and at all times meet the minimum requirements stipulated in the Contract. Also the liability on account of Latent Defects, which are applicable to the Contractor, shall be similarly applicable to all the Sub-contractors of Contractor.

4.2.2 Contractor shall obtain from each of approved Subcontractor and each Subcontractor that is a party to, a Subcontract pursuant to which engineered equipment is to be provided, Warranties, which cover a period of not less than 24 (twenty four) Months from the date of Take-over of the Relevant Package. Contractor shall obtain additional Warranties if required by the Contract including Technical Specifications.

4.2.3 Contractor shall obtain from each Subcontractor who is party to a Subcontract pursuant to which off-the shelf equipment is to be supplied or purchased (whether or not such equipment is engineered equipment), the best Guarantee or Warranty commercially available.

4.2.4 Owner/Project Manager shall be entitled to receive all benefits and proceeds (including damages and rebates) paid by or on behalf of any subcontractor pursuant to any Warranty. Neither Contractor nor its Subcontractors, nor any person under the control of either thereof, shall take any action which could release, void, impair or waive any Warranty on equipment**,** Materials, items, Goods or Services relating to the Relevant Package or the Work.

4.2.5 Nothing in this clause shall derogate from the obligations of Contractor to provide the Guarantees and Warranties described in, and to comply with the provisions of clause no. 11.0 and 12.0 of these General Conditions of Contract.

4.2.6 Contractor shall, on its part based on, professional judgement enforce all Warranties provided by the Subcontractors to the fullest extent thereof till such time they are transferred to the Owner/Project Manager pursuant to sub-clause 4.2.7 below.

4.2.7 Upon the expiration or termination of any of the Warranties provided by Contractor pursuant to the Contract or termination of the Contract for any reason whatsoever, the Contractor shall assign, and hereby assigns, effective as of such date, or otherwise make available, to Owner/Project Manager all of Contractor's rights under all such Subcontractor Warranties (except to the extent Contractor has therefore provided Warranty services to Owner/Project Manager and is enforcing Contractor's rights with respect to such Services under the applicable Subcontractor Warranty) and shall deliver to Owner/Project Manager copies of all Contracts providing for such Warranties.

4.2.8 Contractor, in accordance with the Contract, shall require all Subcontractors to be covered by the insurance specified in the Contract, during the time in which they are engaged in performing Services.

4.2.9 Contractor shall require all Subcontractors to release and waive any and all rights of recovery against Owner/Project Manager, the Financing Parties and each of their promoters (including the directors, officers and shareholders of each such promoter), affiliates, subsidiaries, employees, successors, permitted assigns, insurers and underwriters, and against Contractor and all other Subcontractors which the releasing Subcontractor may otherwise have or acquire, in or from or in any way connected with any loss covered by policies of insurance maintained or required to be maintained pursuant to this the Contract (other than third party liability insurance policies) or because of deductible clauses in or inadequacy of limits of any such policies of insurance. Contractor shall further require all Subcontractors to include in all policies of insurance maintained by the Subcontractors clauses providing that each underwriter shall release and waive all of its rights of recovery, under subrogation or otherwise, against Owner/Project Manager, the Financing Parties and each of their promoters, affiliates, subsidiaries, employees, successors, permitted assigns, insurers and underwriters, and against Contractor and all other Subcontractors. The identity of the insurers and the form of the policies shall be subject to the approval of the Owner/Project Manager, who shall not unreasonably withhold such approval.

4.2.10 Owner/Project Manager shall not be deemed by virtue of the Contract to have any contractual obligation to or relationship with any Subcontractor.

4.3 Review and Approval - Non-Release of Contractor's Liability

4.3.1 The review by and approval and consent of, Owner/Project Manager as to the approved Subcontractors list or as to Contractor entering into any subcontract with any approved Subcontractor or as to any Work done or supply made or Services provided by any such approved Subcontractor shall not relieve Contractor of any of his duties, liabilities or obligations under this Contract, and Contractor shall be liable hereunder to the same extent as if any such sub-contract had not been entered into. Any inspection review or approval by Owner/Project Manager of any Work or Goods or of any Work in progress by Contractor or Sub-contractors or participation by Owner/Project Manager in any Test conducted by or under the direction or supervision of the Contractor or any Sub-contractor shall not relieve Contractor of any of its Work, duties, liabilities or obligations under the Contract. Owner/Project Manager shall not be deemed by virtue of the Contract to have any contractual obligation or liability to, or relationship with, any Sub-contractor.

5.0 INSPECTION AND TESTING

5.1 Requirements

5.1.1 Contractor shall perform all inspection, expediting and quality surveillance as may be required for performance of the Services. Contractor's responsibilities under this sub-clause shall include, without limitation, inspecting all supplies, Materials and equipment that comprise or will comprise the Relevant Package or that are to be used in performance of the work.

5.1.2 The Contractor shall at its own expense carry out at the place of manufacture and/or on the site carry out all such tests &/or inspections of the plant & equipment and any part of the facilities as are specified in the contract. The Contractor shall carry out the inspection and quality control aspects as set out in Technical Specifications. In the event the Owner/Project Manager establishes that the Contractor is not carrying out all such inspection and quality control aspects, the Owner/Project Manager has the right to appoint at Contractor's cost third party inspection agencies (such as Lloyds Register of Shipping / Bureau Veritas / TUV).

5.1.3 The Contractor shall obtain from any relevant third party or manufacturer any necessary permission or consent to enable the Owner/Project Manager (or their designated representatives) to attend the test and/or inspection. Contractor / Contractor's third party inspection agency shall perform such detailed inspection of all work in progress at intervals appropriate to the stage of design, engineering, procurement, fabrication, construction, erection, testing, Commissioning, start-up or Tests before Provisional Acceptance as is necessary to ensure that such work is proceeding in accordance with the Contract, the Documents, Applicable Laws, Applicable Permits, Good Engineering Practices and Prudent Electricity Industry Practice and to protect Owner/Project Manager against defects and deficiencies in such work (including any which would diminish or void the ability of Owner/Project Manager or Contractor to realise upon any manufacturer's or supplier's warranty or under any applicable insurance coverage). On the basis of such inspections, Contractor shall keep Owner/Project Manager continuously informed of the progress and quality of all work, whether performed by Contractor or any Sub-contractor, and shall provide Owner/Project Manager with Written reports which shall contain notwithstanding anything to the contrary contained herein defects and deficiencies revealed through such inspections and of measures proposed by Contractor to remedy such defects and deficiencies. Owner/Project Manager or Owner's Representative shall have the option, at Owner's /Project Manager's expense, of being present at all such inspections, and the Contractor shall give notice of all such inspections agreed.

5.1.4 In the event that the progress and quality of the work is not proceeding in accordance with the Contract, Owner/Project Manager or Owner's Representative shall be entitled to make recommendations to Contractor or any Sub-contractor for the purpose of remedying such failure and any such defects and deficiencies or variances. Any inspection performed or not performed by Owner/Project Manager hereunder shall not be a waiver of any of Contractor's obligations under the Contract or be construed as an approval or acceptance of any of the work or Services hereunder or absolve the Contractor in any manner of its liabilities, responsibilities and obligations under the Contract.

5.1.5 The Contractor shall, where required give due notice to the Owner/Project Manager/Owner's Representative whenever such work is ready before covering up or putting out of view. The Owner's Representative shall then either carry out the inspection, examination, measurement or testing or notify the Contractor that it is considered unnecessary.

5.1.6 The Owner's Representative shall have the right to re-inspect any work though previously inspected and approved by him at the Site, before and after the same are erected. If by the above inspection the Owner's Representative rejects any work, the Contractor shall make good for such rejections either by replacement or modifications/ repairs as may be necessary to the satisfaction of the Owner's Representative.

5.1.7 The Owner/Project Manager and the Owner's Representative shall be entitled, during design, engineering, manufacture, fabrication and preparation at any places where work is being carried out, to inspect, examine and test the materials and workmanship, and to check the progress in the performance of the work at no extra cost to the Owner/Project Manager. The Contractor shall give all reasonable facilities and assistance, including access to Documents to carry out such inspection, examination, measurement and testing. All inspection and tests shall be in line with approved Inspection & Test Plans and Owner/Project Manager/Owner's Representative shall carry out necessary inspection as per the Contract. Should any inspected work or service fail to conform to the Contract, the Owner/Project Manager may reject such work or service and the Contractor shall either replace or make alterations necessary to meet Contract requirements free of cost to the Owner/Project Manager. The Owner/Project Manager's right to inspect, test, and where necessary, reject the work or service shall in no way be limited or waived by reason of any part of the work having previously been inspected, tested and passed by the Owner/Project Manager or Owner's Representative.

5.1.8 The Contractor shall agree, with the Owner/Project Manager/Owner's Representative about the time and place for the testing of any equipment / Materials and other parts of the work as specified in the Contract. The Contractor shall give 15 (fifteen) Days' notice for inspection of indigenous Materials and 30 (thirty) Days' Notice for Offshore Materials. The Owner/Project Manager/Owner's Representative shall give the Contractor not less than 24 (twenty-four) hours' notice of his intention to attend the Tests. The Contractor shall provide sufficient suitably qualified and experienced staff to carry out the Tests specified in the Contract. The Contractor shall present to the Owner/Project Manager/Owner's Representative the calibration certificates of all the testing and measuring instruments proposed to be used for carrying out the Tests. In case the Owner/Project Manager/Owner's Representative is not satisfied with the calibration certificates, the Contractor shall arrange to get the concerned instrument(s) recalibrated to the satisfaction of the Owner/Project Manager/Owner's Representative.

5.1.9 If the Owner's Representative does not attend at the time and place agreed, or if the Contractor and the Owner's Representative agree that the Owner's Representative shall not attend, the Contractor may proceed with the Tests, unless the Owner's Representative instructs the Contractor otherwise. Participation by Owner/Project Manager or Owner's Representative in or their absence from or failure to participate in any Tests (other than the Performance Tests) shall not relieve or absolve the Contractor from any Guarantee or Warranty or obligations of Services under or in pursuance of the Contract.

If any dispute or difference of opinion shall arise between the parties in connection with or arising out of the test and/or inspection of the Plant and Equipment or part of the Facilities that cannot be settled between the parties within a reasonable period of time, it may be referred to in accordance with Clause 22.2.3 for determination in accordance with GCC.

5.1.10 The Contractor shall promptly forward to the Owner/Project Manager/Owner's Representative duly certified reports of the Tests.

5.1.11 If the Owner/Project Manager/Owner's Representative requires such equipment, materials, design or workmanship to be re-tested, the Tests shall be repeated under the same terms and conditions. Contractor shall undertake an additional testing of any material, equipment or the work, if the Owner/Project Manager/Owner's Representative believes the results of earlier Tests are not accurate or do not establish the true condition to specification of equipment, material or work being tested. If such retesting demonstrate that the work, equipment or material being so tested conforms to the requirements of Contract, then Owner/Project Manager shall bear the cost of such additional Test and the cost of any required uncovering and covering the Goods or Services and shall grant the extension of time for completion, if necessary. If however such retesting confirms Owner/Project Manager/Project Manager's conclusion and cause the Owner/Project Manager to incur additional costs, such costs shall be recoverable from the Contractor by the Owner/Project Manager and may be deducted by the Owner/Project Manager from any monies due, or to become due, to the Contractor. Neither the failure by Owner/Project Manager/Owner's Representative to discover defects, nor any payment to Contractor in respect of the Tests, shall prejudice the rights of Owner/Project Manager thereafter to require and obtain from Contractor the performance of the Services in accordance with the Contract herewith. Owner/Project Manager/Project Manager shall not be deemed to have accepted any Services as a result of any additional testing.

5.2 Rejection

5.2.1 If, as a result of inspection, examination or testing, the Owner/Project Manager/Owner's Representative decides that any equipment, system, materials, design or workmanship has failed in such inspection, examination or tests or is defective or otherwise not in accordance with the Contract, the Owner's Representative may reject such equipment, system, materials, design or workmanship and shall notify the Contractor promptly, stating his reasons. The Contractor shall then promptly correct or replace, such item or portion so as to pass retesting and otherwise meet and conform to such requirements. Following any such rejection, all expenses reasonably incurred by the Owner/Project Manager in consequence of such re-testing or inspection shall be borne by the contractor. No changes to Project Schedule or increase in the contract price shall be granted with respect to such additional testing. Contractor shall solely bear any cost resulting there from.

6.0 INSURANCE

6.1 Offshore Supply Contractor: Insurance of Goods

Offshore Supply Contractor shall, at its sole cost, on behalf of and in the name of Owner/Project Manager, take Industrial All Risk (IAR) Insurance Policy cover for 110% (One hundred and ten percent) of the full replacement value (including all taxes, duties, levies and all other costs) against Marine and all other risks (including fire, terrorists act, water and mine, SRCC) from Free on Board at the port of despatch upto unloading at the port of destination in India in respect of all Offshore supplies.

6.2 Onshore Service Contractor: Insurance of Relevant Package

6.2.1 (i) The Onshore Service Contractor shall, at its sole cost on behalf of the Owner/Project Manager, take Insurance Policy:

a) In respect of all Material including Goods, equipment received at Site and to be handed over to the Contractor in his capacity as bailee of such Materials from the time of receipt at site until Take Over.

b) In respect of Work done by him and his Sub-contractors upto including, erection, testing commissioning till Take Over be liable for all risks relating to the aforesaid and shall at his own cost obtain Insurance to cover all such risks (including fire, terrorists act, war and mine, SRCC) for 110% (one hundred and ten percent) of the replacement value (including all taxes, duties, levies and all other costs) in respect of aforesaid Materials or Works in the joint names of himself and Owner/Project Manager.

(ii) The Onshore Service Contractor shall also arrange for Insurance against transit and all risks (including fire, terrorists act, war and mine, SRCC) in the name of Owner/Project Manager in respect of off-shore Materials including Goods and equipment from unloading at port of destination in India until delivery and receipt at site including off-site storage of the Materials on Owner/Project Manager's behalf for 110% (one hundred and ten percent) of the replacement value (including all taxes, duties, levies and all other costs).

(iii) The Onshore Service Contractor shall also arrange for Insurance against transit and all risks (including fire, terrorists act, war and mine, SRCC) in the name of Owner/Project Manager in respect of 110% (one hundred and ten percent) of the value of onshore supplies from Ex-works until delivery and receipt to site.

(iv) At least 3 (three) days before despatch of Onshore supplies, the Onshore supply contractor shall intimate the Onshore Service Contractor and Owner/Project Manager of the relevant details of the consignment to enable the Onshore Service Contractor to obtain necessary insurance cover. Any liability arising due to default in fulfilling this obligation by the Onshore Supply Contractor will be to the Onshore Supply Contractor's account.

(v) At least 7 (Seven) days before despatch of Offshore supplies, the Offshore supply contractor shall intimate the Onshore Service Contractor and Owner/Project Manager of the relevant details of the consignment to enable the Onshore Service Contractor to obtain necessary insurance cover. Any liability arising due to default in fulfilling this obligation by the Offshore Supply Contractor will be to the Offshore Supply Contractor's account.

6.2.2 **Rented Equipment**

All construction equipment shall be brought to and kept at the Site at the sole cost, risk and expense of Contractor, and Owner/Project Manager shall not be liable for any loss or damage thereto, except to the extent any such loss or damage is caused solely by the Owner/Project Manager. Contractor, at his sole discretion, may maintain adequate, appropriate and prudent insurance with respect to such construction equipment.

Any Insurance policy carried by the Contractor, any Sub-contractor or any third party on or in respect of any construction equipment shall provide for waiver of the underwriter's right to subrogation against Owner/Project Manager, the Financing parties, their assignees, subsidiaries, parent companies, affiliates, employees, insurers and underwriters. Contractor shall obtain adequate insurance to cover all construction equipment rented or leased from third parties.

6.2.3 **Statutory Insurance Benefits**

Contractor shall maintain with respect to the Work to be done under the Contract, in each applicable jurisdiction, all statutory insurance benefits and other insurance required by law.

6.2.4 **Third Party Insurance**

Contractor shall at its sole expense, in the joint names of Owner/Project Manager and Contractor prior to the commencement of any Work on the Site, pursuant to the Contract, obtain adequate insurance, against liability for damage or death of or personal injury occurring before Final Performance Acceptance to any Person (including any employee of the insured parties) or to any property (other than property forming part of the Relevant Package) due to or arising out of the performance or non-performance of the Work by Contractor or any Sub-contractors and other third party liabilities on account of obstruction, loss of amenity, trespass, nuisance or advertising pursuant to the Contract.

6.2.5 **Automobile Liability Insurance**

Contractor shall, at its sole expense and in the joint names of Owner/Project Manager and Contractor, shall maintain automobile liability insurance covering all owned, non-owned and hired automobiles, trucks and other vehicles used by Contractor or its Subcontractors in connection with the execution of the work at the Project Site.

6.2.6 **Insurance against Accident, etc. to Workmen and Other Insurances**

Contractor shall, at its sole expense, insure and shall maintain Insurance as required by Indian and all other Applicable Laws for all actions, suits, claims, demands, costs, charges and expenses arising in connection with the death of or injury to any person employed by Contractor or its Subcontractors for the purpose of the performance of the Work or supply of Goods.

In addition, Contractor shall obtain and maintain all other Insurances required to be obtained and maintained by it for fulfilling all his obligations under the Contract including Insurances against damages to designs and the like arising out of Services.

6.3 General Insurance Requirements

All insurance obtained by Contractor shall be maintained with an insurer approved by the Owner/Project Manager.

On or prior to the Commencement Date of Contract**,** Contractor shall furnish to the Financing Parties and Owner/Project Manager certificates of Insurance (or if one of the Financing parties, Owner/Project Manager or Owner's Representative so directs, copies of the actual insurance policies signed by an authorised Representative of the insurer) from each Insurance carrier showing that the above required Insurance is in force, the amount of the carrier's liability there under, and further providing that the Insurance will not be cancelled, changed or not renewed until the expiration of at least 90 (ninety) Days (to the extent obtainable under commercially reasonable terms) after written notice of such cancellation, change or non-renewal has been received by Owner/Project Manager and the Financing Parties and Contractor. All policies and certificates of Insurance affected in accordance with this clause shall be in form and content acceptable to Owner/Project Manager and Financing Parties.

6.3.1 **Remedy on Failure to Insure**

If Contractor shall fail to effect and keep in force the Insurance for which it is responsible under the Contract including clause no. 6.0 hereof, Owner/Project Manager may effect and keep in force any such Insurance, and pay such premiums as may be necessary for that purpose, and from time to time, after issuance of a reimbursement request therefor accompanied by relevant supporting documentation, deduct the amount so paid by Owner/Project Manager from any amounts due or which may become due to the Contractor under the Contract.

6.3.2 **Subcontractor's Insurance and Subcontractor's Waiver.**

a) Unless Contractor's insurance covers its Subcontractors, Contractor shall require all such Subcontractors providing equipment, construction equipment or Services to Contractor or the Project to obtain, maintain and keep in force during the time in which they are involved in the performance of the Work or supply of Goods hereunder**,** coverage's consistent with Contractor's insurance obligations hereunder.

b) Contractor shall require all Subcontractors to release and waive any and all rights of recovery against Owner/Project Manager, the Financing Parties, and each of their parent companies and affiliated companies and subsidiaries and their respective officers, directors, employees, successors, permitted assigns, insurers and underwriters, and against Contractor and all other Sub-contractors, which the releasing Subcontractor may otherwise have or acquire, in, from or in any way connected with any loss, injury or damage covered by policies of insurance maintained or required to be maintained pursuant to this Contract (other than third party liability Insurance policies) or because of deductible clauses in or inadequacy of limits of, any such policies of Insurance.

c) Contractor shall further require all Subcontractors to include in all policies of Insurance maintained by Subcontractors clauses providing that each underwriter shall release and waive all of its rights of recovery, under subrogation or otherwise, against Owner/Project Manager, the Financing Parties, and each of their parent companies, affiliated companies and subsidiaries and their respective officers, directors, employees, successors, permitted assigns, insurers and underwriters, and against Contractor and all other Subcontractors.

6.3.3 **Descriptions not Limitations**

The Insurance coverage referred to in this clause no. 6.0 shall be set forth in full in the respective policy forms, and the foregoing descriptions of such policies are not intended to be complete, nor to alter or amend any provision of the actual policies and in matters, if any, in which the said description may be conflicting with such instruments, the provisions of the policies of the Insurance mutually agreed by the Parties shall govern; provided, however, that neither the content of any Insurance policy or certificate nor Owner/Project Manager's approval thereof shall relieve the Contractor of any of its obligations under the Contract.

The Owner/Project Manager shall give to the Contractor all such reasonable assistance as may be required by the Contractor. With respect to insurance claims in which the Owner/Project Manager's interest is involved, the Contractor shall not give any release or make any compromise with the insurer without the prior written consent of the Owner/Project Manager.

6.3.4 Risk of Loss of Damage

a) Between the date hereof and the earlier of (i) the Final Performance Acceptance and (ii) the Date of Termination of this Agreement and provided the Owner/Project Manager has Taken Over the Relevant Package, Contractor shall bear the complete risk of loss, destruction or damage (including deterioration in quality) of or to the equipment or Relevant Package, and all equipment and components thereof (including all temporary equipment, Materials and other items and including equipment, construction equipment and other items that are purchased for permanent installation in or for use during construction of the Relevant Package or equipment regardless of whether Owner/Project Manager has title thereto or otherwise in connection with the performance of the Work or supply of Material), arising from any cause whatsoever; provided, however, that Contractor regardless of anything stated herein shall bear such risk of loss, destruction or damage with respect to the Relevant Package, any common component of the Relevant Package or the Relevant Package as a whole after such Take Over for any period during which such Relevant Package , any common component or the Relevant Package, as the case may be, control thereof of which is delivered to Contractor because of the testing, Commissioning or start-up of the Relevant Package, any common component or the Relevant Package as a whole.

b) At all times after the Take Over, the Owner/Project Manager shall bear the complete risk of loss, destruction or damage (including deterioration in quality) of or to the Relevant Package, and all components thereof, arising from any cause whatsoever save and except where covered by any Guarantee and Warranty and Latent Defects and clause (a) above.

c) In the event of loss, destruction or damage (including deterioration in quality) of or to the Relevant Package, or any component thereof (including all equipment, construction equipment and other items including temporary Materials and other items that are purchased for permanent installation in or for use during construction of the Relevant Package, regardless of whether Owner/Project Manager has title thereto or otherwise in connection with the performance of the Work), prior to such Take Over, Contractor will be obliged to repair or replace the Work or Material which has suffered loss, damage or destruction or which has deteriorated provided that any proceeds of Insurance required to be maintained pursuant to this clause 6.0 with respect to such loss, damage or destruction (other than third party liability Insurance), if received by the Owner/Project Manager, where relevant, are paid to or on behalf of Contractor.

d) Notwithstanding anything to the contrary contained in the Contract, the Costs and expenses towards any loss, destruction or damage of or to the Relevant Package or any equipment or component forming part thereof will be borne by Owner/Project Manager to the extent Owner/Project Manager bears the risk of loss pursuant to the preceding sub-clause (b) and such costs and expenses will be borne by Contractor to the extent that Contractor bears the risk of loss pursuant to the sub-clauses (a) and (c) above. Contractor shall bear the complete risk of loss, destruction or damage to the Relevant Package till the date of Take-Over and in respect of all equipments, Materials, and other items provided Ex-works at the relevant factory gate and in respect of all Work / Services as they are done, provided that any proceeds of Insurance required to be maintained pursuant to this clause no. 6.0 with respect to such loss, damage or destruction (other than third party liability insurance) if received by Owner/Project Manager, where relevant, are paid to or on behalf of Contractor.

6.3.5 **Waiver of Subrogation**

All insurance policies supplied or arranged on Owner/Project Manager's behalf by Contractor shall include a waiver of any right of subrogation of the insurers there under against Owner/Project Manager, the Financing Parties and their respective assigns, subsidiaries, affiliates, parent companies, employees, insurers and underwriters, and of any right of such insurers under such Contractor policies to any set-off or counterclaim or any other deduction, whether by attachment or otherwise, in respect of any liability of any such Person insured under any such policy.

6.3.6 **Contractor's Waiver**

Contractor further releases, assigns and waives any and all rights or recovery against Owner/Project Manager, the Financing Parties and their respective assigns, subsidiaries, affiliates, parent companies, employees, insurers and underwriters, and against Other Contractors of Owner/Project Manager and their subcontractors which Contractor may otherwise have or acquire in or from or in any way connected with any loss covered by the policies of Insurance maintained or required to be maintained by Contractor pursuant to this Contract (other than third party liability insurance policies) or because of deductible clauses in, or inadequacy of limits of, any such policies of Insurance.

6.3.7 **Additional Insured**

Except to the extent prohibited by law and except for Insurance coverage described in clause no. 6.2.2 above, all Insurance coverages referred to in this clause no. 6.0 shall name Owner/Project Manager, the Financing parties and their respective assignees, subsidiaries, affiliates and parent companies as additional named insured and sole loss payees, as their respective interests may appear.

6.3.8 **No Limitation of Liability**

The required coverage referred to and set forth in this clause no. 6.0 shall in no way affect or limit Contractor's liability with respect to performance of the Work or any obligation under the Contract.

Notwithstanding the extent of Insurance cover and the amount of claim available from the underwriters the Contractors shall be liable to make good the full replacement / rectification value of all equipment / Materials to ensure the availability as per Project requirements.

6.3.9 Contractor shall bear the risk of loss pursuant to clause 6.3.4 hereof. However all the Insurance policy mentioned in this clause shall be administered and managed by the Contractor and shall be effected from the Effective Date of Contract and thereafter shall operate from the time the relevant property leaves the premises of the manufacturers in the country of origin, and shall continue during the ordinary course of transit and during storage on or off the Plant Site, if any, erection and Commissioning until the date on which Owner/Project Manager takes over the care, custody and control of the Relevant Package, to the exclusion of Contractor.

The Owner/Project Manager retains the right to take any or all the above Insurance covers at his own cost. In case the Owner/Project Manager exercises his option of taking the above Insurance covers in his own name, the price quoted by the Bidder against such insurance covers included in "Schedule of Prices" shall be deducted from the Contract Price.

6.3.10 Irrespective of Insurance cover taken by Owner/Project Manager or Contractor, the Contractor shall be responsible for preference of all claims and make good for the Material loss or damage or loss by way of repairs and / or replacement of operation of Works damaged / lost. The transfer of title shall not in any way relieve the Contractor of above responsibilities during the period of Contract.

6.3.11 For supply of goods, erection, Commissioning, testing, Trial Operation and other allied Services during the Contract Period, if any derived liability occurs to Owner/Project Manager, all the Contractors shall make necessary arrangements for indemnifying such liability on joint and several basis without any limits. However, it may be advisable for the Contractors to take appropriate and suitable Insurance cover for such contingencies.

6.3.12 The amount of claim shall be paid to the Owner/Project Manager. The Owner/Project Manager at his discretion may authorise the underwriters to pay the same directly to the Contractors from time to time for settlement of claims related to repairs / replacement.

6.3.13 The Contractor shall include the names of Financing Parties as indicated and required by Owner/Project Manager in the respective Insurance coverage mentioned above.

7.0 TITLE

7.1 Notwithstanding anything to the contrary in the Contract, ownership of the Goods to be imported into the Country where the Site is located shall be transferred to the Owner/Project Manager and vest with the Owner/Project Manager upon loading onto the mode of transport at the port of shipment to be used to convey the Goods from the Country of origin on FOB basis to that country after necessary inspection and verification and quality clearances.

7.2 Ownership of the Goods procured in the country where the Site is located shall be transferred to the Owner/Project Manager when the Goods are despatched by the Supply Contractor thereof after the necessary inspection and verification and quality clearances subject to the following:

a) FOR despatch – On handing over the Goods to the carrier against a receipt and such receipt having been received by the Owner/Project Manager.

b) In case the Goods are procured by the Contractor from vendors, on receipt of duly endorsed documents of title to the Goods.

7.3 Ownership in respect of Goods supplied by the Contractor for incorporation in Permanent Works for execution of Civil Construction shall pass on to the Owner/Project Manager on the date of issue of completion certificate.

7.4 Title to services shall pass as the Services are performed.

7.5 Transfer of property in the Goods shall be without prejudice to any Warranty or liability of the Contractor as to the quality, suitability or performance of the Goods. This Transfer of Title shall not be construed to mean the acceptance of quality and adequacy and the consequent Take-over of Goods, equipment and Materials. The Contractor shall continue to bear the risk, be responsible for the Quality and performance of Goods, equipment, Materials and Services and for their compliance with Specifications until "Take Over" and the fulfilment of Guarantee provisions of this Contract.

8.0 FOSSILS

All fossils, coins, articles of value or antiquity, and structures and other remains or things of geological or archaeological interest discovered on the Site shall (as between the parties) be the property of the Owner/Project Manager. The Contractor shall take reasonable precautions to prevent his staff, labour or other persons from removing or damaging any such article or thing. The Contractor shall, immediately upon discovery of such article or thing, advise the Owner/Project Manager or Owner's Representative.

9.0 COMMENCEMENT, DELAYS AND SUSPENSION

9.1 Notice to Proceed

Contractor shall commence performance of Work or supply of Goods on the date which the Owner/Project Manager specifies (the "Commencement Date") in Notice to Proceed (the "Notice to Proceed") delivered for commencement of the Work or supply of Goods, which shall not be earlier than the date of issue of the Notice to Proceed. Unless specifically agreed otherwise in the Contract, the Effective Date of the Contract shall also be reckoned as the Commencement Date.

9.2 Commencement of the Work / supply of Goods

Contractor will commence the Work / supply of Goods as per the Effective Date / Commencement Date indicated in the Letter of Intent (LOI) and/or Contract.

9.3 Contractual Time for Completion

The Relevant Package shall be completed and shall have successfully passed the Tests before Take Over within the time for completion as set forth in the specification failing which the Contractor shall pay to the Owner/Project Manager for such delay in Relevant Package Completion (the "Delay Liquidated Damages"). Payment of any Delay Liquidated Damages shall not affect or prejudice in any way or manner Owner/Project Manager's right to terminate the Contract nor shall any termination of Contract prejudicially affect the Owner/Project Manager's right to recover any accrued Delay Liquidated Damages or release the Contractor from any obligation for payment thereof.

9.4 Extension of Time for Completion

9.4.1 The Contractor may apply for an extension of the time for completion if he is or will be delayed before the time for completion by any of the following causes:

a) A Change Order (unless an adjustment to the time for completion is agreed under clause no. 14 of these General Conditions of Contract);

b) A Force Majeure event (as defined in sub-clause 20.1 of these General Conditions of Contract)

c) A cause of delay giving an entitlement to extension of time under a sub-clause of this clause no. 9.4, unless the Contractor has not complied with such sub-clause; or

d) Any delay, impediment or prevention by the Owner/Project Manager or Owner/Project Manager's failure to fulfil any of its obligations set forth in the Contract.

9.4.2 As per the requirement of sub-clause 3.21.2 (or such other period as may be agreed by the Owner/Project Manager/Owner's Representative), the Contractor shall submit an application with full supporting details together with any other notice required by the Contract and relevant to such cause. Except that, if the Contractor cannot submit all relevant details within such period because the cause of delay continued for a period exceeding 5 (five) Days, the Contractor shall submit interim details at intervals of not more than 5(five) Days (from the first Day of such delay) and full and final supporting details in support of his application within 7 (seven) Days of the date of ceasure of such delay.

The Owner/Project Manager/Owner's Representative shall proceed to agree or determine either prospectively or retrospectively such extension of the time for completion as may be due. The Owner/Project Manager/Owner's Representative shall notify the Contractor accordingly. When determining each extension of time, the Owner/Project Manager/Owner's Representative shall review his previous determinations and may revise the total extension of time.

9.5 Rate of Progress

9.5.1 If, at any time, the Contractor's actual progress falls behind the Schedule in any manner or it becomes apparent that it will so fall behind, the Contractor shall submit to the Owner/Project Manager/Owner's Representative a revised programme taking into account the prevailing circumstances. The Contractor shall, at the same time, notify the Owner/Project Manager/Owner's Representative of the steps being taken to expedite progress, so as to achieve completion within the time for completion stipulated under the Contract, including in particular the Schedule and the Guaranteed Completion Dates. The Contractor may also be asked to modify the plan, as a result of the changed circumstances due to delay, in order to complete the Work in time.

9.5.2 If any steps taken by the Contractor in meeting his obligations under this sub clause no. 9.5 cause the Owner/Project Manager to incur any additional costs, such costs shall be recoverable from the Contractor by the Owner/Project Manager, and may be deducted by the Owner/Project Manager from any monies due, or that may become due, to the Contractor under the Contract or otherwise.

9.6 Suspension of Supply of Goods/ Work

9.6.1 The Owner/Project Manager may at any time instruct the Contractor to suspend progress of part or all of the Work or supply of Goods. During suspension, the Contractor shall protect, store and secure such part or all of the Work or Goods against any deterioration, loss or damage or other losses.

9.6.2 If the Contractor suffers delay and / or incurs Cost in following the Owner/Project Manager/Owner's Representative's instructions under clause no. 9.6 hereto and in resumption of the Work or supply of Goods, the Contractor shall give notice to the Owner's Representative, with a copy to the Owner/Project Manager. After receipt of such notice the Owner/Project Manager / Owner's Representative shall proceed to agree or determine:

a) Any extension of time to which the Contractor is entitled under the Contract including clause no. 9.4 of these General Conditions of Contract; and

b) The amount of such Cost, which shall be added to the Contract Price,

and shall notify the Contractor accordingly. Provided, however, notwithstanding anything to the contrary contained in these General Conditions of Contract, the Contractor shall not be entitled to such extension and payment of Cost if the suspension is due to a cause attributable to the Contractor.

9.6.3 The Contractor shall not be entitled to extension of time for, or payment of the costs incurred in, making good any deterioration, defect or loss caused by faulty design, workmanship or Materials, or by the Contractor's failure to take the measures specified in clause no. 9.6.1 of these General Conditions of Contract.

9.6.4 **Prolonged Suspension**

If suspension under clause no. 9.6.1 of these General Conditions of Contract, continues for more than 180 (one hundred and eighty) Days in case of a single event and 365 (three hundred and sixty five) Days in case of cumulative events, and the suspension is not due to a cause attributable to the Contractor, the Contractor may by notice to the Owner/Project Manager/Owner's Representative require permission within 30 (Thirty) Days to proceed. If permission is not granted within the said 30(thirty) Days period by the Owner/Project Manager/Project Manager, the Contractor may treat the suspension as an omission of the affected part of the Work under clause no. 14.0 of these General Conditions of Contract. If such suspension affects the whole of the Work, the Contractor may terminate his employment, under clause no. 16.2 of these General Conditions of Contract subject to clause no. 16.3.

9.6.5 **Resumption of Supply of Goods/ Work**

After receipt of permission or of an instruction to proceed, the Contractor shall, after notice to the Owner/Project Manager, and together with the Owner's Representative, examine the Works and the Relevant Package and Materials affected by the suspension. The Contractor shall make good any deterioration or defect in or loss of the Works or Relevant Package or Materials, which has occurred during the suspension. The Work or supply of Goods after resumption shall be started by the Contractor within 7 (seven) Days of receipt of permission or an instruction to proceed.

10.0 TESTS BEFORE TAKE OVER

The Tests before Provisional Acceptance shall be conducted at Site after the Relevant Package has attained stable operation at the end of Trial Operation as per Technical Specifications.

10.1 Performance Guarantee Tests

10.1.1 **Requirements**

Contractor shall undertake, perform and conduct in the presence of the Owner/Project Manager and Owner's Representative, all required Tests on the Relevant Package in accordance with the procedures and protocol set forth in the Contract, the Applicable Laws, the Applicable Permits at no additional cost or expense except as otherwise expressly provided in the Contract and in accordance with Performance Test codes as set forth in the Schedule of Performance Guarantee in Technical Specifications hereto to prove and establish the satisfactory achievement of Performance Guarantees as set forth in the Contract.

10.1.2 Contractor shall give at least 30 (thirty) Days' prior notice to the Owner/Project Manager of the anticipated Schedule for undertaking of the Performance Tests, of the Relevant Package so that they may designate and make available representatives to observe the preparations for and conduct thereof. Such Schedule for the Performance Tests shall be subject to approval of Owner/Project Manager/Owner's Representative.

10.1.3 Contractor shall not perform or undertake any Performance Test, on the Relevant Package if any of the following exists:

a) All conditions and requirements that must be fulfilled under the Contract hereunder prior to commencement of such Performance Test, have not been duly fulfilled or

b) Owner/Project Manager gives advance notice to Contractor that Work necessary for the safe performance of such Performance Test has not been performed or is incomplete or defective.

10.1.4 During Performance Tests equipment/systems shall be operated within the limits set by Operation & Maintenance Manual and the Contract and in accordance with the Prudent Electricity Industry Practices and Good Engineering Practices.

10.1.5 During the Performance Tests, the Contractor shall demonstrate that the Relevant Package / Unit meets under the design conditions stipulated in the Technical Specifications as set forth in the Contract.

10.1.6 If Relevant Package fails to meet the conditions for Provisional Acceptance and guarantees as set forth in the Clause 10.5 of these General Conditions of Contract, the Contractor shall at no extra cost to Owner/Project Manager rectify, or modify, the deficient Relevant Package / Unit or component thereof as appropriate that enables the conditions for Provisional Acceptance to be met.

10.1.7 If any Relevant Package fails to meet the Guarantees as set forth in the Specification during any such Performance Test, Owner/Project Manager's remedy for such failure shall include the right to require Contractor to redesign, repair or modify the deficient Relevant Package at no extra cost to Owner/Project Manager until the Relevant Package meets the Guarantees.

10.1.8 Owner/Project Manager shall have right to suspend or delay any Performance Test of the Relevant Package if it is anticipated that the electrical output demanded from the Facility by the Grid during any part of such Performance Test may be less than the Gross Electrical Output Guarantee under the PPA. For any such suspension or delay by Owner/Project Manager, the Contractor would be entitled to an extension of time as appropriate under the Contract.

10.2 Revenue During Tests

Any output of electricity during Tests and all proceeds from the sale thereof shall be the property of the Owner/Project Manager and Owner/Project Manager shall be entitled to receive and retain for its own use all revenues generated or earned during the Commissioning. Tests before Take Over and other Tests, whether or not Owner/Project Manager has assumed the occupancy or possession of the Relevant Package.

10.3 Performance Test Report

10.3.1 (i) On completion of Performance Test, Contractor shall deliver to Owner/Project Manager a report ("Performance Test Report") setting forth the results thereof calculated in accordance with agreed Performance Test code, procedures, criteria and formulae set forth in the Contract. The Owner/Project Manager/Owner's Representative shall inform Contractor after the receipt of the Report stating whether:

a) the Performance Test, were performed in accordance with the procedures and protocol set forth in this Contract

b) the Performance Guarantees, are satisfied; and

c) The Performance Test Report is correct and complete.

(ii) If the Performance Test Report is incorrect or incomplete Owner/Project Manager shall specify in what respects the Performance Test Report was insufficient, incomplete or incorrect and the Contractor shall promptly provide such additional information required by Owner/Project Manager. If in the opinion of Owner/Project Manager/Owner's Representative the additional information provided does not satisfactorily remedy the incompleteness or incorrectness, the Performance Test Report shall be withdrawn and the Contractor shall re-issue the Performance Test Report.

(iii) If in the opinion of Owner/Project Manager the Performance Test was not performed in accordance with the procedures and the protocols set forth in the Contract, the Owner/Project Manager shall specify in what respect the Performance Test was not carried out properly and the Contractor shall carryout the re-test.

(iv) If the Performance Guarantees are not satisfied, the Owner/Project Manager shall inform the Contractor that the Performance Guarantee Test is unsuccessful with reasons.

10.3.2 If the Relevant Package / Unit does not achieve the Performance Guarantees, the Contractor shall submit a remedial plan setting forth Contractor's proposed rectification plan and schedule for satisfaction of Performance Guarantees within fifteen (15) Days from the date of the unsuccessful Tests. On completion of rectification, retesting pursuant to the Contract including this clause no. 10.3 of these General Conditions of Contract shall be carried out by Contractor at its cost. Any retesting pursuant to this clause no. 10.3 shall not occur without at least 15 (fifteen) Days' written notice to Owner/Project Manager/Owner's Representative.

10.3.3 In case the result of Performance Tests, after all the remedial measures and modifications have been carried out by Contractor, are not meeting the minimum guaranteed performance levels set forth in sub-clause 10.5.1(b) of General Conditions of Contract or exceeds the combined (total) Liquidated Damages payable for deficiency in Performance guarantees as per Sub-clause 19.2.1 (ii) (the "Minimum Guaranteed Performance") Contractor shall at his risk and Cost take all remedial and rectification measures to bring the Relevant Package performance to such Minimum Guaranteed Performance level failing which the Owner shall have the right in its sole discretion to reject the Relevant Package / Unit or to first attempt to rectify the Relevant Package at the risk and cost of the Contractor so as to get the Minimum Guaranteed Performance and on determining that such attempt is unsuccessful to reject the Relevant Package. Upon rejection of the Relevant Package / Unit on account of the failure to meet the Minimum Guaranteed Performance, the Contractor shall notwithstanding anything to the contrary in the Contract, at its Cost and expense forthwith replace or remedy the Relevant Package so that it attains at least the Minimum Guaranteed Performance or at Owner's option shall pay to Owner all money paid by the Owner with interest and other Costs and also dismantle and dispose the rejected Relevant Package / Unit and clear the Site at his Cost and if he fails in this, the Owner will dismantle and dispose the rejected Relevant Package and clear the Site at Contractor's Cost and risk and recover all money paid(with interest) to the Contractor and expenses incurred in dismantling, disposing off the Relevant Package and clearing the Site from the Contractor.

10.4 Correction of Performance Defects

At any time during and promptly after completion (whether or not successful) of the Performance Tests (or any rerun of such Tests, whether pursuant to this clause or otherwise), Contractor shall advise Owner/Project Manager/Owner's Representative in writing of any defects in the Relevant Package thereof that were discovered or that occurred during such Tests. Contractor shall promptly commence and complete corrective measures to remedy such defects including redesigning, reengineering, repairing or replacing any defective Materials at Contractor's sole cost and expense.

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

10.5 Provisional Performance Acceptance

10.5.1 Provisional Performance Acceptance shall occur with respect to the Relevant Package / Unit if and only if:

a) Trial Operation is successfully completed and successful completion of performance test,

b) A Performance Test Report prepared after Performance Test before Take Over and accepted by Owner/Project Manager in accordance with the Contract and including clause no. 10.3 of these General Conditions of Contract.

c) The Relevant Package / Unit is in accordance with all Applicable Laws and all government approvals, Prudent Utility Practices and Good Engineering Practices.

d) Owner/Project Manager/Owner's Representative determine that the Relevant Package is complete and can be legally, safely and reliably placed in commercial operation with a normal compliment of spares and personnel,

e) All Permits required to operate and maintain the Relevant Package / Unit , which are to be obtained by Contractor, have been obtained,

f) Owner/Project Manager has received from Contractor:

(i) All Documents required under the Contract for Owner/Project Manager to start-up, operate and maintain the Relevant Package / Unit,

(ii) All essential and ordered recommended spare parts necessary to operate the Relevant Package / Unit in a safe, efficient and effective manner; and

(iii) All special tools and other maintenance tools and tackles as per Contract;

g) Contractor has completed the training program for Operation and Maintenance ("O&M") personnel as required by clause no. 3.17 of these General Conditions of Contract; and

h) Contractor has delivered to Owner/Project Manager a completion certificate certifying each of the foregoing and Owner/Project Manager has accepted the same.

10.5.2 The Owner/Project Manager shall issue a Take Over Certificate (TOC) to the Contractor certifying the date of achievement of the last of the condition under clause No. 10.5.1 above upon which the Provisional Acceptance has occurred subject to Takeover of the Relevant Package has taken place. Any Liquidated Damages for delay accruing pursuant to the Contract for failure of the Relevant Package to achieve Provisional Acceptance by its Guaranteed Completion Date shall stop accruing as of the date specified in the TOC.

10.5.3 On issuance of TOC for a Relevant Package, Contractor shall handover to Owner/Project Manager, and the Owner/Project Manager shall takeover such Relevant Package operating in its normal, steady-state, automatic operating mode at the level of the Performance Guarantees achieved at the most recent Performance Test. Forthwith upon such takeover, Owner/Project Manager shall be responsible, for the care, custody and operational control of the Relevant Package. The Contractor's obligations towards Warranty and Latent Defects shall commence from the date of TOC of Relevant Package.

10.6 Final Performance Acceptance

10.6.1 Final Performance Acceptance of the Relevant Package / Unit shall occur if and only if

(i) Performance Guarantee Test has been concluded including any retest in which the Relevant Package demonstrates achievement of all the Performance Guarantees set forth in Technical Specifications hereto or the Contractor has opted to pay the Liquidated Damages for the shortfall in performance;

(ii) Contractor has completed all the Work including completion of the Punch List items in accordance with the Contract, (including the obligations during the Warranty period)

(iii) Provisional Performance Acceptance of the Relevant Package has occurred or occurs concurrently with Final Performance Acceptance;

(iv) Final Documents for start-up, operation and maintenance including 'As built' drawings are provided by the Contractor to the Owner/Project Manager as per the contract and

(v) Contractor has delivered to the Owner/Project Manager a completion certificate certifying each of the foregoing and Owner/Project Manager has accepted the same.

10.6.2 Upon Owner/Project Manager's reasonable determination that conditions for Final Acceptance set forth in sub-clause 10.6.1 are satisfied, Owner/Project Manager shall provide Written Notice to Contractor certifying the date upon which Final Performance Acceptance occurred.

10.6.3 At Final Performance Acceptance, Contractor shall leave the Relevant Package operating in its automatic normal operating mode at the level of the Performance Guarantees achieved at the most recent Performance Test.

10.7 Final Acceptance Certificate

In order to achieve Owner/Project Manager's final acceptance, Contractor must certify to the satisfaction of Owner/Project Manager/Owner's Representative that:

a) All the Contractor's and Sub-contractor's personnel, supplies, unused Materials, waste, rubbish and temporary facilities located at or near such Relevant Package have been removed,

b) Final Performance Acceptance has occurred for the Relevant Package and all other provisions of and all items required by this Contract have been performed or delivered, as the case maybe, in accordance with this Contract and in a manner satisfactory to Owner/Project Manager.

c) All Sub-contractors have been paid the dues by the Contractor and no due certificates received from such Sub-contractor.

d) All statutory or legal liabilities on account of the work performed under the contract have been duly calculated and paid by the Contractor.

Upon certification by Contractor of satisfactory completion of sub-clauses 10.7 (a) through 10.7(d), Owner/Project Manager shall issue a Final Acceptance Certificate certifying such matters within 120 (one hundred and twenty) Days.

10.8 Use of the Relevant Package / Unit Prior to Owner/Project Manager's Acceptance

Owner/Project Manager reserves the right to take possession of the Relevant Package / Unit and use it for any intended purpose, any portion or all of any handed over but as yet unaccepted Relevant Package / Unit. The taking of possession at any time or use of any of such portion of Relevant Package shall not be deemed to be an acknowledgement of Owner/Project Manager acceptance of Relevant Package / Unit and shall not relieve Contractor from his obligations under the Contract in this respect, until Owner/Project Manager's acceptance of the Relevant Package / Unit, has occurred. Owner/Project Manager shall provide Contractor with reasonable and timely access to complete its obligations hereunder.

11.0 LIQUIDATED DAMAGES

11.1 Liquidated Damages for Delay

11.1.1 If Provisional Performance Acceptance does not occur on or before the Guaranteed Completion Date of Relevant Package, Contractor shall pay Liquidated Damages to Owner/Project Manager for such delay for each and every week or part thereof which elapses after the Guaranteed Completion Date for the Relevant Package until the earlier of (i) Provisional Performance Acceptance, or (ii) Final Performance Acceptance in case Provisional Performance Acceptance occurs concurrently with Final Performance Acceptance or (iii) the Day on which Contractor has paid to the Owner/Project Manager the maximum amount of Liquidated Damages for delay pursuant to the Contract.

11.1.2 The Liquidated Damages payable by Contractor to the Owner/Project Manager is 0.5% of the Contract Price for every week or part thereof of delay of not achieving the intermediate milestones (to be arrived at during contract finalization), subject to a maximum of 5% of Contract Price per milestone (the "Liquidated Damages for Delay") and 1% of the Contract Price for every week or part thereof of delay of not achieving the final milestones subject to a maximum of 10 % of the Contract Price for the overall schedule.

11.1.3 Notwithstanding the foregoing, no Liquidated Damages for Delay shall be payable for period of delay in achieving Provisional Performance Acceptance beyond Guaranteed Completion Date of the Relevant Package to the extent such delay is solely on account of Force Majeure Event and Contractor has been granted an extension of time pursuant to clause no. 20.0 hereof.

11.1.4 If at any time, the Contractor is falling behind the schedule for intermediate milestone/s, he shall take necessary action to make good for such delays as per various provisions in the Contract to ensure overall project schedule and achieve the final milestone/s. In case the Contractor is able to achieve the final milestone/s by the Guaranteed Completion Date/s, the Liquidated Damages deducted for the delays in intermediate milestone/s shall thereon be refunded to the Contractor along with the final payment.

11.1.5 The Contractor shall pay to the Owner/Project Manager the Liquidated Damages for Delay calculated by Owner/Project Manager pursuant to the contract failing which same shall be adjusted from any sum due or payable by Owner/Project Manager to Contractor or recovered from performance and other securities provided by the Contractor.

11.2 The Liquidated Damages for Failure to meet Performance Guarantees

11.2.1 The Performance Liquidated Damages payable by the Contractor to the Owner/Project Manager which will be calculated as set forth in the Contract / Technical Specifications.
For the shortfall in any operational performance of the Relevant Package / Unit in case it is found applicable, liquidated damages for the short fall in performance shall be levied on the Contractor to a maximum of 15 % of the Contract Price.

Overall cap for the Liquidated Damages

The Overall cap on liquidated damages (for delay & performance) shall be to a maximum of 20 % of the Contract Price

11.3 Liquidated Damages Being Reasonable

The Parties acknowledge that

a) Damages for Contractor's failure to meet any Guaranteed Completion Date and/or Contractor's failure to achieve the Performance Guarantee, are difficult to determine and that the Liquidated Damages set forth in the Contract including clause no. 11.0 of these General Conditions of Contract are pre-determined, pre-agreed and appropriate measures of the damages for such delays or such shortfalls in performance and are neither penalty nor consequential damages sustained by Owner/Project Manager as a result of such delays and / or shortfalls. Payment of all Liquidated Damages pursuant to this clause no. 11.0 shall be subject to the limitation on liability in respect thereof set forth in clause no. 19.2 of these General Conditions of Contract.

b) Contractor waives any defence to non-performance of its obligation to pay Liquidated Damages pursuant to the Contract including this clause no. 11.0 on the ground of alleged invalidity or unenforceability of provisions relating to payment of Liquidated Damages based on any theory or law or otherwise.

c) The amount of Liquidated Damages specified herein represent the projected commercial losses of the Owner/Project Manager, are fair and reasonable, are not penalties and reflect the Parties' assessment and estimate of such financial losses and damages of the Owner/Project Manager.

11.4 In view of the foregoing, the Contractor accepts and agrees to such Liquidated Damages as liquidated damages and shall not dispute such Liquidated Damages in any proceedings under the Contract.

12.0 WARRANTIES

12.1 Contractor Warranties

Contractor warrants to Owner/Project Manager with respect to the Performance of Work or supply of Goods that (i) all equipment and materials comprising the Relevant Package / Unit will be new and free from defective workmanship and (ii) the design and engineering of the Relevant Package shall be free from deficiencies. If Owner/Project Manager notifies Contractor in Writing with adequate detail of any defects with respect to (i) above or deficiencies with respect to (ii) above discovered during the applicable Warranty Period therefor, Contractor shall (a) re-perform any of the work hereunder to correct any errors, omissions, defects or deficiencies in the Relevant Package, and (b) in the case of any defective equipment or materials, at Contractor's option either repair or replace at its Cost.

Contractor warrants to Owner/Project Manager that:

a) Adherence to the Operations Manual shall allow operation and maintenance of the Relevant Package /Unit in accordance with manufacturer's guidelines with performance at a level at least as favourable to Owner/Project Manager as the Performance Guarantees and such operation will not impair any Warranty in respect of Work including equipment and materials;

b) The Relevant Package / Unit supplied will incorporate all such modifications and improvements as their respective Manufacturer(s) may have decided to incorporate in similar generating Unit as of the date of Taking-Over and the end of the Warranty Period, provided that the incorporation of such modifications and improvements may take place at such time during the Warranty Period as the parties may agree;

c) He shall inform the Owner/Project Manager in Writing of the substantive information contained in all reports prepared by or credible reports received by it (Or its affiliates) or occurrences known to it (or its affiliates) prior to Bid submission and prior to the date hereof and during the Contract Period including the Latent Defects Period on operating failure or other design, operating or maintenance problem or condition with equipment using technology of the type supplied for the Main Equipment which defect, failure or condition, has had or could be expected to have adverse impact on the availability or performance of such equipment being shut down or ceasing operation for a period of at least 48 (forty eight) hours. Contractor covenants to furnish the Owner/Project Manager promptly all such further reports and information regarding occurrences of such defects, failures, problems or condition.

d) All information, averments and data submitted, starting from the Bid and upto end of Contract Period, to the Owner/Project Manager is correct and true. If at any later date, any of the aforesaid information, averment and data submitted is found to be false or incorrect, in part or in whole, the Contractor would be treated as a Contractor in Default as per Clause 15.2, and all consequences shall apply accordingly. The Owner/Project Manager would also be entitled to recover any cost or damages from Contractor including through encashment/forfeiture of Contract Performance Bank Guarantee and deductions from amounts payable to the Contractor.

12.2 Warranty Period

12.2.1 The Warranty Period for the Relevant Package shall be twenty-four (24) Months from date of Provisional Acceptance of the Relevant Package.

Any parts or components of the Goods or Services forming the Relevant Package having defects which is warranted and corrected by Contractor either by way of repair or replacement shall be further warranted by Contractor for a period of twenty-four (24) Months from the date such correction is effected and accepted by Owner/Project Manager/Owner's Representative.

Notwithstanding the above, in no event shall the warranty on any part or component exceed forty eight (48) Months from the date of Provisional Acceptance (the "Sun-set Date").

Notwithstanding the Sun-set Date, where a recurring defect of any particular part or component results in the failure of such part or component more than twice within the appropriate Sun-set Date, such part or component shall be replaced or repaired by the Contractor until such time that such part or component has operated without failure for a period of twenty four (24) months from the date of installation of such replaced / repaired part.

The above Warranties are however subject to the provision that should any scheduled inspection of a particular item of the Relevant Package falls due within the above Warranty Period and any part or component thereof is scheduled to be refurbished or replaced in accordance with the Operation and Maintenance Manual, then such parts are warranted only up to the date of such scheduled replacement or refurbishment. The refurbished or newly replaced parts shall thereafter be covered for under the terms and conditions agreed by the Parties with respect to such replaced or refurbished parts.

12.2.2 **Latent Defects Liability Period**

The Latent Defects Liability Period for the Relevant Package shall be thirty-six (36) months from the expiry of the Warranty Period for the Relevant Package, or sixty (60) months from the date of Provisional Acceptance of the Relevant Package, whichever is earlier. Any such Latent Defects identified during the appropriate Latent Defect Liability Period shall be corrected and made good by the Contractor at his sole Cost.

Should any scheduled inspection of a particular item of the Relevant Package fall due within the Latent Defects Liability Period and any part or component thereof is scheduled to be refurbished or replaced in accordance with the Operation and Maintenance Manuals, then the warranty for such parts shall be limited up to the date of such scheduled replacement or refurbishment. The refurbished or newly replaced parts shall from this point onwards be covered for under the terms and conditions agreed by the Parties with respect to such replaced or refurbished parts.

12.2.3 Owner/Project Manager shall give notice of observed defects promptly following such observation. Such notice must be given at the latest within thirty (30) Days from the end of the appropriate Warranty Period or Latent Defect Liability Period as applicable.

12.2.4 Contractor's obligation to effect repairs or replacement based on Contractor's Warranties shall not extend to failure caused by:

a) normal wear and tear;

b) failure to adhere to the Operation and Maintenance Manual; or

c) any repair or modification initiated or undertaken by Owner/Project Manager during the Warranty Period without the proper recourse to Contractor and without the Contractor's knowledge or consent, which consent shall not be denied unreasonably.

12.3 Sub-contractor Warranties

No warranty obtained from any Sub-contractor shall be deemed to reduce or limit Contractors Warranties or Latent Defects liability set forth in this clause no. 12.0 or Contractors obligation to supply Goods or perform corrective work.

12.4 Survival of Warranties

Warrantees and Latent Defect Liability under the contract shall survive any termination of the Contract in respect of any part of the work for which Owner/Project Manager has paid Contractor.

12.5 Emergency Repairs

In the event of repairs carried out by the Contractor during the Warranty Period is not found satisfactory, the Owner/Project Manager reserves the right to rectify / replace the part at Contractor's risk and Costs.

In the event of an emergency where Contractor's personnel is not available on Site or cannot be on Site within an acceptable period of time and if in the judgement of Owner/Project Manager the delay from giving formal notice would cause serious loss or damage which could be prevented by immediate action, defects may be corrected by Owner/Project Manager or a third party designated by Owner/Project Manager at the Contractor's cost and expense, without giving prior notice to Contractor. In the event such action is taken by Owner/Project Manager, Contractor will be notified promptly and shall assist wherever possible in undertaking the necessary corrections. The above emergency repairs shall not relieve the Contractor from liability under the terms and General Conditions of Contract.

12.6 Removal of the Defective Work

If the defect or damage is such that it cannot be remedied expeditiously at the Site, the Contractor may, with the consent of Owner/Project Manager/Owner's Representative, remove from the Site for the purposes of repair any part of the Works which is defective or damaged. If the value of part or material removed from the Site is substantial (value to be finalised at appropriate stage) as determined by the Owner/Project Manager/Owner's Representative, the Contractor shall provide security in the form of bank guarantee for a value as determined by the Owner/Project Manager/Owner's Representative.

In case of defective parts which are not repairable at Site but are essential for commercial operation of the equipment, Contractor and the Owner's Representative shall mutually agree to a program of replacement or renewal which will minimise interruptions to the maximum extent, in the operation of the equipment and the Relevant Package and the Contractor shall expeditiously provide necessary parts for replacement before shut down planned.

The cost of any special or general overhaul rendered necessary during the warranty period due to defects in Relevant Package or defective Work carried out by the Contractor, the same shall be borne by the Contractor.

12.7 Further Tests

If the remedying of any defect or damage is such that it shall affect the performance of the Relevant Package, the Owner/Project Manager may require that Tests before Take Over to be repeated to the extent necessary. The requirement shall be made by notice within 30 (thirty) Days after the defect or damage is remedied. Such Tests shall be carried out in accordance with procedures set forth in clause no. 10.0 of the General Conditions of Contract.

12.8 Right of Access

The Contractor shall have the right of access to all parts of the Relevant Package and to records of the working and performance of the Relevant Package, except as may be inconsistent with any reasonable security restrictions imposed by the Owner/Project Manager.

12.9 Contractor to Search

The Contractor shall, search for the cause of any defect, under the direction of the Owner/Project Manager/Owner's Representative at Contractor's cost.

13.0 CONTRACT PRICE AND PAYMENT

13.1 Contract Price

Subject to the full and complete performance of the Contract Works and in full consideration to the Contractor for all costs incurred in connection therewith, the Owner shall pay, and the Contractor shall accept, all in accordance with the Contract. The Contract Price, as applicable inclusive of all taxes. Such sum may not be adjusted except as set forth in the Contract.

Pre-Effective Date Conditions

The Contractor has had sufficient opportunity to investigate and make a careful examination, survey and inspection of and has investigated and made a careful examination, survey and inspection of the Pre-Effective Date Conditions and has satisfied itself as to the feasibility of executing the Contract Works at the Site. The "Pre-Effective Date Conditions" shall consist of the following:

- the Site and surrounding areas and to have satisfied itself as to the condition of and circumstances affecting the Site (including but not limited to soil, surface, subsurface, environmental, geological, seismic, geotechnical, climatic, hydrological conditions and the existence of underground obstructions, fossils, antiquity structures, archaeological remains, and the general and local conditions with respect to waste disposal, handling and storage of Equipment, availability and quality of utilities, location of underground utilities, and equipment and facilities needed prior to and during performance of all the Contractor's obligations under the Contract);

- the availability and condition of methods of transporting the Equipment and Contractor's Equipment to the Site and the suitability and availability of access routes to the Site (including the availability and condition of roads);

- the local ambient conditions based upon previous ambient data;

- the qualifications of all Subcontractors;

- the PPA and the PPA Pass Through Obligations; and

- all other difficulties, hazards and other matters that may affect the Contractor's performance.

Where the Contractor wishes to have other access or intrusion on to or over land adjoining the Site, then arrangements must be made by the Contractor and such access or intrusion will be entirely at the Contractor's risk and cost. The Contractor shall keep the Owner informed in respect of negotiations for any such arrangements and the Owner's consent shall be required for any such arrangements.

The Contractor specifically acknowledges and accepts the Pre-Effective Date Conditions and agrees that the Contract Price shall not be increased and Guaranteed Completion Date shall not be extended, in each case as a result of any Pre-Effective Date Condition. Without prejudice to the Contractor's obligations under the Contract, the Contractor shall be responsible for any misunderstanding or incorrect information that the Contractor obtained and relied on.

Taxes & Custom Duties

The Contractor shall be responsible for and shall administer and pay all other taxes including stamp duty and all sales, use, gross receipts, and other similar taxes and contributions imposed by any taxing authority upon the sale, purchase or use of the Equipment and on all services or labour carried out in relation to the Contract Works, as well as taxes on or measured by the Contractor's income or taxes on or measured by wages earned by employees of the Contractor or any Subcontractor or any taxes or contributions in the nature of workman's compensation, social security, old age benefits or similar items based upon or relating to employment of workers by the Contractor or any Subcontractor. The Contractor shall furnish to the appropriate taxing authorities all required information and reports in connection with such taxes.

The Contractor shall obtain all import licenses and perform and arrange for customs clearance for the Contractor's Equipment. The Contractor shall have the obligation and responsibility to apply for all available exemptions from customs and import duties on the Contractor's Equipment and obtain any available tax exemption certificates for customs clearance. In the event that the relevant exemption from customs and import duties on the Contractor's Equipment is not issued by the relevant Government Authority, the relevant customs and import duties shall be paid by the Contractor.

Notwithstanding the foregoing above, the Owner shall not be required to reimburse the Contractor for any taxes to the extent such taxes are payable as a result of the Contractor's or any Subcontractor's failure to follow or comply with available procedures for the exemption from or abatement of such taxes.

The Owner shall have the right to deduct or set-off any monies in respect of any taxes or levies or any withholding tax charged to the Owner which should be attributable to the Contractor under this Clause from any payment to be made by the Owner to the Contractor under the Contract.

The Contractor shall be responsible for the payment of any taxes, duties, levies or imposts imposed in relation to any surplus materials and Contractor's Equipment which he / his contractor removes from site.

The Contractor shall indemnify, save harmless and defend the Owner, its directors, officers, employees and agents against all and any liabilities, claims and charges (including any penalties, fines, fees and like) arising in connection with the matters referred to in Clauses above.

Legal Requirements

(a) If after the Effective Date an amendment to the Owner's Requirements or the Contractor's Specification becomes necessary for conformity with the terms of any Required Consent; then, with the Owner's prior written consent, such amendment shall be treated as if it were an instruction of the Owner as per Contract effecting a Variation of the Owner's Requirements.

(b) If, after the Effective Date, the Contractor or the Owner finds there was a divergence between the Legal Requirements and either the Owner or the Contractor's Specification in existence before the Effective Date, such person shall immediately give to the other party written notice specifying the divergence. If the additional price / cost for accommodating the legal change or the legal condition is found to be substantial, the Owner shall resort to approach the Contractors competitors to obtain a better price. The Contractor shall inform the Owner's Representative in writing of the Contractor's proposed amendment for removing the divergence, and with the Owner's consent the Contractor shall, entirely at the Contractor's own cost, carry out and complete the relevant Contract Works in accordance with the amendment.

Except where above clause (b) applies, the Contractor shall pay, and indemnify, save harmless and defend the Owner, its directors, officers, employees and agents against liability in respect of, any fees or charges (including any rates or taxes) legally demandable in relation to any Legal Requirement in respect of the Contractor's performance of the Contract Works. No adjustment shall be made to the Contract Price in respect of the amount of any such fees or charges (including any rates or taxes) unless above clause (a) applies.

If any emergency compliance requires the Contractor to supply materials or execute work before receiving the Owner's consent under above clause

- the Contractor shall supply such limited materials and execute such limited work as are reasonably necessary to secure immediate compliance with the Legal Requirements; and
- the Contractor shall forthwith inform the Owner of the emergency.

13.1.1 The Contract Price for the entire scope of Work and supplies in line with the Tender Documents shall be fixed, on lump sum basis and will remain firm throughout the Contract Period. However, in case of delay in execution, the Liquidated Damages pursuant to Clause 11.1 will be recovered from the Contractor.

(i) Contract Price for the Offshore Supply Contract shall be the CIF Price of supplies from outside the Owner's Country and shall be inclusive of, inter alia, design and detailed engineering which are integral to these items and their performance, essential(Mandatory) spares, maintenance tools and tackles, marine Insurance, freight, packing and forwarding and all taxes, duties and other statutory levies in respect thereof as detailed in the Tender Documents subject to clause no. 3.24 of General Conditions of Contract.

(ii) Contract Price for the Onshore Supply Contract shall include the Ex Works price of supplies including design and detailed engineering, which is integral to these items and their performance, essential spares, maintenance tools and tackles from the Owner's Country and shall be inclusive of packing and forwarding and all taxes duties and other statutory levies and the like payable in respect thereof as detailed in the Tender Documents subject to clause no. 3.24 of General Conditions of Contract.

(iii) Contract Price for the Onshore Services Contract shall be inclusive of Customs clearance at Indian Port, loading/delivery from Indian port to Site and/or delivery to Site for Onshore supplies, receipt and unloading at site, storage, preservation, Insurance in respect of supplies from Ex Works/Indian Port to Site and for Works up to Take Over of Relevant Package, training, erection, testing, installation, Commissioning, Reliability Operation and satisfactory completion of the Tests before and upto the date of Take Over within Owner's Country and all taxes, duties and other statutory levies and the like payable in respect thereof as detailed in the Tender Documents subject to clause no. 3.24 of General Conditions of Contract.

(iv) Contract Price towards Site Safety Management Service:

Contractor shall indicate separately price along with detailed breakup for Site Safety Management as per “Schedule of Price” attached in Technical Specifications. Contractor’s safety Price / Budget as approved by the Owner/Project Manager shall be separately monitored for expenses incurred. In case of deficient safety management by the Contractor at site is observed by the Owner / Project Manager the same shall be brought out to the notice of the Contractor in writing. In case Contractor fails to remedy the safety site shortfalls, Owner/Project Manager will rectify the same and the cost shall be debited to the Contract price excluding the safety Budget Price.

(v) The Contract Price for each Contract shall be as per "Schedule of Prices". The rates of taxes and duties as applicable as on 15 (fifteen) Days prior to closing date for submission of Price Bid shall be considered for the purpose and shall be indicated in the "Schedule of Prices". The Contract Price of different Contracts is to be given separately for the Relevant Package in annexure to "Schedule of Prices" and shall be in the same format as per "Schedule of Prices".

This “General Conditions of the Contract” (GCC) is comprehensive to cover the scope as defined in items (i) to (iii) above. The principles outlined under this GCC are also respectively applicable to the part scope in case the Owner decides to separate out the total scope in line with items (i) to (iii) above. With the split as agreed the Contractors obligations & liabilities in all respects such as penalties(LDs), warranties, guarantees, liability limitations etc., as applicable under this GCC, in no case shall be diluted

(vi) The total price is the sum of all the prices of aforementioned Contracts and this total price shall be in respect of supplies, work forming part of Works, and all other obligations including Warranties, Guarantees, Performance Guarantees, Insurance site safety management covered in the Contract and Specifications subject to other terms and conditions in the Contract and particularly clause no. 3.24.

(vii) Contractor shall submit detailed billing break up within a month time & the same shall be mutually discussed and agreed with the Owner/Project Manager.

13.1.2 The Contract describes Contractor’s obligation in respect of design, engineering, manufacture, supply, construction, erection, testing, installation, Commissioning and Tests before Take-Over of the Relevant Package, but shall not relieve or derogate Contractor from obligation to take all measures necessary to deliver the Relevant Package to Owner/Project Manager in accordance with the Performance Guarantees and the intent of Tender Documents and to do and deliver and perform all such other and further Work and supplies as are necessary for completion of Relevant Package in all respects or incidental thereto and for the Relevant Package to meet the Performance Guarantees and the Specifications within the lump sum total price described in sub clause 13.1.1

13.1.3 The Contract Price is not subject to any escalation and variation in price except as otherwise provided, it being a fixed price Contract. Any variation in Foreign Exchange during the Contract Period will be to Contractor's account.

13.1.4 The Contractor shall pay all taxes, duties and levies in consequence of his obligations under the Contract, and the Contract Price shall not be adjusted for such Costs, taxes, duties and levies except as may otherwise be expressly stated in clause no. 3.24 of the General Conditions of Contract;

13.2 Contract Performance Security or Contract Performance Bank Guarantee

13.2.1 Contractor shall furnish to Owner/Project Manager within 14 days of issue of Letter of Intent (LOI) by the Owner/Project Manager, a Contract Performance Bank Guarantee (the "Performance Security") as a Performance Security for due and faithful performance of its obligations under Contract, as mentioned in Instructions to Bidders in format of Information Form CP, issued by Indian Nationalised Banks (or their foreign branch) or issued by a Foreign Bank and counter guaranteed by Indian Nationalised Bank (or its foreign branch), for an amount equivalent to 10 (Ten) % of the Contract Price. The validity of the Performance Security shall be up to end of Warranty Period plus claim period of six Months. The charges for counter guaranteeing of Performance Security, if any, shall be borne by and be to Contractor's account.

13.2.2 In case Contractor fails to fulfil its obligations under Contract, the proceeds of Performance Security may be appropriated by Owner/Project Manager as part compensation for any loss resulting from Contractor's failure to perform and fulfil the various obligations concerning supply of Goods and Work under Contract without prejudice to any of the rights or remedies to which the Owner/Project Manager may be entitled under the Contract or otherwise in law.

13.2.3 The Performance Security shall be denominated proportionately in the currencies of the Contract.

13.2.4 Contractor shall extend the validity of the Performance Security suitably, if it is required, due to delay in Acceptance of Relevant Package for reasons attributable to Contractor, at its own cost well in time and in any case at least 60 (sixty) days before the expiry of the period of validity thereof.

13.2.5 The Performance Security shall also be extended suitably at least 60 (sixty) days before the expiry of the period of validity thereof in the event of repair / replacement of any equipment or any part thereof during Warranty Period to take care of Extended Warranty Period of repaired / replaced equipment or its part. The value of the performance security during the Extended Warranty Period shall be 10 (ten) percent of the cost of such repaired / replaced equipment or its part.

13.2.6 The Performance Security shall be discharged by Owner/Project Manager within 30 (thirty) days of the date of completion of all of Contractor's obligations including Warranty Period obligations under the Contract.

13.3 Terms of Payment

The terms of payment shall be as stipulated in Special Conditions of Contract

13.3.1 **Advance Payment**

Initial advance in respect thereof in accordance with the provisions set forth in the Contract in this behalf will be paid on fulfilment of all of the following:

a) Signing of Contract Agreement;

b) Submission of an unconditional Performance Security as per clause no. 13.2.1 of the General Conditions of Contract;

c) Submission of a detailed Network Schedule/PERT network indicating detailed milestones based on the Work schedule and its approval by the Owner/Project Manager.

d) Detailed break-up of FOB / Ex-Works price of equipment components / systems;

e) Detailed activity wise price break up for all Services including erection, commissioning, installation, testing etc and

f) Documentation and Bank Guarantee for advance as per clause no. 13.3.2 below.

The advance payment will be released to the bidder progressively on fulfilment of conditions precedents as agreed. The details of the advance release plan will be discussed at the contract discussion / finalization stage

13.3.2 Documentation and Bank Guarantee for Advance Payment shall include:

a) Invoice for amount of advance in original and five (5) copies.

b) Bank Guarantee equivalent to the advance payment with 1 (one) copy of original Bank Guarantee valid up to Final Performance Acceptance of Plant issued by Indian Nationalised Banks (or their Foreign branch) or issued by a foreign Bank and counter guaranteed by Indian Nationalised Bank (or its Foreign Branch). The charges for counter guarantee/ confirmation, if any, will be to Contractor's account.

c) Bank Guarantee for advance payment shall be denominated in the currencies of Contract.

13.3.3 All further payments under the Contract shall be made as stipulated in the Special Conditions of Contract.

13.3.4 **Schedule of Payments**

Based on the terms of payment as per clause 13.3 and agreed Work and supply schedule prepared in line with detailed network schedule, payment of Contract Price shall be subject to limits of Milestone Payment Schedule and the following in respect thereof.

a) The Milestone Payment Schedule may be modified by Owner/Project Manager/Owner's Representative if progress is not as scheduled.

b) Later of (i) accomplishment of a milestone and (ii) the date fixed for accomplishment of such a milestone as set out in the Milestone Payment Schedule.

c) Submission of documentation / data to Owner/Project Manager/Owner's Representative for approval.

d) Submission of Monthly Progress Reports and updated Network Schedule

13.3.5 **Retention for Safety Compliance**

a) An amount as stated in the table below shall be retained towards Contractor's safety performance against every RA bill:

Contract Price	Retention Amount (%)
Upto INR 1 million	2.5
Above INR 1 million and below INR 5 million	2
Above INR 5 million and upto INR 100 million	1.5
Above INR 100 million	1

The above mentioned safety retention shall be over and above any other retentions / deferred payments as may have been specifically agreed in the Contract.

b) For Contract Price INR 10 million or above and Contractual Time for Completion 12 months or more, the above safety retention will be released half yearly against the Safety Performance Score (methodology for evaluation enumerated in the Safety Terms & Conditions attached as Appendix to this General Terms & Condition) which will be evaluated by the Order Manager every month. For all other contracts, the above said safety retention shall be released along with the final settlement only at the end of the contract period

c) The Owner shall have the right to stop any work which in its opinion is not meeting the safety standards/guidelines of the Owner and good engineering practice. The Contractor shall not be eligible for and shall not be granted any extension in Contractual Time for Completion due to such stoppage of work by the Owner

d) The above retention towards safety shall not absolve the Contractor of its liabilities including statutory liabilities towards safety violations, injury or death (whether by accident or otherwise). An amount between INR 0.5 to 5 million as deemed appropriate by Owner's appointed Committee for incident investigation and/or as determined by statutory authorities (whichever higher), will be payable by the Contractor in case of such severe incidents of injury leading to loss of property or partial/ permanent disablement (e.g. loss of limb/s, vision etc.) or death

e) Notwithstanding anything else stated in the Contract, the Contract shall be liable for termination without any notice and without recourse to Owner in case of three (3) or more severe safety violations. There shall be no termination fees / compensation payable to Contractor for such termination.

f) In case the Contractor achieves 100% on the Safety Performance Score, the Contractor shall be awarded a discretionary bonus of 1% of invoiced value subject to a maximum of INR 5 million towards Safety Performance.

13.4 Application for Interim Payment Certificates and Claim for Payments

13.4.1 The Contractor shall submit a statement, "the Interim Payment Certificate", in six copies to the Owner/Project Manager/Owner's Representative after the end of each month before the tenth day of the next month, in a form approved by the Owner/Project Manager/Owner's Representative, showing the amounts to which the Contractor considers himself to be entitled, together with supporting Documents which shall include the detailed report on the progress during the month in accordance with clause no. 3.23 above. The statement shall include the following items, as applicable, which shall be expressed in the currencies in which the Contract Price is payable, in the sequence listed:

a) The estimated Contract value of the design and construction Documents produced and the Works executed up to the end of the month (including variations but excluding items described in sub-paragraphs (d) to (f) below);

b) Certification from Owner/Project Manager/Owner's Representative that the applicable Work or supply of Goods has been performed and that the quality of Goods or Work described in the Interim Payment Certificate is in line with Contract;

c) If there is any pending or threatened dispute, regarding Goods or Work covered by such request or payment as a result of which Contractor intends to withhold payment from such Sub-contractor, a report detailing such dispute and circumstances thereof;

d) Any amounts to be added and deducted for Change in Law or variation in tax as per clause 3.26.

e) Any other additions or deductions which may have become due in accordance with the Contract (including those under clause no. 22.0 of these General Conditions of Contract), other than those under clause no. 11.0 above; and

f) The deduction of the amounts certified in all previous Interim Payment Certificates.

g) Any other information that the Owner/Project Manager/Owner's Representative may reasonably request.

13.4.2 Contractor shall raise its consolidated invoices / bills only once a month.

13.5 Mode of Payment

13.5.1 The mode of payment by Owner/Project Manager to the Contractor shall be mutually agreed to after approval of financing plan by the Lenders, as applicable.

13.5.2 The Owner/Project Manager shall pay the amount certified in each Interim Payment Certificate within 30 days from the date on which the Owner/Project Manager/Owner's Representative received the Contractor's statement and supporting Documents and the Owner/Project Manager shall pay the amount certified in the Final Payment certificate within 120 days from the date of issue of the Take-over certificate.

13.5.3 Pursuant to this clause no. 13.0, if the commercial banks are closed due to a public holiday, period as above shall be extended to the first business day after the end of the period concerned. In addition, unless the parties otherwise agree, Owner/Project Manager shall not be obligated to pay, in respect of any request for payment, any amount in excess of amount anticipated to be paid for Work or supply of Goods completed in such date, as set forth in the mentioned payment schedule. If any request for payment does not comply in all Material respects with this clause no. 13.0, Owner/Project Manager shall inform Contractor about the same within 15 days following the receipt of such request for payment, and Contractor shall re-submit such request for payment. If less than the full amount is paid, Owner/Project Manager shall state in writing the reasons for paying such lesser sum. Any dispute shall be dealt with under clause no. 22.0 below and shall not be a basis for withholding payment of any undisputed amount. Any dispute regarding Owner/Project Manager's payment of a lesser sum than that set forth in a request for payment must be raised by Contractor within 30 days of receipt of such payment, or Contractor's right to dispute such payment is waived. During the pendency of any such Dispute and the resolution thereof, Contractor shall continue to perform the Work in accordance with the provisions set forth herein.

13.6 Delayed Payment

If payment of any sum payable is delayed beyond additional 60 days for reasons solely attributable to the Owner/Project Manager, the Contractor shall be entitled to receive simple interest charges on the amount unpaid during the period of delay. These interest rates shall be calculated at the rate of one percentage points above the Base Rate of State Bank of India. The Contractor shall be entitled to such payment without formal Notice and without prejudice to any other right or remedy.

13.7 Deductions from Contractor's Bills/Payments Withheld

13.7.1 All costs, damages or expenses, which the Owner/Project Manager may have paid, for which under the Contract the Contractor is liable, will be claimed by the Owner/Project Manager. All such claims shall be billed by the Owner/Project Manager to the Contractor regularly as and when they fall due. Such bills shall be supported by appropriate and certified vouchers or explanations, to enable the Contractor properly identify such claims. Such claims shall be paid by the Contractor within 15 (fifteen) Days of the receipt of the corresponding bills and if not paid by the Contractor within the said period, the Owner/Project Manager may the deduct the amount, from any monies due or becoming due by him to the Contractor under the Contract or may be recovered by actions of Law or otherwise, if the Contractor fails to satisfy the Owner/Project Manager of such claims.

13.7.2 Owner/Project Manager shall have the right to withhold from any payment due to Contractor, including the final payment, such amounts as Owner/Project Manager reasonably deems necessary or appropriate to protect it because of any one or more of the following reasons:

a) Defects in any Work, which might affect Owner/Project Manager's ability to operate Relevant Package as contemplated herein, whether or not payment has been made therefor;

b) The filing of any vendor / tradesman's lien or similar encumbrance in respect of the Work or the Relevant Package (or any portion thereof);

c) A dispute as to the accuracy or completeness of any request for payment received by Owner/Project Manager pursuant to this clause no. 13.0 within 90 Days of receipt thereof or payment made there under;

d) Contractor's failure to deliver any Performance Securities to Owner/Project Manager

e) Any requirement in accordance with Applicable Laws to withhold any Taxes payable by Contractor in respect of the Goods/Work or any part thereof;

f) Contractor's failure to make payments to Sub-contractors or Workers for Work or supply of Goods or to any statutory & Regulatory authority including amounts withheld by Contractor because of disputes between Contractor and such Persons.

g) Any legal cases, litigations pending against the Contractor or against the Owner/Project Manager but relating to the Works or Contractor's obligations under the Contract.

h) Any breach of warranties contained in the Contract

13.7.3 In addition to the provisions of this clause no. 13.7 which relates to the recovery by the Owner/Project Manager of any amounts that the Owner/Project Manager may have paid, for which the Contractor is liable under the Contract, the Owner/Project Manager shall also be entitled to recover all the dues in terms of the Contract including Liquidated Damages for delay, Liquidated Damages for the shortfall in the guaranteed performance parameters, etc., by way of deductions from the payments due to the Contractor or that may become due to the Contractor in future or from any securities / guarantees under the Contract and / or otherwise.

13.7.4 Notwithstanding any dispute that Contractor may have, and regardless of the basis thereof or grounds therefor, Contractor agrees that it will, for so long as the Contract has not been terminated diligently prosecute the Work up to Final Performance Acceptance and Take-over of Relevant Package, all in accordance with the terms of the Contract.

13.7.5 Any payment due to Owner/Project Manager by the Contractor and remaining unpaid beyond the stipulated date shall be liable to interest payment at the rate of 1(one) percentage point above the Base Rate of State Bank of India from the date of due to Owner/Project Manager to the date of receipt of dues from Contractor by Owner/Project Manager.

13.8 Final Performance Acceptance and Contractor's Request for Final Payment

13.8.1 Prior to Final Performance Acceptance of Relevant Package, Contractor shall submit to Owner/Project Manager/Owner's Representative, a final Request for Payment. Contractor shall, prior to or concurrently with that request,

a) Provide certification to Owner/Project Manager/Owner's Representative that every liability to Sub-contractors, Workers and other Persons incurred by or for Contractor on account of the supply of Goods or performance of the Work of such Relevant Package has been duly paid, discharged or waived, together with releases and waivers of liens effective under Applicable Law and in form and substance satisfactory to Owner/Project Manager from all the foregoing (to the extent such releases and waivers have not already been delivered to Owner/Project Manager);

b) Provide Certificate to Owner/Project Manager that all statutory and regulatory liabilities have been settled with regard to supply or Work in respect of the Contractor and Sub-contractor and there are no claims or demands pending from such authorities. The Contractor further undertakes that in the event of unpaid liability or unsettled claim, the Contractor shall pay the same.

c) Furnish to Owner/Project Manager/Owner's Representative a sworn statement setting forth in reasonable detail each liability to Sub-contractors and other Persons which are disputed by Contractor and which Contractor knows or has reason to believe may thereafter be disputed on account of the performance of the Work of such Relevant Package;

d) Furnish to Owner/Project Manager the documents required by Sub-clause 3.2.2 and

e) Prepare with Owner/Project Manager/Owner's Representative a Punch List of all items, which remain to be finished, corrected or otherwise performed. Promptly after preparation of the Punch List Items, Owner/Project Manager/Owner's Representative shall mutually agree on the amount of money due on account of the pending items of the Punch List to be withheld from the payment due to Contractor and date of completion shall be as per clause no. 10.7 above. The Punch List reserve shall in no event exceed 150% (one hundred and fifty percent) of the aggregate value of Punch List Items, as reasonably determined by Owner/Project Manager/Owner's Representative.

Any final request for payment which does not satisfy all of the conditions set forth above does not constitute a valid and proper final request for payment and Owner/Project Manager shall not have any obligation to make any payment there under.

13.8.2 Within 120 (One hundred and twenty) Days following the Final Performance Acceptance of Relevant Package and issue of Final Acceptance certificate, and Owner/Project Manager's receipt of a valid final request for Payment, Owner/Project Manager shall pay to Contractor, the Contract Price then unpaid plus all other net amounts then owed by Owner/Project Manager to Contractor hereunder in connection with such Relevant Package, less

a) The Punch List reserve,

b) Such amount as Owner/Project Manager deems reasonably necessary to pay each liability then outstanding against Contractor on account of the Supply of Goods or Performance of Work of such Relevant Package, together with any amounts withheld from the Final Payment pursuant to clause no. 13.8 above (collectively, the "Claims reserve") and

c) The amount of any Liquidated Damages payable and paid determined in accordance with clause 11.0 above.

The Claims Reserve shall be held by the Owner/Project Manager until Contractor provides Owner/Project Manager with:

(i) Satisfactory evidence that each of the foregoing underlying liabilities has been duly paid, discharged or waived or

(ii) A letter of credit satisfactory in amount, form and substance to Owner/Project Manager to indemnify Owner/Project Manager against the same or otherwise a Bank Guarantee in a format acceptable to Owner/Project Manager from a bank as prescribed for Contract Performance Guarantee.

13.8.3 All payments made during the Contract including the Final payments shall be on account payments only till release of the Contract Performance Guarantee, which shall be construed to be the Final Payment. The Final Payment will be made on completion of all the Works and of fulfilment of all obligations under the Contract by the Contractor.

13.8.4 The Final payments to the Contractor on successful completion of performance and Guarantee Tests shall be subject to the Contractor having cleared all his dues to the Owner/Project Manager under the Contract as also all of his Sub-contractor/Sub-vendors and having paid all the statutory liabilities.

13.8.5 All payments to be made by the Owner/Project Manager under the Contract shall be subject to compliance by the Contractor of all statutory requirements as may be applicable.

13.9 Punch List Items

Contractor shall perform all Work required or appropriate for all Punch List Items within a Schedule to be mutually determined by Contractor and Owner/Project Manager after submission of the Final Request for Payment in accordance with clause no. 13.8 above. Such Schedule shall provide for completion of all Punch List Items as soon as practicable following determination of the completion schedule, but no later than the date set forth in clause no. 10.6 above. Upon completion of the Punch List Items, Contractor may submit to Owner/Project Manager and the Owner's Representative a request for release of the Punch List Reserve and shall furnish with such a request a certificate that all Punch List Items have been completed. Unless Owner/Project Manager disputes a charge or statement in such request or certificate, Owner/Project Manager shall release the Punch List Reserve to Contractor within 30 (thirty) Days after receipt of Contractor's request therefore given in accordance with the foregoing sentence of this clause no. 13.9.

13.10 Effect of Payment

13.10.1 No payment and no partial or entire use or occupancy of Relevant Package by Owner/Project Manager shall:

a) Be deemed a representation that Owner/Project Manager has inspected the Relevant Package;

b) Constitute or be deemed an acceptance, in whole or in part, of any portion of the Work or the Relevant Package; or

c) Operate to release Contractor from any obligations or Liabilities under the Contract.

13.10.2 The Final Payment shall be deemed to release Contractor from all obligations hereunder except those in respect of Owner/Project Manager acceptance of such Relevant Package, Contractor's Guarantees and Warranties regarding the Relevant Package, the indemnification and any other obligations under the Contract, which by their terms can be deemed to survive beyond the Final Payment.

13.11 Release

The acceptance by Contractor of payment pursuant to clause no. 13.8 above shall, to the fullest extent permitted by law, operate as a release by Contractor to Owner/Project Manager of all liability of Contractor and any Sub-contractor or any other Person who supplied the Goods or performed Work or cause the Goods to be supplied or Work to be performed, directly or indirectly, on behalf of Contractor and from any further payment for all things done or furnished in connection with the Work, except for and to the extent of (i) amounts withheld under clause no. 13.8.2 above or (ii) any unresolved payment disputes between Contractor and Owner/Project Manager which have not been resolved prior to receipt of the Final Payment.

13.12 Dedicated Bank Account

13.12.1 The Contractor shall maintain a separate account with a Scheduled Bank for the purpose of receiving all the payments under the Contract and for utilization of payments received from the Owner for disbursement to its sub- contractors. The Contractor shall maintain separate books of accounts for all payments under this Contract and Owner/Project Manager shall have access to these at all the times.

13.12.2 **Account Tracking Mechanism:**

In case the contractor wants to withdraw funds from the above bank account for any purpose other than the contract, he shall be required to submit an undertaking to the project manager certifying that all due statutory payments, labour payments and payments to all his sub- contractors have been disbursed corresponding to the total payment received by him under the contract

13.12.3 For tracking of payments received from the employer, the Contractor shall also submit a monthly statement by 7th of every month certifying the transactions pertaining to the above account along with the purpose of such transactions. In case, the Contractor transfers the funds for any purposes other than the Contract, without prior consent of the Owner, it will constitute a breach of Contract by the Contractor

13.12.4 In case the Contractor violates any of the above provisions, Owner shall have the right to give suitable instructions to the bank to regulate/ freeze the account.

14.0 CHANGE ORDERS

A Change Order shall be issued by the Owner/Project Manager in accordance with this clause 14.0, when either Owner/Project Manager or Contractor proposes to make any change in the Services, the Contract Price, the Performance Guarantees and/or the Schedule.

14.1 Further Detailing not a Change Order

Contractor's performance of Services shall be subject to further detailing from time to time and Contractor shall receive no additional compensation for such detailing to the extent that such detailing does not constitute a Change Order.

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

14.2 Right to Change Order

14.2.1 Change Orders may be initiated by the Owner/Project Manager/Owner's Representative at any time during the Contract Period, either by instruction or by a request (the "Change Order Notice") to the Contractor to submit a proposal. If the Owner/Project Manager/Owner's Representative requests the Contractor to submit a proposal and subsequently elects not to proceed with the change, the Contractor shall not be reimbursed for the Cost incurred for proposal.

14.2.2 The Contractor shall not make any alteration and/or modification of the Services unless and until the Owner/Project Manager/Owner's Representative instructs or approves a Change Order in Writing.

14.2.3 Change Orders may be requested by the Contractor (the "Change Order Request") (i) in case its performance of Services is affected by any Change in Laws or any act or omission of the Owner/Project Manager, Owner's Representative or Owner/Project Manager's Other Contractors, or (ii) to propose any change which in the Contractor's opinion will reduce the cost of constructing, maintaining or operating the Relevant Package or otherwise be of benefit to the Owner/Project Manager.

14.3 Change Order Procedure

14.3.1 If the Owner/Project Manager/Owner's Representative issues a Change Order Notice, the Contractor shall submit a proposal addressing the following, within fifteen (15) Days or any other period as mutually agreed:

a) a description of the proposed design and/or work to be performed, and a programme for its execution together with supporting details and calculations;

b) the Contractor's proposal for any necessary modifications to the Schedule;

c) the Contractor's proposal for any adjustment to the Contract Price, Guaranteed Completion Dates, Performance Guarantees and/or modifications to the Contract.

14.3.2 If the Contractor issues a Change Order Request, the Contractor shall submit a proposal addressing the following:

a) the reasons for the request with supporting details / documents;

b) a description of the design and/or work affected or proposed to be performed, together with programme for execution and other supporting details / calculations;

c) the Contractor's proposal for any necessary modifications to the Schedule;

d) the Contractor's proposal for any adjustment to the Contract Price, Guaranteed Completion Dates, Performance Guarantees and/or modifications to the Contract.

14.3.3 The Owner/Project Manager/Owner's Representative shall respond with approval, rejection or comments within a period to be mutually agreed after receipt of such proposals.

14.3.4 If the Owner/Project Manager/Owner's Representative instructs or approves in Writing a Change Order, he shall proceed with adjustments to the Contract Price, Schedule of Payments, Performance Guarantees and/or Guaranteed Time for Completion.

14.3.5 Contractor shall not suspend performance of this Contract during review and negotiation of any Change Order, except as may be directed by Owner/Project Manager or required by Applicable Law

14.3.6 Payment in respect of the approved Change Orders shall be released by the Owner/Project Manager to the Contractor on satisfactory completion of such Change Order and its certification by the Owner's Representative in the same manner as applicable to corresponding milestone payments under the Contract.

15.0 TERMINATION BY THE OWNER/PROJECT MANAGER

15.1 Termination for Convenience

The Owner/Project Manager shall be entitled to terminate the Contract at the Owner/Project Manager's convenience, at any time by giving thirty (30) Days prior notice to the Contractor. Such notice of termination shall specify that termination is for Owner/Project Manager's convenience and the date upon which such termination becomes effective. Upon receipt of such notice, the Contractor shall proceed as follows:

(i) cease all further work, except for such work as may be necessary and instructed by the Owner/Project Manager/Owner's Representative for the purpose of making safe or protecting those parts of the Services already executed, and any work required for leaving the Site in a clean and safe condition;

(ii) stop all further sub-contracting or purchasing activity, and terminate Sub-contracts;

(iii) handover all Documents, equipment, materials and spares relating to the Relevant Package prepared by the Contractor or procured from other sources up to the date of termination for which the Contractor has received payment equivalent to the value thereof;

(iv) handover those parts of the Relevant Package executed by the Contractor up to the date of termination; and

(v) remove all Contractor's Equipment, which is on Site and repatriate all his staff and labour from the Site.

15.2 Termination for Default by Contractor

15.2.1 Notice to Correct

If the Contractor fails to carry out any of his obligations, or if the Contractor does not execute the Services in accordance to the Contract, the Owner/Project Manager/Owner's Representative may give notice to the Contractor requiring him to make good such failure. The Contractor shall remedy the same or take reasonable action to remedy the same within fifteen (15) Days from date of such notice.

If the Contractor:

a) fails to comply with a notice under sub-clause 15.2.1, or

b) abandons or repudiates the Contract, or

c) without reasonable excuse fails to commence or proceed with the Services in accordance with the Contract, or

d) becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under any Applicable Law) has a similar effect to any of these acts or events, or

e) assigns the Contract without the required consent of Owner/Project Manager, or

f) fails to comply with Applicable Laws and/or Applicable Permits, or

g) is in material breach of the Contract,

fails to comply with Tata Power's Contractors Safety Terms & Conditions

then the Owner/Project Manager may, without prejudice to any other right or remedy Owner/Project Manager may have under the Contract after having given thirty (30) Days' notice to the Contractor, terminate the Contractor's employment under the Contract, should Contractor fail to rectify within such notice period or commence to rectify the defaults within fifteen (15) Days of receipt of such notice from Owner/Project Manager; provided always that in the case of paragraph (d) above, the termination shall become effective on Owner/Project Manager issuing the notice of termination.

Without prejudice to the foregoing the amount of Liquidated Damages for Delay for which the Contractor would be otherwise become liable under clause 11.1 exceeds the aggregate cap referred to in clause 19.2.1 (i), then Owner shall at any time thereafter be entitled (but not obliged) by notice forthwith to terminate the employment of the Contractor

Upon termination, Owner/Project Manager shall automatically without the necessity of any further action by the Contractor stand subrogated to the interests of Contractor in or under any Sub-contracts. Owner/Project Manager shall succeed Contractor in all Sub-contracts and the Owner/Project Manager shall compensate the Sub-contractors under such Sub-contracts the compensation becoming due and payable under their agreements with the Contractor from and after the date Owner/Project Manager decides to succeed to the interests of the Contractor. The Contractor shall simultaneously deliver all Documents relating to the Relevant Package prepared by the Contractor or procured from other sources up to the date of termination to the Owner/Project Manager. Upon termination, if requested by Owner/Project Manager, Contractor shall withdraw from the Site and shall remove as directed by Owner/Project Manager any debris or waste materials (including any hazardous substances) generated by Contractor in performance of the Services.

Owner/Project Manager may take possession of any and all materials, documents, purchase orders, correspondence and schedules that Owner/Project Manager deems necessary to complete the Relevant Package. The Owner/Project Manager is also free to take possession of and use Contractor's Equipment at Site free of any cost. The rights and authorities conferred on the Owner/Project Manager and the Owner's Representative by the Contract shall not be affected by such termination.

The Contractor shall not be released from any of his obligations or liabilities accrued under the Contract. For the avoidance of doubt, the termination of the Contract in accordance with this clause shall neither relieve the Contractor of his accrued obligations for Warranty or Latent Defects or his accrued liability to pay Liquidated Damages for Delay and/or Performance nor shall entitle him to reduce the value of Contract Performance Security.

15.2.2 The Owner/Project Manager may upon such termination complete the Relevant Package himself and/or by employing any other contractor. The Owner/Project Manager or such other contractor may use for such completion such of the Documents made by or on behalf of the Contractor, Contractor's Equipment, Temporary Works, plant and materials as he or they may think proper. Upon completion of the Services, or at such earlier date as the Owner/Project Manager/Owner's Representative thinks appropriate, the Owner/Project Manager/Owner's Representative shall give notice that the Contractor's Equipment and Temporary Works will be released to the Contractor at or near the Site. The Contractor shall remove or arrange removal of the same from such place without delay and at his cost.

15.2.3 Upon termination, if Owner/Project Manager is of the opinion that he is not able to complete the Relevant Package himself or with the help of other contractors, then he may reject the incomplete Works. In such an event the Owner/Project Manager shall recover all money paid by the Owner/Project Manager to the Contractor for the incomplete /rejected Relevant Package. The Contractor shall also dismantle and dispose off the rejected/incomplete Works and also clear the Site at his cost. If he fails to do so, the Owner/Project Manager will dismantle and dispose off the rejected incomplete Relevant Package and clear the Site at Contractor's Cost and risk and recover all expenses incurred in this regard from the Contractor.

15.3 Payment after Termination

15.3.1 After termination under clause no. 15.2 above, the Contractor shall not be entitled to any further payment under the Contract, except that, if Owner/Project Manager completes the Relevant Package and the costs of completion are less than the Contract Price, the Owner/Project Manager shall pay Contractor an amount properly allocable to Services fully performed by Contractor prior to termination for which payment was not made to Contractor or a Sub-contractor, upon completion of the Relevant Package by Owner/Project Manager.

15.3.2 The Owner/Project Manager shall be entitled to recover from the Contractor the extra costs, if any, of completing the Works. In addition, Owner/Project Manager shall be entitled to exercise any rights or remedies available to Owner/Project Manager hereunder or at law or in equity.

15.4 Bribes

If the Contractor, or any of his Sub-contractors, agents or servants gives or offers to give or promises to give to any Person any bribe, gift, gratuity or commission as an inducement or reward:

a) For doing or forbearing to do any action in relation to the Contract, or

b) For showing favour or disfavour to any Person in relation to the Contract

then the Owner/Project Manager may, after having given 15 (fifteen) Days' Notice to the Contractor, terminate the Contractor's employment under this Contract and also expel him from the Site. The effects of termination contained in clause 15.2 above shall apply mutatis mutandis to the termination under this clause. In addition he will also be subjected to any criminal liability, which it may incur, and payment of loss or damage to the Owner/Project Manager resulting from any cancellations.

Tata Code of Conduct

The Owner Company abides by Tata Code of Conduct (TCOC) in all its dealings with stakeholders and if in case of any concerns the Contractor is requested to bring the same to the notice of the Owner's Chief Ethics Counsellor at **cecounsellor@tatapower.com** (copy of the Tata Code of Conduct enclosed with the tender document). The Contractor and his subcontractors are also expected to abide by the principles of TCOC.

16.0 DEFAULTS AND REMEDIES

16.1 Contractor's Entitlement to Suspend Work or supply of Goods

16.1.1 If the Owner/Project Manager fails to certify a payment or pay the Contractor the amount due and fails to explain why the Contractor is not entitled to such amount, within 120 (One hundred and twenty) Days after the expiry of the time stated in clause no. 13.0 above within which payment is to be made, except for any deduction that the Owner/Project Manager is entitled to make under the Contract, the Contractor may suspend Work or supply of Goods or reduce the rate of Work after giving not less than 60 (sixty) Days' prior Notice to the Owner/Project Manager. Such action shall not prejudice the Contractor's entitlements to payment under clause no. 13.0 above and to terminate under clause no. 16.2 below.

16.1.2 If the Contractor suspends Work or supply of Goods or reduces the rate of Work, and the Owner/Project Manager subsequently pays the amount due, the Contractor's entitlement under clause no. 16.2 below shall lapse in respect of such delayed payment, unless Notice of termination has already been given, and Notice period of 60 (sixty) Days has expired and the Contractor shall resume Work.

16.2 Termination

If the Owner/Project Manager:

a) Fails to pay the Contractor the amount due within 180 (One Hundred and Eighty) Days after the expiry of the time stated in clause no. 13.0 above within which payment is to be made (except for any deduction that the Owner/Project Manager is entitled to make under the Contract or any disputed amount), or

b) Becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under any applicable law) has a similar effect to any of these acts or events, or

c) If a prolonged suspension affects the whole of the Works as described in clause no. 9.6 above, then the Contractor may terminate his employment under the Contract by giving Notice in Writing to the Owner/Project Manager, and the Financing parties subject to clause no. 16.3 below.

16.3 Notice of Right to Cure

16.3.1 Notwithstanding anything to the contrary in this Contract, Contractor shall not be entitled to terminate this Contract unless:

a) Contractor gives Written Notice to Owner/Project Manager and Financing parties which specifies the default and

b) Owner/Project Manager or Financing parties shall within 120 (One Hundred and Twenty) Days after such Notice fail to cure any such default, other than the default mentioned clause 16.2 (a) above in which case the termination shall become effective on Contractor issuing the notice for termination.

16.3.2 Cure by Financing parties may include:

a) Causing Owner/Project Manager to cure**;** or

b) Curing themselves

c) Seeking foreclosure of all or part of the Plant.

16.4 Cessation of Work and Removal of Contractor's Equipment

16.4.1 After termination under clause 16.2 above, the Contractor shall:

a) Cease all further Work, except for such Work as may be necessary and instructed by the Owner/Project Manager/Owner's Representative for the purpose of making safe or protecting those parts of the Works already executed, and any Work required to leave the Site in a clean and safe condition,

b) Handover all Design Documents, Construction Documents, Manuals, equipment, Materials and spares for which the Contractor has received payment,

c) Hand over those other parts of the Works executed by the Contractor upto the date of termination, and

d) Remove all Contractor's equipment, which is on the Site and repatriate all his staff and labour from the Site.

16.4.2 Any such termination shall be without prejudice to any other right of the Contractor under the Contract.

16.5 Payment on Termination

16.5.1 After termination under clause no. 15.1 or clause 16.2 above, the Owner/Project Manager shall return the initial Advance Bank Guarantee and Contract Performance Security, (except to the extent required for the surviving obligations of the Contractor) and shall pay the Contractor an amount calculated and certified in accordance with clause no. 20.6 and Sub-contractor cancellation charges.

16.5.2 **Survival of Obligations**

Notwithstanding anything to the contrary contained herein, any termination of this Contract shall not relieve:

a) Either Party of its obligations with respect to confidentiality as set forth in this Contract,

b) Either Party of any obligations hereunder which expressly survives termination hereof, and

c) Either Party of its obligations or liabilities for loss or damage to the other party arising out of or caused by acts or omissions of such First party prior to the effectiveness of such termination or arising out of such terminations and shall not relieve Contractor of its obligations and liabilities for portions of the Work already performed prior to the date of termination.

17.0 INDEMNIFICATION

17.1 General Indemnity

17.1.1 Contractor shall fully indemnify, save harmless and defend Owner/Project Manager, Owner/Project Manager's shareholders, the Owner's Representative, and the directors, agents and employees of the Owner/Project Manager (the "Owner Indemnified Parties") from and against any and all claims, including reasonable legal costs, (collectively the "Damages") by third parties in respect of death or bodily injury or in respect to loss or damage to any property (other than the Plant or part thereof not yet taken over) which arises out of or in consequence of the Services whilst the Contractor has responsibility for the care of the works to the extent resulting from Contractor's or any Sub-contractor's or their agents or employees intentional act, negligence, or strict liability or omission in the performance of the Services hereunder; provided that the foregoing obligation shall not apply to the extent

the Owner Indemnified Parties are contributory negligent or strictly liable or to the extent such damages are caused by the intentional acts or omissions of the Owner/Project Manager Indemnified Parties.

17.1.2 Owner/Project Manager shall fully indemnify, save harmless and defend Contractor and its shareholders and the directors, agents and employees of the Contractor (the "Contractor Indemnified Parties"), from and against any and all claims, including reasonable legal costs, (collectively the "Damages") by third parties in respect of death or bodily injury or in respect to loss or damage to any property which arises out of or in consequence of the execution of the Project to the extent caused by Owner/Project Manager's or Owner's Other Contractor's strict liability, intentional act or omissions or negligence; provided that the foregoing obligation shall not apply to the extent the Contractor Indemnified Parties are contributory negligent or strictly liable or to the extent such damages are caused by the intentional acts or omissions of the Contractor Indemnified Parties.

17.2 Specific Indemnification

17.2.1 Contractor shall fully indemnify, save harmless Owner/Project Manager Indemnified Parties from and against any claim, demand, liability, action, proceedings, cost or expense in favour of any third party with respect to:

a) Failure of Contractor, any Sub-contractor or any of their respective Sub-contractors to comply with Applicable Laws and Applicable Permits, Prudent Utility Practices and Good Engineering Practices.

b) Failure of Contractor to make payments of taxes relating to Contractor's, any Sub-contractor's income or other taxes required to be paid by Contractor pursuant to this Contract irrespective of whether they are reimbursable or to be compensated under the terms of this Contract.

c) Any Hazardous Materials Contractor, any Sub-contractor, or any of their respective Sub-contractors has at any time brought on and caused the release thereof on or from the Site or for which any of them is responsible by law or in the Contract.

17.2.2 Owner/Project Manager shall fully indemnify, save harmless and Contractor Indemnified Parties from and against Damages in favour of any third party with respect to:

a) Failure of Owner/Project Manager or any of its Other Contractors to comply with Applicable Laws and Applicable Permits.

b) Any Hazardous Materials of Owner/Project Manager, or any of its Other Contractors (other than Offshore Supply Contractor, Onshore Supply Contractor, and Onshore Services Contractor, and the Sub-contractors) has brought on and caused the release thereof from the Project Site.

17.3 Intellectual Property Indemnification

17.3.1 In performing the Services, Contractor shall not incorporate into the Relevant Package, or use in connection with the Relevant Package or the performance of the work, any materials, methods, processes, systems or service that involve the use of any confidential information, intellectual property or proprietary rights that Contractor does not have the right to use or incorporate or which may result in claims or suits against Owner/Project Manager, Contractor or any Sub-contractor arising out of claims of infringement of any third party, domestic or foreign patent rights, copyrights, other proprietary rights, or intellectual property rights, licenses or agreements, or applications for any thereof, or rights of use of confidential information.

17.3.2 Contractor shall provide Owner/Project Manager with a perpetual, royalty free license for the use of all Intellectual Property incorporated within the Relevant Package for the sole purpose of operations and maintenance of the Relevant Package.

17.3.3 Contractor shall fully indemnify and save harmless and defend the Owner Indemnified Parties from and against any and all Damages that the Owner Indemnified Parties may suffer, incur or pay by reason of any claims or suits arising out of claims of infringement of any patent rights, copyrights or other intellectual property, proprietary or confidentiality rights with respect to equipment, designs, techniques, processes and information designed or used by Contractor or any sub-Contractor in performing the Work or supply of Goods hereunder or under the Sub-Contracts in any way incorporated in or related to the Project other than any such equipment, designs, techniques, processes and information provided by the Owner Indemnified Parties.

17.3.4 If, in any suit or claim relating to the foregoing, a temporary restraining order or preliminary injection is granted, Contractor shall make every effort to secure the suspension of the injunction or restraining order. If, in any such suit or claim or any part, combination or process thereof, is finally held to constitute an infringement and its use is permanently enjoined, Contractor shall promptly make every reasonable effort to secure for Owner/Project Manager a license, at no Cost to Owner/Project Manager, authorising continued use of the infringing Goods or Work. If Contractor is unable to secure such license within a reasonable time so as to not affect the project Contractual Time for Completion, Contractor shall, at its own expense and without impairing performance requirements, either replace the affected Goods or Work, or part, combination or process thereof with non-infringing components or parts or modify the same so that they become non-infringing.

17.3.5 Final payment to the Contractor by the Owner/Project Manager will not be made while any such suit or claim remains unsettled.

17.4 Notice and Legal Defence

17.4.1 Promptly after receipt by a party of any claim or Notice of the commencement of any action, administrative or legal proceeding, or investigation as to which the indemnities provided may apply, such Party shall notify the other Party in Writing of such fact provided that the failure of a Party to give any such Notice promptly shall not excuse the indemnifying party from its indemnification obligations hereunder except to the extent any such failure actually prejudices the indemnifying Party in the defence of such matters.

17.4.2 The indemnifying Party shall assume on behalf of the indemnified Party and conduct with due diligence and in good faith the defence thereof with counsel reasonably satisfactory to the indemnified Party; provided that the indemnified Party shall have the right to be represented therein by advisory counsel of its own selection and at its own expense; and provided, further, that if the defendants in any such action include both the indemnifying Party and the indemnified Party and the indemnified Party shall have reasonably concluded that there may be legal defences available to it which are different from or additional to, or inconsistent with, those available to the indemnifying Party, the indemnified Party shall have the right to select separate counsel to participate in the defence of such action on its own behalf at the indemnifying Party's expense.

17.4.3 The indemnified Party shall, at the request of the indemnifying Party, provide all reasonably available assistance in the defence or settlement of any such claim, action, proceeding or investigation, and all reasonable costs and expenses incurred by the indemnified Party in connection with the defence or settlement of any such claim, action, proceeding or investigation shall be reimbursed by the indemnifying Party promptly upon demand thereof. The indemnified Party shall not settle or compromise any claim, action or proceeding without the prior Written consent of the indemnifying Party such consent not to be unreasonably withheld.

17.5 Failure to Defend Action

If any claim, action, proceeding or investigation arises as to which the indemnities provided may apply, and the indemnifying Party fails to assume the defence of such claim, action, proceeding or investigation, then the indemnified Party may at the indemnifying Party's expense contest or settle such claim.

17.6 Survival: Expiration of Indemnity

The provision of this Clause 17.0 shall survive final acceptance or the termination of this Contract; provided that neither Party shall have any indemnity obligations pursuant to this Clause 17.0 for any claim arising out of or resulting from events or circumstances occurring after the termination of this Contract or after the expiration of the Latent Defect Liability Period; and provided further that neither Party shall have any indemnity obligation pursuant to this Clause 17.0 unless notice of any such claim for indemnity by either Party is received by the indemnifying Party prior to the date that is three (3) years after the expiration of the Latent Defect Liability Period.

18.0 CONTRACTOR'S CARE OF THE WORKS

18.1 The Contractor shall take full responsibility for the care of the Works from the Effective Date until the date of issue of the Certificate of Take Over when responsibility shall pass to the Owner/Project Manager. If the Owner's Representative issues a Certificate of Take Over for part of the Works, the Contractor shall cease to be responsible for the care of that part from the date of issue of such Certificate of Take Over when responsibility shall pass to the Owner/Project Manager.

18.2 The Contractor shall take responsibility for the care of any outstanding Work or obligations which is required to be completed/ fulfilled prior to the expiry of the Contract Period, until the Owner's Representative confirms in Writing that such outstanding Work or obligation has been completed/fulfilled.

18.3 If any loss or damage happens to the Relevant Package, during the period for which the Contractor is responsible, the Contractor shall rectify such loss or damage, at his cost, so that the Works conform with the Contract. The Contractor shall also be liable for any loss or damage to the Works caused by operations carried out by the Contractor after the date of issue of the Certificate of Take Over until the expiry of the Contract Period in so far as such loss or damage is not covered under Insurance to be taken by the Owner/Project Manager for operation of Plant.

19.0 LIMITATION OF LIABILITY

19.1 No consequential Damages, etc.

Except for any specific liability which may be identified in the Contract and which may be payable hereunder, Contractor shall not be liable for any special, incidental, indirect, or consequential Damages or any loss of business Contracts, revenues or other financial loss (or equivalents thereof no matter how claimed, computed or characterised) arising out of or in connection with the Performance of the Work or supply of Goods unless caused by Contractor's negligence or wilful misconduct. In addition, Owner/Project Manager shall have no liability or any special, incidental, indirect or consequential Damages for any loss of business Contracts, revenues or other financial loss arising out of this Contract.

19.2 Limitation of Liability

19.2.1 Contractor's liability under the Contract shall be limited as below :

(i) with respect to delay in achieving the Guaranteed Completion Dates, the Liquidated Damages for Delay shall be ten percent (10%) of the Contract Price.

(ii) with respect to shortfall in Performance Guarantees (As detailed under clause 11.2) the Performance Liquidated Damages shall be fifteen per cent (15%) of Contract Price;

(iii) the overall cap on Liquidated Damages (for Delay, and Performance) shall be twenty per cent (20%) of the Contract Price;

19.2.2 Not used

19.2.3 Payment of the above Delay Liquidated Damages shall not affect or prejudice in any way or manner Owner/Project Manager's right to terminate the Contract nor shall any termination of Contract prejudicially affect the Owner/Project Manager's right to recover any accrued Delay Liquidated Damages or release the Contractor from any obligation for payment thereof.

19.3 Maximum Liability

The Contractor's aggregate liability under or arising out of or in connection with this Contract, its performance or breach shall be limited to the Contract Price. This shall, however, exclude his liability for Liquidated Damages for Delay and Performance pursuant to Clause 11.0 and any and all third party liabilities or indemnities including Intellectual Property Indemnification pursuant to Clause 17.0 and other provisions of the Contract.

19.4 Exclusive Remedies

The Owner/Project Manager's and Contractor's remedies and liabilities that are identified in this Contract shall be the sole and exclusive remedies available to the Parties in respect of matters to which they are said to relate in this Contract irrespective of any rights and remedies which might be available at common law, in tort (including negligence), by statute or otherwise.

20.0 FORCE MAJEURE

20.1 Definition of Force Majeure

"In this Clause, "*Force Majeure"* shall mean an event or circumstance beyond the reasonable control of the Owner/Project Manager or the Contactor which could not have been foreseen, prevented or mitigated by such Party using its reasonable diligence and which makes it impossible for such Party to perform the whole or in part its obligations under the Contract, including but not limited to:

a) Act of God;

b) An act of war, (whether declared or undeclared) hostilities invasion, armed conflict or an act of foreign enemies, blockade, embargo, revolution, military action, or sabotage.

c) Contamination by radio-activity from any nuclear fuel, or form any nuclear waste from the combustion of nuclear fuel, radioactive toxic explosive, or other hazardous properties.

d) Riot, civil commotion, terrorism or disorder, unless solely restricted to employees of the Contractor or of his Sub-contractors.

e) National or regional industrial disputes or targeted disputes which are part of national or regional campaign and which is not reasonably within the powers of a Party to prevent, or which is not specific to the Party or any of his Contractors or Subcontractors.

f) Operation of the forces of nature such as earthquake, hurricane, lightning, tidal wave, tsunami, typhoon or volcanic activity.

20.2 Excused Performance

If either Party is rendered wholly or partially unable to perform its obligations under this Contract because of a Force Majeure Event, that party will be excused from whatever performance is affected by the Force Majeure event to the extent so affected provided that:

a) The affected Party gives the other Party Written Notice of the occurrence of the Force Majeure Event as soon as practicable after the occurrence of the Force Majeure Event and also gives the other Party Written Notice describing in reasonable detail the particulars of such occurrence, including an estimation of its expected duration and probable impact on the performance of such Party's obligations hereunder, and thereafter continues to furnish thereto timely regular reports with respect to continuation of the Force Majeure Event;

b) The suspension of performance shall be of no greater scope and of no longer duration than is reasonably required by the Force Majeure.

c) No liability of either Party which arose before the occurrence of the Force Majeure Event causing the suspension of performance shall be excused as a result of the occurrence.

d) The affected Party shall exercise all reasonable efforts to mitigate or limit Damages to the other Party.

e) The affected Party shall use its best efforts to continue to perform its obligations hereunder and to correct or cure the event or condition excusing performance;

f) When the affected Party is able to resume performance of its obligations under this Contract, that Party shall give the other Party Written Notice to that effect and shall promptly resume performance hereunder.

20.3 Limitations

Anything in this Contract to the contrary notwithstanding.

a) Any act, event, or occurrence listed above or asserted as a Force Majeure Event that results materially from the negligence or intentional acts of the affected party (including in the case of Contractor or any Sub-contractor thereof) shall not constitute a Force Majeure Event; and

b) The affected Party shall not be relieved from obligations under this Contract to the extent that the negligence or wilful misconduct of the affected Party (or in the case of Contractor or any Sub-contractor thereof) contributes to or aggravates the Force Majeure Event.

20.4 Effect of Force Majeure Event

Neither the Owner/Project Manager nor the Contractor shall be considered in default or in Contractual breach to the extent that performance of obligations is prevented by a Force Majeure Event, which arises after the Effective Date. Except as otherwise provided in a Change Order, an extension of time shall be granted to Contractor only to the extent Contractor proves to Owner/Project Manager;

a) The performance of the Work or supply of Goods is actually and necessarily delayed by an event of Force Majeure and

b) The effect of such event of Force Majeure could not have been prevented or avoided or removed despite exercise of reasonable due diligence whether before, after or during the event of Force Majeure.

20.5 Payment to Contractor

If, in consequence of Force Majeure, the Plant or any part thereof shall suffer loss or damage, the Contractor shall be entitled to claim and receive payment for the cost of Work or supply of Goods executed in accordance with the Contract, prior to the event of Force Majeure.

20.6 Optional Termination, Payment and Release

Irrespective of any extension of time, if a Force Majeure event occurs and its effect continues for a continuous period of 5% time period of the "Contractual time for Completion" or have been delayed for a cumulative period in excess of 7% time period of the "Contractual time for Completion", either the Owner/Project Manager or the Contractor may give to the other a Notice of termination, which shall take effect 30 (thirty) Days after the giving of the Notice. If, at the end of the 30 (thirty) Day period, the effect of the Force Majeure continues, the Contract shall terminate. If the Contract is terminated under this clause no. 20.6 or clause no. 15.1 or 16.2, the Owner/Project Manager shall determine the work done and pay to the Contractor.

a) The amounts payable for any Work or supply of Goods carried out for which a Price is stated in the Contract;

b) The cost of Relevant Package and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: such Plant and Materials shall become the property of (and be at the risk of) the Owner/Project Manager against payment therefore by the Owner/Project Manager, and the Contractor shall place the same at the Owner/Project Manager's disposal promptly upon receipt of request in respect thereof from the Owner/Project Manager.

21.0 FINANCING (as applicable)

21.1 Contractor must submit a breakdown of their equipment and Services by country of origin.

21.2 The Contractor acknowledges that the Owner/Project Manager will seek financing from a variety of sources. The Contractor shall cooperate, facilitate and assist the Owner/Project Manager in complying the requirements of the Financing parties for buyer's credit including:

a) Shall comply with the applicable sourcing rules and Safety, Health & Environmental requirements of the Financing Parties.

b) Acknowledges that the Financing Parties may comment on the Contract and the terms and conditions thereof, and shall negotiate in good faith with Owner/Project Manager and / or the Financing Parties regarding changes requested by the Financing Parties.

c) Acknowledges that the Financing Parties will appoint a Lender's Independent Engineer to represent the Financing Parties in connection with the financing of the Works. The Lenders Independent Engineers duty will include monitoring, checking, inspecting/witnessing the carrying out of the Works and Witnessing the Tests before Take-over.

d) Acknowledges that the Plant and Materials of Works will have to be secured/hypothecated and secured with the lenders/financers and he shall co-operate with them and provide them all information required by them from time to time.

21.3 The Contractor shall seek performance solely from the Owner/Project Manager to satisfy the Owner/Project Manager's obligations under this Contract.

21.4 The Contractor agrees, upon Lenders' request, to enter into a Direct Agreement with the Lenders in the form reasonably required by the Lenders.

22.0 CLAIMS, DISPUTES, MUTUAL SETTLEMENT & ARBITRATION

22.1 Procedure for Claims

22.1.1 If the Contractor or Owner/Project Manager intends to claim any additional payment under any clause of these conditions, the Party claiming shall give Notice to the other Party or as soon as possible and in any event within 30 (thirty) Days of the start of the event giving rise to the claim.

22.1.2 Within 30 (thirty) Days of such Notice, or such other time as may be agreed, the Party claiming shall send to the other Party an account, giving detailed particulars of the amount and basis of the claim along with the necessary supporting documentation. Where the event giving rise to the claim has a continuing effect, such account shall be considered as interim. The Party claiming shall then, at such intervals as the other Party may reasonably require, send further interim accounts giving the accumulated amount of the claim and any further particulars. Where interim accounts are sent to the other Party, the Party claiming shall send a final account within 15 Days of the end of the effects resulting from the event.

22.1.3 If the Party claiming fails to comply with this clause no. 22.1.2, he shall not be entitled to any additional claim and shall be deemed to have waived the same.

22.2 Mutual Settlement

22.2.1 Any disputes or differences arising out of or in connection with the Contract shall, to the extent possible, be settled amicably between the Parties.

22.2.2 If any dispute or difference of any kind whatsoever shall arise between Owner/Project Manager and Contractor, arising out of the Contract for the performance of the Works whether during the progress of Works or after its completion or whether before or after termination, abandonment or breach of Contract, it shall, in the first place be referred to and settled by Owner's Representative, who within a period of 30 (thirty) Days on request by either Party to do so, shall give Written Notice of his decision to the Owner/Project Manager and the Contractor.

Save as hereinafter provided, such decision in respect of every matter so referred shall be final and binding upon the Parties until the completion of the entire Works and shall forthwith be given effect to by the Owner/Project Manager and/or the Contractor, as applicable, who shall comply with all such decisions with all due diligence.

If the Owner's Representative has given Written Notice of his decision to the Parties and no claim to arbitration has been communicated to him by either Party within 30 (Thirty) Days from receipt of such notice, the said decision shall become final and binding on the Parties.

In the event of the Owner's Representative failing to notify his decision as foresaid within 30 (Thirty) Days after being requested as aforesaid, or in the event of either the Owner/Project Manager or the Contractor being dissatisfied with any such decision, as the case may be, within 30 (Thirty) Days after the expiry of first mentioned period of 30 (Thirty) Days, as the case may be, either Party may require that the matter in dispute be referred to arbitration as hereinafter provided.

22.2.3 All disputes or differences in respect of which the decision, if any, of the Owner's Representative has not become final or binding as aforesaid, shall be referred within the next thirty (30) days, for resolution by the intervention of the Managing Director's or CEO's of the respective Parties within the next thirty (30) days through mutual agreement.

22.3 Arbitration

22.3.1 If the disputes or differences under Clause 22.2.3 herein above are still not resolved, the same shall be referred for arbitration in accordance with the Indian Arbitration & Conciliation Act, 1996, or any statutory modification or enactment thereof for the time being in force on the date of the reference to arbitration.

22.3.2 The Contractor and the Owner/Project Manager will continue to perform their respective obligations under the Contract during the Arbitration proceedings unless such performance itself relates to the dispute referred to Arbitration pursuant to this sub-clause.

22.3.3 The Arbitrator Panel shall consist of 3 (Three) arbitrators, one to be appointed by the Owner/Project Manager and Contractor respectively and a third one to be appointed by the two arbitrators so appointed by the Owner/Project Manager and the Contractor and the third arbitrator shall be appointed in accordance with the provisions of the Indian Arbitration and Conciliation Act, 1996. It is to be noted that when one party appoints an Arbitrator, the other party should appoint their Arbitrator within 30 Days. The arbitration shall be held in Mumbai and the courts in Mumbai shall have jurisdiction on any matter connected with any Arbitration under this clause no.22.3.

22.3.4 Arbitration shall be sole and exclusive remedy between the Parties regarding the dispute referred to Arbitration and any claims, counterclaims issues or accountings presented or plead to the arbitrators in connection with such dispute.

22.3.5 The award rendered in any Arbitration commenced hereunder shall be final and conclusive. The award should be implemented and promptly paid.

22.3.6 The Arbitrators shall have full powers to review or revise the decisions, opinions, certifications or valuations of the Owner's Representative. The Owner/Project Manager and the Contractor hereby undertake to carry out the award without delay. The expenses of Arbitration shall be paid as may be determined by the arbitrators. They may from time to time, with the consent of the Parties, enlarge the time for making the award. In case of aforesaid arbitrators dying, neglecting, resigning or being unable to act for any reason, it will be lawful for the Parties to nominate another arbitrator with mutual consent of both the parties.

22.3.7 No decision of the Owner's Representative in accordance with foregoing provisions shall disqualify him as being called as a witness or giving evidence before the arbitrators on any matter whatsoever relevant to the dispute or difference referred to arbitrators as foresaid.

22.3.8 This clause no. 22.3 shall remain in full force and effect notwithstanding any lawful termination of the Contract where either Arbitration has already commenced or the liabilities between the Owner/Project Manager and the Contractor have not been fully determined.

23.0 ENFORCEMENT OF TERMS

23.1 The failure of either Party to enforce at any time any of the provisions of this Contract or any rights in respect thereto or to exercise any option therein provided, shall in no way be construed to be a waiver of such provisions, rights or options or in any way to effect the validity of the Contract.

23.2 The exercise by either Party of any of its rights herein shall not preclude or prejudice either Party from exercising the same or any right it may have hereunder.

24.0 REPRESENTATIONS & WARRANTIES

Each Party hereby represents and warrants to the other Party that:

24.1 Organization, Power and Authority.

It is duly organized and validly existing under the laws of its jurisdiction of incorporation and is qualified to do business in India/ any other country as specified in SCC, and in all other jurisdictions in which the nature of the business conducted by it makes such qualification necessary, and has all requisite legal power and authority to carry on its business and to execute this Contract and to perform the terms, conditions and provisions hereof.

24.2 Authorization.

The execution, delivery and performance by such Party of this Contract have been duly authorized by all requisite corporate action.

24.3 Enforceability.

This Contract constitutes the legal, valid and binding obligation of such Party, enforceable in accordance with the terms hereof.

24.4 No Conflict.

Neither the execution nor delivery nor performance by such Party of this Contract, nor the consummation of the transactions contemplated hereby, will result in a violation of, or a conflict with, any provision of the organizational documents of such Party; a contravention or breach of, or a default under, any term or provision of any indenture, contract, agreement or instrument to which such Party is a party or by which such Party or its property may be bound, or a violation by such Party of any Law.

24.5 No Violation of Law.

It is not in violation of any Law, which violations, individually or in the aggregate, could reasonably be expected to have an adverse effect on it or its performance of any obligations hereunder.

24.6 Litigation.

There is no action, suit or proceeding now pending or (to its best knowledge) threatened against it (or any Subcontractor, in the case of the Contractor) before any court or administrative body or arbitral tribunal that could reasonably be expected to adversely affect the ability of such Party (or any Subcontractor, in the case of the Contractor) to perform its obligations hereunder (or under any Subcontract) other than those notified to the Project Company in writing by the Contractor.

24.7 Contractor's Representations and Warranties.

The Contractor represents and warrants that:

24.7.1 It has or will be the holder of all Permits required to allow it to operate or conduct its business as contemplated hereby;

24.7.2 It has thoroughly examined this Contract, the Technical Specifications and all applicable Laws and has become familiar with their terms;

24.7.3 It has, and its Subcontractors have, full experience and proper qualifications to manufacture Equipment and perform the Work and to construct the Relevant Package under the Contract.

It has ascertained the nature and location of all Work to be performed at the Site, the character and accessibility of the Site and its surrounding areas, availability of lay-down areas for Equipment and tools, the existence of obstacles to construction (including any reasonably identifiable underground obstacles, if any, referred to in this Contract), the availability of facilities and utilities, the location and character of existing or adjacent work or structures, the conditions of roads, waterways and railroads in the vicinity of the Site and in the relevant State in India, including the conditions affecting shipping and transportation (such as the limitations of bridges and tunnels), access, disposal, handling and storage of materials, the surface conditions and other general and local conditions, including labour, safety, weather, environmental conditions, geological conditions, if any, noted in this Contract, water supply, water quality, waste water capacity of existing municipal systems and all other matters that might affect its performance of the Work or its costs or the construction of the relevant Package

24.7.4 All services provided and procedures followed by the Contractor hereunder to engineer, design, procure, construct, commission, start-up and test all the Equipment and other items in the Relevant Package shall be done in a workmanlike manner and in accordance with:

a) Prudent Utility Practices, Engineering Standards and the Design Specifications;

b) All applicable requirements of all applicable Laws;

c) All requirements of this Contract; and

d) All instructions of Vendors and manufacturers of Equipment, including instructions relating to storage, erection and testing;

e) Requirements of the latest Gazette of India - CEA Notification Sr. No.211 dated 20th August 2010: – “Technical standards for construction of electrical plants and electric lines;

f) International safety standards & codes for engineering / design;

g) Relevant sustainability standards & codes.

24.7.5 It is familiar with all necessary facilities for delivering, handling and storing all Equipment and other parts of the Work

24.7.6 It is familiar with all labour conditions and agreements relating to the performance of the Work;

24.7.7 It will design the Equipment and Work for Relevant Package so that the useful life thereof may reasonably be expected to thirty (30) years;

24.7.8 The Contractor has no reason to believe that any Contractor Permits will not be readily obtainable by the Contractor in the ordinary course of business upon due application therefore;

24.7.9 It has satisfied itself as to the means of communication with and access to and through the Site and accommodations it may require and the precautions and times and methods of working necessary to prevent any Contractor Person from creating any nuisance or interference, whether public or private, which might give rise to any law and order problems within or outside the Site.

25.0 MISCELLANEOUS

25.1 Non-Waiver.

Neither Party shall be deemed to have waived any right under this Contract unless such Party shall have delivered to the other Party a written waiver signed by such waiving Party. No failure or successive failure by either Party to enforce any covenant or agreement, and no waiver or successive waivers by either party of any condition of this Contract, shall operate as a discharge of such covenant, agreement or condition, or render the same invalid, or impair such Party's right to enforce the same in the event of any subsequent breach thereof by the other Party.

25.2 Severability.

If any of the terms, covenants or conditions hereof or the application of any such term, covenant or condition shall be held invalid or unenforceable as to either Party or as to any circumstance by any court or arbitrator having jurisdiction, the remainder of such terms, covenants or conditions shall not be affected thereby, shall remain in full force and effect and shall continue to be valid and enforceable in any other jurisdiction. In such event, the Parties shall negotiate in good faith to substitute a term, covenant or condition in this Contract to replace the one held invalid or unenforceable by a mutually agreed amendment to this Contract with a view toward achieving a valid and enforceable legal and economic effect as similar as is then reasonably possible to that originally provided for in this Contract.

25.3 Survival of Provisions.

In order that the Parties may fully exercise their rights and perform their obligations hereunder arising from the performance of the Work, such provisions of this Contract that are required to insure such exercise or performance shall survive the termination of this Contract for any cause whatsoever.

25.4 Entire Agreement.

This Contract constitutes the entire agreement and contains all of the understandings and agreements of whatsoever kind and nature existing between the Parties, and supersedes, to the extent permitted by Indian law, all prior written or oral agreements, commitments, representations, communications and understandings between the Parties.

25.5 Amendment.

No amendment, waiver or consent relating to this Contract shall be effective unless it is in writing and signed by the Parties.

25.6 Successors and Assigns.

All of the terms and provisions of this Contract shall be binding upon and inure to the benefit of the Parties and their respective successors and permitted assigns. This Contract is for the sole benefit of the Parties, and to the extent provided herein, the Indemnitees, and is not for the benefit of any other Person.

25.7 Counterparts.

This Contract may be executed in one or more counterparts, each of which shall be deemed to be an original and all such counterparts shall together constitute one and the same contract.

25.8 No Benefit to Third Parties.

For the avoidance of doubt, this Contract is not intended to confer any legally enforceable rights on any Person other than the Parties, their successors in title and their permitted assignees, whether pursuant to the Contracts (Right of Third Parties) Act 1999 or otherwise.

25.9 **Certification**

The Contractor must be ISO 14001 and OHSAS-18001 certified. In the event Contractor does not have the certification, then the Contractor shall immediately apply for and obtain these accreditations before the commencement of Site Works. Owner shall not permit any work at Site unless Contractor presents bonafide evidence towards obtaining these certifications. Time/cost extension shall not be allowed for any delay in Project Schedule due to Contractor's failure in timely obtaining of these accreditations. Contractor must also certify that the handling, use and disposal of the product shall be consistent with sound environment management.

26.0 Sustainability

The Contractor shall abide to the Owner / Project Manager's Corporate Environment policy, Corporate Sustainability Policy and Corporate Sustainable Procurement Policy (enclosed with the tender document)

The Contractor should strive towards Conservation of Energy, Water, Resources and optimize transportation of Men & Materials to minimize environmental impact and reduce carbon footprint.

The Contractor should carry out the assessment of materials used for construction, operation & maintenance, consumables and accordingly phase out those materials which are environmentally hazardous.

The Contractor organization should be ISO 14001 and SA 8000 and OHSAS-18001 certified. If not, please certify that the handling, use and disposal of your product consider practices consistent with sound environment management.

The Contractor should commit: that no child labour, No forced labour, Non-discrimination on the basis of caste, colour, religion, gender, disability and any other factor unrelated to the requirements of the job.

The Contractor should commit to equal pay for equal value of work, especially for women.

The Contractor should carry out assessment of their Sub-contractors on their Sustainability Readiness so that they comply with the above mentioned standards.

27.0 Total Compliance to TCOC, SHE and Contractor Safety Terms & Conditions

The Contractor shall abide and comply with Owner / Project Manager's Safety, Health & Environment policies, Contractor Safety Terms & Conditions, Sustainability and TCOC manuals / documents as enclosed with the tender in totality.

28.0 Novation

At the Owner's sole discretion, the Contractor shall have no objection and will fully extend co-operation for Novation of this Contract to any Tata Group Companies including Tata Power associates and subsidiaries; if the situation so warrants

29.0 Declaration by Contractor

All articles, Clauses, Conditions, Manuals, instructions cross referred in this GCC are fully read, understood by the Contractor in their entirety for fruitful implementation.

ANNEXURE – I RESPONSIBILITY FOR PERMITS, CLEARANCES AND LICENSES (AS APPLICABLE)

IMPORTANT NOTE: The following Annexure I shall supplement the details mentioned in Technical Specifications. To the extent there is a conflict, the provisions in Technical Specifications shall prevail over those specified in the following Annexure I:

Where the required permits, clearances and licenses are issued by the relevant/ applicable authority for the complete Facility (the overall Generating Station), Owner shall be responsible for obtaining such permits, clearances and licenses. The Contractor shall however, support the Owner by providing necessary documentation for seeking applicable statutory clearances e.g. factory clearance, waste disposal clearances, etc. The actual clearances (which are related to the existing Site) will be pursued and sought by the Owner.

The Contractor is required to participate in the discussions with the statutory authorities as and when required by the Owner. The Contractor shall comply with all the requirements / guidelines of statutory bodies in order to get the Relevant Package certified by them. The Contractor shall facilitate, support and take the ownership for complying with all such statutory directives / guidelines.

The responsibility of obtaining all permits, clearances and licenses which are required specifically for the Relevant Package and / or applicable specifically for the operation of the Relevant Package shall be of the Contractor. Also, the responsibility of obtaining all permits, clearances and licenses which are required specifically for the execution of the Contract including those required for carrying out the Site Services in relation to the scope mentioned in Technical Specifications such as but not limited to equipment transportation, site construction, Electrical Inspectorate license, erection & commissioning activities, such as Labour License, ensuring PF and ESIC coverage for labour etc. shall be in Contractor's scope. Contractor shall get their applications duly endorsed/ forwarded / certified by the concerned Owner/Project Manager representative"

Wherever consent and approval is taken by Owner as a part of Responsibility Matrix indicated above, it would be the responsibility of the Contractor to ensure that there are no non-compliances caused by their action provided further that the Contractor shall not be responsible for such non-compliance if caused by discharges from the Relevant Package which are within the specified limits as per the Technical Specifications. Owner/Project Manager would provide copies of all approvals at its Project Management office for reference by Contractor.

ESG FRAMEWORK FOR BUSINESS ASSOCIATES

Tata Power's Sustainability philosophy sits at the core of its Business Strategy. Tata Power Sustainability Model has an overarching objective of 'Leadership with care' with key elements of 'Care for the Environment'; 'Care for the Community'; 'Care for our Customers & Partners' and 'Care for our People'. These sustainability objectives encompass the Environmental, Social and Governance objectives driven as integrated elements.

Tata Power, together with its stakeholders is determined to achieve sustainable growth while creating shared value for all.
As a part of future ready roadmap, Tata Power has targeted following as our Environment Social and Governance priorities:

- Being Carbon Net Zero before 2045
- Growing Clean capacity (80% by 2030)
- Customer centricity
- Becoming water neutral before 2030
- Achieving zero waste to landfill before 2030
- No net loss of biodiversity before 2030
- Positively impacting 80 million lives by 2027

In order to create a sustainable business ecosystem, Tata Power expects that all its Business Associates (BA) which includes its suppliers, vendors, consultants and service providers to align to its ESG and sustainability commitments.

Tata Power encourages improved efficiencies and scaling up of green initiatives through technology and innovation taking us farther on the journey of reducing carbon emissions and preparing the entire eco-system towards products and services that would have net positive impact on the environment and communities that we operate in.

The Vendors/ bidders wishing to associate with Tata Power are expected to share their own sustainability and ESG journey. We at Tata Power promote all Business Associates to have a sustainable procurement policy for their supplier and service providers to contribute to our integrated approach in achieving a sustainable supply chain. The BA is encouraged to carry out the assessment of their sub-contractors and sub-vendors on sustainability readiness so that they are aware of the expectation/ business requirement.

The Vendor/ Bidder shall fill-in the 'Environment, Social and Governance Compliance Screening Questionnaire for Business Associates' attached at Annexure-I and submit the same along with the Bid in Ariba online platform.

Responsible Supply Chain Management:

Tata Power is committed for a cleaner environment and respect of Human rights through its Responsible Supply Chain Management policy.
Tata Power Business Associate (BA) shall comply with all the environment & Human rights related laws, including emission norms, Labour and environmental regulations.

Tata Power encourages its BA to focus on green design, green supply, green production green logistics and green packaging in performing their business obligations. The BA is expected to abide by the Tata Power Corporate Environment policy, Energy Conservation and Corporate Sustainability Policy (enclosed with this document as Annexure-II).

The BA is expected to:

- Strive towards Conservation of Energy, Water, Resources and optimize transportation of Men & Materials to minimize environmental impact and reduce carbon footprint.
- Carry out the assessment of materials used for construction, operation & maintenance, consumables and accordingly phase out those materials which are environmentally hazardous.
- Be cognizant that diversity in the workplace positively impacts business.
- Promote affirmative action by supporting people from SC/ ST background by engaging workforce from SC/ ST community under the contracts agreed herein.
- Share the commitment of 'No child labour', 'No forced labour', Non-discrimination on the basis of caste, colour, religion, gender, disability, maternity or pregnancy or any other factor unrelated to the requirements of the job
- Pay the wages or remuneration to the workforce, personnel deployed in compliance to all applicable laws and regulations.
- Provide its employees/ deployed labor with an employment environment that is free of physical or psychological harassment.
- Carry out the assessment of their Sub-contractors on their Sustainability Readiness so that they are aware of the above expectation/ standards
- To ensure usage of suitable package material which is more environmentally sustainable. Further the packing material shall be recycled to the extent possible. The material used for packing is expected to suit the mode of transport and to ensure its safe receipt at point of delivery.

Waste Disposal:

The BA is expected to follow best practices for disposal of waste, few of which are listed below:

- Have a detailed project plan that includes the waste management, segregation of all designated waste material (Recyclable/ Non-Recyclable), collecting, storing, disposing and transferring the same to pre-arranged facility/ destination in timely and safe manner as per environmental legislations. The project plan shall also include the innovative construction practice to eliminate or minimize waste, protect surface/ground water, control dust and other emissions to air and control noise.

- Have purchase policy to encourage the procurement of material with recycled and minimum packaging of goods during delivery and appropriate means for site-to-site transportation of materials to avoid damage and litter generation.

- Ensure that the residents living near the site are kept informed about proposed working schedule and timings/ duration of any abnormal noise full activity that is likely to happen.

- Ensure the regular maintenance and monitoring of vehicles and equipment for efficient fuel use so that emissions and noise are within acceptable limits to avoid air pollution.

Water Management:

The BA is expected to follow best practices for water management, few of which include a management and monitoring system for water withdrawals and consumption, procedures to reduce water usage or reuse/recycle water, and pretreatment of wastewater before disposal.

Compliance to Law:
The BA shall adhere to responsible business practices and comply with the provision of all the Statutory Acts Applicable. Special attention of the BA is drawn towards the compliance of provision of the following statues: (along with the latest amendments/additions, as applicable):

- The Child Labour (Prohibition and Regulation) ACT, 1986.
- The Contract Labour (Regulation and Abolition) ACT, 1970.
- The Employee's Pension Scheme, 1995.
- The Employee's Provident Funds and miscellaneous provisions Act, 1952.
- The Employees State Insurance Act, 1948.
- The Equal Remuneration Act, 1976.
- The Industrial Disputes Act, 1947.
- The Maternity Benefit Act, 1961.
- The Minimum Wages Act, 1948.
- The Payment of Bonus Act, 1965
- The Payment of Gratuity Act, 1972.
- The Payment of Wages Act, 1936.
- The Shops & Establishment Act, 1954.
- The Workmen's Compensation Act, 1923.
- The Employer's Liability Act, 1938.
- and any other applicable statutory act

Social Accountability (SA 8000):

Tata Power expects its BAs to follow guidelines of SA 8000:2014 on the following aspects

- Child Labour
- Forced or Compulsory Labour
- Health & Safety
- Freedom of Association & Right to Collective Bargaining
- Discrimination
- Disciplinary Practices
- Working Hours
- Remuneration
- Management System

Health and Safety

The BA is expected to ensure the health and safety of his and his Sub-contractor's staff and labour. The BA shall, in collaboration with and according to the requirements of the local health authorities, ensure that medical staff, first aid facilities, sick bay and ambulance service are available at the accommodation and on the Site at all times, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics. The BA shall maintain records and make reports concerning health, safety and welfare of persons deployed, and damage to property, as the Owner's Representative may reasonably require. The BA shall be responsible for the medical treatment / hospitalization of his and his Sub-contractor's staff/ labour.

The BA shall appoint a qualified Safety officer at the Site to be responsible for maintaining the safety, and protection against accidents, of all personnel on the Site. Such Safety officer shall have the authority to issue instructions and take protective measures to prevent accidents.

The BA shall comply in toto with the Tata Power's Contractor Safety Terms & Conditions, Health Safety & Environment Manual while working on Tata Power Site/ Services/ Contracts.

Grievance Mechanism

The BA is expected to have grievance procedures that allow stakeholders to anonymously bring environmental and/or work-related violations and/or concerns to the attention of management. In addition, the BA is expected to have procedures for examining reports of environmental and/or work-related violations or concerns and/or privacy complaints.

Data Protection

The BA is expected to have a formal process to address data security or privacy issues.

ANNEXURE-I

Sr. No.	Question Description	Response (Y/N)	Remarks
Organization			
1	Does your Company have Sustainability Policy at Organization Level? If Yes, Please attach		
2	Do you have sustainable procurement policy in place for your own suppliers? If Yes, Please attach		
3	Does your company do regular assessment of its suppliers on ESG parameters?		
4	Are there ESG risks, or negative impacts identified in your supply chain		
Governance			
1	Is diversity taken into consideration when appointing board members/ senior management? Do you have an independent director/s?		
2	Has your company taken initiatives to ensure ethical practices at workplace? Please share the details, Policies etc.		
3	Does your company have a formal process to address data security or privacy issues? Please share the details, Policies etc.		
4	Does your company have grievance mechanism for stakeholder issues and track resolution?		
Environment/ Planet			
1	Does your company have Environmental Policy? If Yes, Please attach		
2	Do you have a formal process for waste management including solid wastes, liquid wastes and hazardous waste?		
3	Does your company track greenhouse gas emission? Also, what percentage of own consumption comes from the renewable energy?		
4	Does your company have a formal process for water management including monitoring of water consumption and withdrawals, and if applicable, pretreatment of wastewater?		
Green Technology/ Innovation			
1	Are your facility/ Product/ Services provided by you is based on green design, green production, green packaging or green logistics considerations? Please elaborate.		
2	Do your products or services have any environmental or social features or benefits (e.g. environmental/energy certification, ecolabels, fair trade certification, etc.)?		
Social/ People			
1	Does you facility/ Company have written personnel policies in place Are you an equal opportunity employer?		
2	Please describe any formal programme / campaign in place to promote company involvement with the community (volunteering, etc.). What is the percentage of profit spend on community activities?		
3	Does your company have a written Health & Safety Policy or Program? If Yes, Please attach		
Certifications: Does your company have following certifications (valid till date-please mention validity)			
1	ISO9001 accreditation		
2	SA8000 or equivalent		
3	ISO 14001 certification		
4	ISO 18001/45001 or equivalent		
5	ISO/IEC 27001 or equivalent		
6	Any Other (Please specify)		

Signature

Business Associate Name

ANNEXURE-II

CORPORATE SUSTAINABILITY POLICY

At Tata Power, our Sustainability Policy integrates economic progress, social responsibility and environmental concerns with the objective of improving quality of life. We believe in integrating our business values and operations to meet the expectations of our customers, employees, partners, investors, communities and public at large

- We will uphold the values of honesty, partnership and fairness in our relationship with stakeholders
- We shall provide and maintain a clean, healthy and safe working environment for employees, customers, partners and the community
- We will strive to consistently enhance our value proposition to the customers and adhere to our promised standards of service delivery
- We will respect the universal declaration of human rights, International Labour Organization's fundamental conventions on core labour standards and operate as an equal opportunities employer
- We shall encourage and support our partners to adopt responsible business policies, Business Ethics and our Code of Conduct Standards
- We will continue to serve our communities:
  - By implementing sustainable Community Development Programmes including through public/private partnerships in and around our area of operations
  - By constantly protecting ecology, maintaining and renewing bio-diversity and wherever necessary conserving and protecting wild life, particularly endangered species
  - By encouraging our employees to serve communities by volunteering and by sharing their skills and expertise
  - By striving to deploy sustainable technologies and processes in all our operations and use scarce natural resources efficiently in our facilities
  - We will also help communities that are affected by natural calamities or untoward incidence, or that are physically challenged in line with the Tata Group's efforts

The management will commit all the necessary resources required to meet the goals of Corporate Sustainability.

(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018

TATA POWER
Lighting up Lives!

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Section E.4: Annexure to GCC

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Appendix 3:

Safety Terms and Conditions

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Reason for Change	Date of Last Revision	Prepared By	Reviewed By	Approved by
Inclusion of Odisha Discom and periodic Revision	*10-Jan-2021-R4*	All Discom and CFT members	Debi Prasad Acharya (Head-Safety-Odisha Discom	Suresh H Khetwani (*Chief safety and Environment*)

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1.0 Objective:

The Objective of Safety Terms and Conditions is to apprise the Business Associates about various critical procedures of the Tata power Division/Discoms and the expectations from the BA to implement such procedures without fail. Certain terms and conditions are also mentioned to ensure a safe work atmosphere round the year. Refer Contractor's Safety Code of Conduct- *Document no TPSMS/GSP/ CSM/015*

2.0 Scope:

This procedure applies to all operating and project sites of The Tata Power Company Ltd and Group companies including new businesses like Electric Vehicle charging, Home Automation, Microgrid, Roof top solar etc. *This Code of Conduct also applies to all operating and project sites of four Odisha Discoms and New business based on mutually agreed timeline for implementation. R5*

3.0 Safety Organization & Responsibilities

3.1 Contractor Site Management and Supervision

Each Contractor will be responsible for fulfilling all statutory and safety requirements as per the laws of the land and not limited to Factory Act, Electricity Act, Electricity Rules and Regulations, Shop and Establishment Act etc.

Each Contractor shall provide at least one competent full-time safety supervisor for workforce of every 50 workers or less than that. When workforce ranges to 500, the contractor must provide at least one qualified safety officer (This may be subjected to change as per applicable act). Thus, for work force of 500 workers there will be one qualified safety officer and 10 safety supervisors. For every 500 additions in workforce, the contractor must add 1 safety officer and 10 safety supervisors. The Order Manager or Safety Department of the Tata Power Division /Discoms will review and approve the appointment of all safety officers and supervisors. The safety supervisors/officers will work with the guidance from Tata Power Division /Discoms Safety Department and align themselves with Tata power Division/Discom safety requirements.

For O&M related AMC activities, minimum one qualified safety officer to be deployed for each Division of the Discoms.

Qualified safety officer means he or she has completed PDIS or ADIS from a recognized institute.

Site Safety Officer/Safety Supervisor / Safety Coordinator shall be interviewed by the Order Manager/ Safety head of the Tata Power Division/Discom and then gate passes shall be issued if the interview is successful.

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Site Manager of Contractor/Subcontractor is responsible, and will be held accountable, for the safety of their own workforce as well as that of sub-contractors. He should also ensure that all equipment, materials, tools, and procedures remain in safety compliance at job site.

Responsibility of Site manager includes, but not limited to:

3.1.1 Holding officer/supervisors accountable for safety and actively promote safe work performance.
3.1.2 Participate in and cooperate with all safety program requirements to be implemented to meet Tata Power Division /Discoms safety objectives
3.1.3 Ensure timely reporting of safety incidents, near misses, unsafe acts, and conditions.
3.1.4 Identify the training needs of BA employees and maintain all safety training documents.
3.1.5 Provide Safety Performance Report at an agreed frequency.
3.1.6 Stopping of unsafe work (Acts and/or Conditions) immediately. Work to start only after corrective actions are implemented.
3.1.7 Ensure and participate in daily toolbox talk for all the jobs.
3.1.8 Ensure that only tested and certified tools and equipment are issued to the workers and being used at the site.

3.2 Contractor Supervisors and General Staff.

Contractors' site supervisors and general staff members in charge of job site functions such as field engineering, warehousing, purchasing, costing, and scheduling etc. are responsible for the safe performance of the work of those they supervise. They must set an example for their fellow employees by being familiar with applicable sections of the Site Safety program and ensuring that all site activities are performed with SAFETY as the primary objective.

Each site supervisor is responsible and will be held accountable for identifying, analyzing, and eliminating or controlling all hazards through implementation of an aggressive, pro-active Health, Safety and Environmental Program. Each supervisor will proactively participate in the Safety program by observing, correcting, and recording unsafe acts and conditions at plant / sites.

3.3 Contractor Workforce

3.3.1 *Contractors shall provide adequate quality and quantity of manpower as mutually agreed. (R5)*

3.3.2 All the contractor employees shall attend "SHE L0(Other than new business and Odisha Discom)/L1 Foundation Course in Safety". Depending on the critical procedure in job employees shall also be required to attend "SHE L2 course of critical/high risk operations". All Supervisors shall be required to attend "SHE L3 Supervisory Training". All the above trainings will be conducted by TPSDI/Skill development institute of Disco, or other equivalent institute approved by Tata Power.

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3.3.3 Contractor employees shall be required to attend any other additional training if suggested by Order manager or Site Safety Head. The cost of such additional training shall be borne by the Vendor.

3.3.4 Contractor / Vendor shall mobilize their manpower well in advance to complete the training through TPSDI/*Sill development Institute*.

3.3.5 The Vendor / BA shall arrange or bear the conveyance and food expenses incurred during training of BA employees in Odisha Discom. (R5)

3.3.6 The validity of the training L1, L2 and L3 is 3 years. *There will be competency assessment as Revalidation test in every three months for Tata Power Division and six months for Odisha Discom till one year from implementation of CSCC*.(R5) Those who fail in the competency assessment shall undergo training again.

3.3.7 Supervisors/Welder/Electricians/Line man /Fitters /Radiographers/ Riggers engaged by the contractor shall have valid competency certificates issued by authorized agency/Institute.

3.3.8 Contractor workforce must make safety a part of their job by following safety rules and regulations and by using all safeguards and safety equipment. They must take an active part in the Safety programs for the Site.

3.3.9 Every member of the workforce is expected to report for work without influence of any Drug/Alcohol. Failure to comply with this requirement shall result in immediate termination of employees under the influence of drug and alcohol plus show cause notice/penalty to the vendor.

3.3.10 All employees shall report hazardous conditions, practices and behaviours in their work areas and correct wherever possible.

3.3.11 Workforce is responsible for active participation in safety and health programs, suggestion systems, trainings and reporting of unsafe act/practices, Unsafe conditions incidents and injuries to their supervisors.

3.4 Vendor/Contractor/sub-contractor

3.4.1 Vendors/Contractor shall always comply with and ensure that their workforce comply with all site safety rules and regulations. Specifically, with applicable provisions of the Site Safety Management Plan and all statutory safety rules and regulations.

3.4.2 After receiving the work order/ purchase order vendor/contractor/bidder shall not appoint Sub-contractor without safety assessment of the sub-contractor through safety concurrence group Under Contractor Safety Code of Conduct. Penalty of 5% of contract value will be applicable to the contractor if subcontractor is appointed without the permission of SCG and without evaluation through CSCC process.

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4.0 Tools and Tackles(R5)

4.1 Tools & Tackles used to carry out the job shall be checked and inspected by Order Manager and safety Officer.

4.2 Vendor must submit a valid Certificate from Competent person under the Factories Act 1948 and State Factories Rule for all Lifting Tools and Tackles (like Hoist, D Shackles, chain Block, wire ropes etc.).

4.3 All Electrical Hand Tools must be tested for leakage of current by a person /agency authorized by Tata Power Division /Discoms. Electrical power must be taken though RCCB of 30mA. Electrical hand tools should not have cord more than 3 meters in length. If power source is at > 3 meters, extension boards with RCCB of 30 mA and ON/OFF switch, shall be used.

4.4 Removal or inclusion of tools any new tool /tackles / machinery / equipment at site should only be done with concurrence of the order Manager / Head Safety.

5.0 **Site Safety Rules and Procedures:**

The work in the safest possible manner can only happen when it has been carefully planned and all applicable procedures are followed. The Tata Power Safety Procedures are derived from Tata Power best practices and the applicable Government acts regulations. In each case, the most stringent regulation is used. All safety rules and procedures developed from time to time shall be mandatorily followed by the vendor and his employees while working at Site.

6.0 Critical safety Rules and Procedures: Following is the list of Tata Power's critical Safety Rules and Procedures. Contractor shall refer to approved Rules and Procedures for detailed requirements and ensure conformance

6.1 Lock Out and Tag Out Procedure.

This procedure is intended to be used for the protection of Personnel while servicing or performing maintenance on distribution network/ equipment / pipeline / vessel / process systems. This is a general procedure that shall be used as the minimum requirements for isolation of equipment, pipelines, machines, system from all possible sources of hazardous energy and / or material such as Steam, Hot Water, Compressed Air, any other process fluid / chemical energy /Mechanical energy or Electrical energy. For complete procedure kindly refer Procedure Document No. **TPSMS/CSP/LOTO/001**

6.2 Excavation Safety (Shoring and Sloping) Procedure

This procedure is developed to cover the safe practices required for shoring and sloping in excavation and trenching jobs. This procedure is developed to establish mandatory requirements for practices to protect personnel, property and equipment from hazards associated with above activities. For complete procedure kindly refer Procedure Document No TPSMS/CSP/EXS/002

6.3 Confined Space Entry Procedure:

This procedure outlines the steps required to perform the confined space entry and to protect personnel from the hazards of entering and conducting operations in confined spaces. For complete procedure kindly refer Procedure Document No – TPSMS/CSP/CSE/003.

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6.4 Working at Height Procedure:
This procedure describes the rules and procedures to protect employees from the hazards of working at heights. This procedure is developed to cover the safe practices required for Working at Heights. This procedure is developed to establish mandatory requirements for practices to protect personnel from hazards associated in this area. For complete procedure kindly refer Procedure Document No – TPSMS/CSP/WAH/004.

6.5 Heavy Equipment Movement Safety Procedure.
Heavy equipment lifting and movement is an activity involving loading, unloading, storage and movement from one place to another including lifting and erection or repairing of equipment with cranes or hoists. Material, machinery and equipment handling operations are being carried out by large capacity cranes and hoists, which make the job safer and faster. This procedure addresses the hazards and precautions associated with such equipment and their use. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/HEMS/005.

6.6 Mobile Crane Safety Procedure.
Mobile cranes are responsible for many incidents, injuries. Falling loads from mobile cranes pose a severe hazard to operators and nearby workers and property. Many types of cranes, hoists, and rigging devices are used for lifting and moving materials. To maintain safe, appropriate standards must be adhered to and only qualified and licensed individuals shall operate these devices. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/MCS/006.

6.7 Scaffold Safety Procedure.
This procedure is developed to provide information on the safe erection, use, dismantling and maintenance of access scaffolding in the workplace. It is developed to establish mandatory requirements for practices to protect personnel from hazards associated with erection, use and dismantling of scaffolds. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/SCAF/007.

6.8 Permit to Work Procedure.
Given the inherent hazards of the power generation and distribution industry, a significant number of TATA POWER operations and installations are critical. Work Permit (WP) System is an essential element in controlling the workplace risks in an effective manner. For complete procedure kindly refer Procedure Document No – TPSMS/CSP/PTW/008.

6.9 Job Safety Analysis (JSA) Procedure.
This objective of this procedure is to have a task-based risk assessment process in place that identifies, evaluates and controls the risks associated with work activities, and as a result, prevents those involved in the task or those potentially affected by the task, from being harmed. For complete procedure kindly refer Procedure Document No- TPSMS/CSP/JSA/009 REV 01.

6.10 Electrical Safety Procedure.

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The objective of these standards is to specify minimum mandatory requirements and advisory guidance for identifying and controlling hazards to ensure 'Zero Harm' regarding operation maintenance and testing of electrical equipment. For complete procedure kindly refer Procedure Document No- TPSMS/CSP/ELEC/010

6.11 Fire Safety Management Procedure.

Objective of This standard is to specify the minimum mandatory requirements and advisory guidelines to ensure prevention of fire related incidents and managing / controlling their impacts if they do occur. For complete procedure kindly refer Procedure Document No - TPSMS/CSP/ELEC/011

6.12 Hazard Identification & Risk Assessment (HIRA) Procedure(R5):

Objective of this procedure is to define guidelines for Hazard identification, Risk assessment and determination of controls. For complete procedure kindly refer Procedure Document No - TPSMS/CSP/HIRA/012.

6.13 *Management Of Change (MOC) Procedure(R5)*:

The objective of this document is to establish the procedures necessary to ensure that HSE risks are managed to an acceptable level in Tata Power Management of Change (MOC) process. For complete procedure kindly refer Procedure Document No - TPSMS/CSP/MOC/013.

6.14 *Pre-Start-up Safety Review (PSSR) Procedure*(R5).

Objective of this procedure is to provide guidelines for safe initial startup of a new facility or restart of a modified facility. The PSSR process verifies that the new/modified facility meets the original design and operating parameters. The intent is to prevent incidents caused by inadequate, incomplete, unauthorized design, construction, installation, and/or commissioning. For complete procedure kindly refer Procedure Document No - TPSMS/CSP/MOC/014.

6.15 *Road Safety procedure(R5)*:

To provide Safety Rules for road travel management and safe usage of all types of vehicles viz. passenger/ commercial, owned/ hired by company, driven by employees or contractors. For complete procedure kindly refer Procedure Document No - TPSMS/CSP/RSP/015.

7.0 General safety Rules and Procedure:

7.1 Lift (Elevator) Safety Procedure:

To provide safe operating procedure for taking control of lift car before entering and existing the pit of OTIS make elevators. For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/LIFT/001**,

7.2 Working on conveyor belt Procedure:

This procedure is developed to cover the safe practices required for Working on live equipment and to protect personnel from hazards associated with it. For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/CONV/003**

7.3 Batteries Handling & Disposal(R5)

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To provide procedure for recycling and / or safe disposal of used / waste batteries in compliance with all legislation. For complete procedure kindly refer Procedure Document No – ***TPSMS/GSP/HAZM/003***

7.4 **Material Handling and Storage Procedure**:
The purpose of this document is to provide procedures to assist the safe handling of materials (manual handling and mechanical handling). For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/MATL/004.**

7.5 ***Office Safety Procedure(R5):***
The objective is to provide a safe working environment to those working in office premise, who may be exposed to emergency situations and other chronic / cumulative risks that may arise due to various reasons of unsafe act, unsafe condition, fire and or pandemic crisis like COVID-19 etc. For complete procedure kindly refer Procedure Document No -***TPSMS/GSP/OFS/006***

7.6 ***Earth Leakage Circuit Breaker (ELCB) Testing Procedure(R5)*****:**
The objective of this procedure is to define the minimum requirements for testing of Earth Leakage Circuit Breaker (ELCB). For complete procedure kindly refer Procedure Document No - ***TPSMS/GSP/ELCB/008.***

7.7 ***Occupational Health & Safety Legal Compliance Procedure(R5):***
Objective of this procedure is provide guidelines for compliance of Occupational Health & Safety (OH&S) legal requirements and all ratified protocols and agreements are incorporated in Tata Power Safety Management System (SMS). For complete procedure kindly refer Procedure Document No - ***TPSMS/GSP/LEGL/009*****.**

7.8 ***Incident Reporting & Investigation Procedure(R5):***
Objective of this procedure is to outline the process for reporting, recording and investigating an incident, recommending corrective and preventive actions and to communicate the lessons learned to prevent recurrence of similar incidents. For complete procedure kindly refer Procedure Document No - ***TPSMS/GSP/IRI/011*****.**

7.9 **Contractor Safety Management Procedure.**
The purpose of this document is to engage with contractors in a way to create safe work environment for everyone working for Tata Power. For complete procedure kindly refer Procedure Document No – **TPSMS/GSP/CSM/015**.

7.10 ***Tree Trimming Procedure(R5):***
The objective of this procedure is to define guidelines and minimum requirements for Tree trimming. For complete procedure kindly refer Procedure Document No – ***TPSMS/GSP/TTRM/017***

7.11 ***Safe Lone Working Procedure(R5):***
Objective of this procedure is to lay down guidelines for reduction and safe managing of any additional risk arising from lone working. For complete procedure kindly refer Procedure Document No – ***TPSMS/GSP/LONE/019.***

7.12 ***Good Housekeeping(5S) Procedure(R5):***

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Objective of this procedure is to explain the meaning, importance and provide guidelines for implementation of Good Housekeeping(5S) at workplaces across organization. For complete procedure kindly refer Procedure Document No – ***TPSMS/GSP/GHK/022***.

7.13 Personal Protective Equipment(R5):

This procedure describes the basic requirements, applicability, minimum specifications of Personal Protective Equipment (PPE). For complete procedure kindly refer Procedure Document No – ***TPSMS/GSP/PPE/023.***

7.14 Process Safety Management Procedure(R5):

The objective of this document is to provide a standardized & uniform guideline to implement Process Safety Management in Tata Power, its JVs, and subsidiaries to prevent or minimize the consequences of releases of toxic, flammable, pressurized or uncontrolled chemicals/Steam/Water or any other material which may result in toxic, fire, explosion, burn or flood like situation. For complete procedure kindly refer Procedure Document No – ***TPSMS/GSP/PSM/024***

The above procedures will be updated time to time and the updated version of the procedures as well as any additional critical procedure will be available on official website of Tata Power (www.tatapower.com) for your reference.

8.0 **Training and Capability Building**.

Safety Training and capability building of workforce is a major component of safety management program. All training required must be provided and documented as specified by Tata Power and Indian Regulations. Tata Power Division /Discoms Safety department will audit contractors training and related documentation to assure its adequacy.

8.1 Tata power Odisha Discom Site Safety Orientation.R5

All Tata Power contractor and subcontractor workforce is required to attend Site Safety Orientation Training to receive a Safety Training Card, which is required to obtain a Gate Pass to the site, prior to entry. This Safety Orientation Course will be for duration of minimum half day. The information provided during the orientation will include, but is not limited to following:

8.1.1 Job rules, personal safety, and conduct
8.1.2 Hazard's reporting
8.1.3 Reporting of injuries
8.1.4 Emergency procedures
8.1.5 Safety Activities and Program including disciplinary measure and incentives.
8.1.6 Critical safety procedure relevant to the job

8.2 **Capability Building:**

8.2.1 All Tata Power contractor and subcontractor workforce is required to attend L1 Training to receive a Safety Training Card, which is required to obtain a Gate Pass to the site, prior to entry.

8.2.2 Appropriate practical training such as SHE L1, L2& L3 is given to ensure that a jobholder, either supervisor or worker, is competent to do his/her job safely. The skill training is provided through TPSDI, and other agencies authorized

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by Tata Power on the list of 15 critical Safety procedures mentioned under safety procedures. Duration of course is as specified by Division/Discom

8.2.3 Contractor shall ensure that concerned workmen are provided with adequate training before he/she is allowed to execute the work. An evaluation test will be conducted after the completion of the training. Those employees who meet the minimum required competency will be provided with Certificate (Card), which will be valid for 3 years, post which the workmen have to reappear for assessment.

8.2.4 If the workman is not able to qualify the assessment, he/she will be given 3 additional attempts to clear in 3-month time failing which he/she will not be allowed to work in the Division /Discoms.

8.2.5 *After expiry of Certificate or Training /Competency Card again one day recertification of L1, L2 and L3 skill training will be provided. R7.*

8.2.6 Quarterly /Half yearly(For Odisha and New business) Revalidation Test - "SHE L1 Revalidation test" will be conducted for the contractor's employees to revalidate their safety awareness and knowledge.

8.2.7 Order Manager and Safety In charge of the Division/Site /Plant will conduct a Competency Assessment of all workforces, going to be deployed at site / plant for high-Risk job.

8.2.8 *The Contactor shall bear the conveyance and food expenses of his staff for attending training sessions and capability building sessions in new business-like Odisha Discom.*

8.2.9 *The Contactor shall bear the entire cost of L1/L2/L3, the costs towards training, salaries/wages, boarding and lodging of his staff for attending training sessions and capability building sessions. These trainings are offered on nominal chargeable basis payable by Contractor and rates shall be decided by TPSDI from time to time in case of training trough TPSDI. Generally, L0 is of one day, L1 is for 2 days for each critical procedure and L3 is for one day. Around Rs 700+GST is approx. cost /Day/Candidate. -R5*

8.2.10 *Competency assessment of all critical workforce to be carried out for all who has taken L2 training. R5*

9.0 Recognition to the Prior Learning in Safety-R5

If "Order Manager" recommends and "Head of the Safety Department of Discom" is satisfied with the safety knowledge and competency of the employee of contractor, a test may be conducted by Tata power Skill development Institute/ other recognized institute to assess the prior learning in safety. If employees of the contractors pass in such test, he will be exempted from appearing in SHE L1 training. *This assessment is on nominal chargeable basis and rates are decided by TPSDI from time to time.*

10.0 **Safety performance retention(R5) and Safety Performance Evaluation:** *A certain percentage of the bill value will be retained against every running bill as safety performance retention. The amount will be released with the last invoice or every six-month based on Safety Performance Score of contractors. This is as per CSCC Document no TPSMS/GSP/ CSM/015*

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This safety retention shall be waived for Contractors who have either submitted a Contract Performance Bank Guarantee or have a retention from each running bill for an amount not less than 10% of each bill subject to the express undertaking / understanding that if there are any deductions required to be made for safety non-performance as per the Safety Performance Score, then Tata Power shall recover any such deductions against safety non-performance directly from the monthly bills / final settlement as the case may be failing which it shall be within its right to recover such sum from accounts payable or the CPBG or the retention of the Contractor available with Tata Power for the said contract or any other contract between the Contractor and Tata Power.

11.0 Pre-Employment and Periodic Medical check-up:

Contractor shall arrange to conduct a pre-employment and periodic medical check-up for its entire workforce by Tata Power medical officer or Tata Power authorized medical officer. The contractor shall be able to produce the certificate prior to the employment. The contractor shall also organize to conduct periodical medical checkup (six monthly) for the following category of employees:

- Drivers (Check for Vision & Hearing)
- HEM Equipment Operators (Check for Vision & Hearing)
- Workforce working at Height (Check for Vision, Hearing, Vertigo & Height Phobia)
- Workforce Handling the hazardous substances - Coal, ash and chemicals (Chest X-ray and Lung Function T)
- Workforce in high Noise area (> 90 Decibel), Check for Hearing
- Workforce handling radiography equipment for conducting NDT.
- Workforce, working in specific areas requiring specific medical attention should conduct the medical tests test as laid down in the respective Site Safety Management Plan.

12.0 Other Conditions:

12.1. The manpower/vehicles/Tools & Tackles/Equipment provided shall be as per mutually agreed SLA.
12.2. No Supervision No work policy should strictly be followed.
12.3. Test Before Touch must be ensured every time a job is being carried out in electrical network.
12.4. HIRA /JSA as per the job scope must be prepared in detail and submitted along with Site Safety Plan by the successful bidder.
12.5. Personal protective equipment (PPE) must always be checked before use to ensure that they are in good condition and clean. Replace them if necessary.
12.6. All relevant PPE shall be provided by the vendor while working at the site.
12.7. Housekeeping shall be maintained all the time while execution of work. All the unwanted material shall be removed from the site at the end of the day's work. Old/damaged parts if taken out of the system shall be kept at

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identified placed and it shall be shifted to scrap yard or disposed of as per instruction of order manager.

12.8. Site Safety Plan shall be prepared by successful bidder along with order manger. Appendix 1 to be filled by successful bidder and submitted to Tata Power safety in-charge, before mobilization of team at site and start of the work.

12.9. The Owner or Proprietor of BA must visit worksite at least once in a month and meet Order Manager every month. In case of incidents, the Owner or Proprietor of BA is required to attend Time Out Meetings to understand the gaps that contributed to the incident.

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General Safety Conditions for various contracts Specific to Odisha Discom(R5)

13.0. Safety Conditions for maintenance of STS (Sub Transmission System) Network.

A BA awarded a major contract work of maintenance of sub – transmission network in area of a power system will be required to fulfil the following conditions:

- Availability of Discharge Rods - Minimum 6 Nos. in each maintenance vehicle, fit for purpose and in good conditions and defective rods are removed from service.
- Availability of Neon tester - Minimum one Neon Tester in each Maintenance Vehicle, in good and working condition and defective or non-standard neon testers are removed from service.
- Electrical hand Gloves - Minimum two sets of 33 KV and two sets of 11 KV in maintenance vehicles.
- The BA linemen must be having required ELBO certification for the voltage level involved.
- BA shall provide Safety Policy, Safety Objectives, Organogram showing structure and responsibility of Safety management of his company and shall document the work practices and procedures in terms of Safety Management.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, Labour laws, etc.
- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- BA shall abide by Safety manuals and guidelines of Discom issued from time to time.
- BA shall ensure safety training and induction program for the employees. The BA employees must carry safety training card / competency card to the worksite and produce the card on demand.
- All BA employees must be given valid ID card issued by BA cell of Discom who will check statutory compliances before issuing ID cards.
- BA shall not employ a new workman without training and issue of ID card.
- BA shall conduct safety audits & inspections as per Discom procedures.
- BA shall provide proper PPEs as per CSM F-8 ensure periodic inspection of PPE, Tools and tackles to ensure their serviceability.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by the Discoms.
- BA shall ensure that no job shall be carried out without efficient supervision.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident, or accident to engineer in-charge and SAFETY team of the Discom.
- BA shall provide safety performance and Safety MIS to engineer in-charge and Discom SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA safety staff shall work as per the guidance of the Discom safety department and functionally report Safety Head of Discom. Any leaves by safety staff of the BA shall have to approved by Discom Safety Department.
- BA shall ensure to depute Safety Staff for managing safety in worksites. In case the BA has been awarded work in more than one area power system, then the following safety structure will be adopted.
- Safety manager and Safety engineer must be having PDIS or ADIS.

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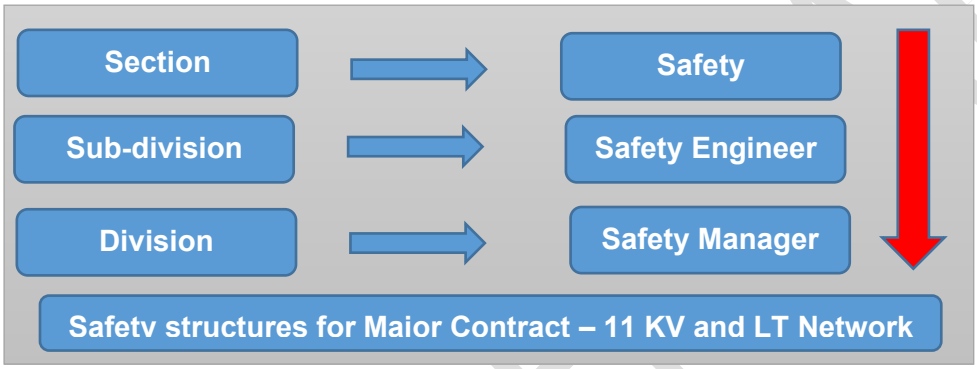
14.0 Safety Conditions for maintenance of 11 KV and LT Network.

A BA awarded a major contract work of maintenance of 11 KV and LT Network in area of a power system will be required to fulfil the following conditions:

- Availability of Discharge Rods - Minimum 6 Nos. in each PSS/FCC and maintenance vehicle, fit for purpose and in good conditions and defective rods are removed from service.
- Availability of Neon tester - Minimum one Neon Tester in each PSS/FCC/ Maintenance Vehicle, in good and working condition and defective or non-standard neon testers are removed from service.
- Electrical hand Gloves - Minimum two sets of 33 KV and two sets of 11 KV in each PSS/Maintenance vehicles and two sets of LT hand gloves at each FCC.
- The BA linemen must be having required ELBO certification for the voltage level involved.
- BA shall provide Safety Policy, Safety Objectives, Organogram showing structure and responsibility of Safety management of his company and shall document the work practices and procedures in terms of Safety Management.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, Labour laws, etc.
- BA shall abide by Safety manuals and guidelines of Discom issued from time to time.
- BA shall ensure safety training and induction program for the employees. The BA employees must carry safety training card / competency card to the worksite and produce the card on demand.
- All BA employees must be given valid ID card issued by BA cell of Discom who will check statutory compliances before issuing ID cards.
- BA shall not engage new workman without training and issue of ID card.
- PSS operator shall not be involved in maintenance activities.
- BA shall conduct safety audits & inspections as per Discom procedures.
- BA shall provide proper PPEs as per CSM F-8 ensure periodic inspection of PPE, Tools and tackles to ensure their serviceability.
- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- BA to ensure that all LT complaints are routed through Call Centre and recorded in FCC. Rectification of fault shall be done only after call centre logging and with the knowledge of BA supervisor.
- No one will work alone or unsafely under public pressure or otherwise.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by the Discoms.
- BA shall ensure that no job shall be carried out without efficient supervision.

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- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident, or accident to engineer in-charge and SAFETY team of the Discom.
- BA shall provide safety performance and Safety MIS to engineer in-charge and Discom SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA safety staff shall work as per the guidance of the Discom safety department and functionally report Safety Head of Discom. Any leaves by safety staff of the BA shall have to approved by Discom Safety Department.
- BA shall ensure to depute Safety Staff - One safety supervisor per section, One safety engineer per sub-division and one safety manager per Division Safety manager and Safety engineer must be having PDIS or ADIS.



15.0 **Safety Conditions for the major contract work in Civil Projects:**

A BA awarded a major contract work of / in civil project will be required to fulfil the following safety conditions:

- BA shall provide Safety Policy, Safety Objectives, Organogram showing structure and responsibility of Safety management of his company and shall document the work practices and procedures in terms of Safety Management.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, Labour laws, etc.
- BA shall abide by Safety manuals and guidelines of Discom issued from time to time.
- BA shall ensure safety training and induction program for the employees. The BA employees must carry safety training card / competency card to the worksite and produce the card on demand.
- All BA employees must be given valid ID card issued by BA cell of Discom who will check statutory compliances before issuing ID cards.
- BA shall not employ a new workman without training and issue of ID card.
- BA shall conduct safety audits & inspections as per Discom procedures.
- BA shall provide proper PPEs as per CSM F-8 ensure periodic inspection of PPE, Tools and tackles to ensure their serviceability.
- BA shall ensure the adherence to standard operating procedures or guidelines laid down by the Discoms.
- BA shall ensure that no job shall be carried out without efficient supervision.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident, or accident to engineer in-charge and SAFETY team of the Discom.

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- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- BA shall provide safety performance and Safety MIS to engineer in-charge and Discom SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA safety staff shall work as per the guidance of the Discom safety department and functionally report Safety Head of Discom. Any leaves by safety staff of the BA shall have to approved by Discom Safety Department.
- BA shall refer Construction Safety Manual of the Discom for details.
- BA shall ensure to depute a Safety Supervisor (for workforce up to 100 at site) / a safety engineer (for workforce up to 250 at site) / safety manager (for more than two safety engineers) for managing safety at the project site. In case the BA has been awarded more than one major contracts, then the following safety structure will be adopted.
- Safety Engineers and Safety Managers must be having PDIS or ADIS.

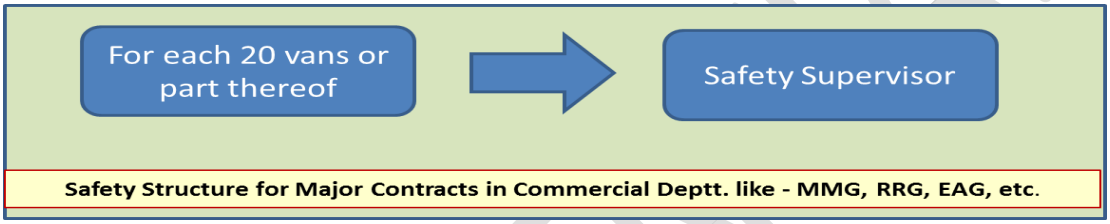


16.0 **Safety Conditions for the major contract work in Commercial Department like - MMG, RRG, EAG, etc.:**

A BA awarded a major contract work in meter management group & energy auditing group will be required to fulfil the following safety conditions:

- BA shall provide Safety Policy, Safety Objectives, Organogram showing structure and responsibility of Safety management of his company and shall document the work practices and procedures in terms of Safety Management.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, Labour laws, etc.
- BA shall abide by Safety manuals and guidelines of Discom issued from time to time.
- BA shall ensure safety training and induction program for the employees. The BA employees must carry safety training card / competency card to the worksite and produce the card on demand.
- All BA employees must be given valid ID card issued by BA cell of Discom who will check statutory compliances before issuing ID cards.
- BA shall not employ a new workman without training and issue of ID card.
- BA shall conduct safety audits & inspections as per Discom procedures.
- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- BA shall provide proper PPEs as per CSM F-8 ensure periodic inspection of PPE, Tools and tackles to ensure their serviceability.

- BA shall ensure the adherence to standard operating procedures or guidelines laid down by the Discoms.
- BA shall ensure that no job shall be carried out without efficient supervision.
- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident, or accident to engineer in-charge and SAFETY team of the Discom.
- BA shall provide safety performance and Safety MIS to engineer in-charge and Discom SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- BA safety staff shall work as per the guidance of the Discom safety department and functionally report Safety Head of Discom. Any leaves by safety staff of the BA shall have to approved by Discom Safety Department.
- BA shall ensure to depute a Safety Supervisor for managing safety at worksite.
- The BA for the RRG work shall depute one Safety supervisor.



17.0 **Safety Conditions for Major Projects in Distribution Network**

A BA awarded a major Projects in Distribution Network shall be required to fulfil the following conditions:

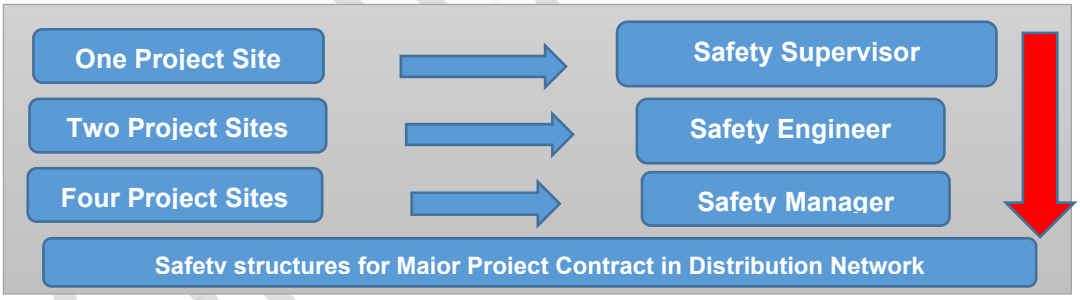
- Availability of Discharge Rods - Minimum 6 Nos. for each project site, fit for purpose and in good conditions and defective rods are removed from service.
- Availability of Neon tester - Minimum one Neon Tester in each project site, in good and working condition and defective or non-standard neon testers are removed from service.
- Electrical hand Gloves - Minimum one sets of 33 KV, 11 KV and LT in each project site.
- The BA linemen must be having required ELBO certification for the voltage level involved.
- BA shall provide Safety Policy, Safety Objectives, Organogram showing structure and responsibility of Safety management of his company and shall document the work practices and procedures in terms of Safety Management.
- BA shall comply with all statutory requirements like applicable acts, regulations, codes of practice, OHSAS Standards, Labour laws, etc.
- BA shall abide by Safety manuals and guidelines of Discom issued from time to time.
- BA shall ensure safety training and induction program for the employees. The BA employees must carry safety training card / competency card to the worksite and produce the card on demand.
- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- All BA employees must be given valid ID card issued by BA cell of Discom who will check statutory compliances before issuing ID cards.
- BA shall not employ a new workman without training and issue of ID card.
- BA shall conduct safety audits & inspections as per Discom procedures.
- BA shall provide proper PPEs as per CSM F-8 ensure periodic inspection of PPE, Tools and tackles to ensure their serviceability.

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- BA shall ensure the adherence to standard operating procedures or guidelines laid down by the Discoms.
- BA shall ensure that no job shall be carried out without efficient supervision.

Sr. No	Type of Audit	Frequency
1	Tool Bag and PPE audit	Weekly
2	First Aid Box Maintenance Record	Fortnightly
3	Fire Extinguisher Record(Applicable for the BA involved in major construction works and have storage of flammable material at worksite)	Monthly
4	Safety Talk Register	Weekly
5	Site Safety Audit	Daily

- BA shall ensure reporting of any unsafe act, unsafe conditions, near miss, incident, or accident to engineer in-charge and SAFETY team of the Discom.
- BA shall provide safety performance and Safety MIS to engineer in-charge and Discom SAFETY group periodically. Based on any non-confirmation to the safety procedures and guidelines, BA is liable to be negatively marked for his performance and suitable penalty will be imposed.
- The BA shall participate in Safety promotional activities like celebration of Lineman day on 4th March, National Fire Service Day on 14th April and Theme based safety campaigns undertaken by the Discoms every month.
- BA safety staff shall work as per the guidance of the Discom safety department and functionally report Safety Head of Discom. Any leaves by safety staff of the BA shall have to approved by Discom Safety Department.
- BA shall ensure to depute Safety Staff for managing safety in worksites. One safety supervisor per project site or 100 persons, one safety engineer for 2 project sites of 250 persons, and one safety manager for four project sites or 500 persons.
- Safety manager and Safety engineer must be having PDIS or ADIS.



18.0 **Schedule of Safety Audits by BA Safety Staff**

Safety Undertaking of BA by way of Affidavit

I_____ s/o_____R/o_____ (AUTHORIZED REPRESENTATIVE/PARTNER/DIRECTOR/PROPRIETOR) of M/S _____(name of company/firm)__ having its office at (Complete address of Company), authorized vide power

of attorney dated ------/Board resolution dated----/letter of authority dated----, hereinafter referred to as **Contractor [or Business Associate (BA)]** which expression shall, unless it be repugnant to or inconsistent with the meaning or context thereof, be deemed to include its heirs, executors, administrators, and assigns do hereby affirm and undertake as under :

1. The present undertaking shall remain in force from the date of execution of contract and shall be valid till the date of termination of the said contract by either party. The undertaking is binding on me (contractor) as well as my sub-contractor and its employees, representatives etc.
2. That I (the contractor) will be responsible and liable to comply and abide by all the safety rules, instructions and regulations as may be specified and laid down by the Discom to achieve its goal of Zero for on-site incidences.
3. That the Contractor shall be fully responsible for ensuring occupational health and safety of its employees, representatives, agents as well as of its subcontractor's employees, at all times during the discharge of their respective obligations under the contract including any methods adopted for performance of their tasks / work.
4. That Contractor shall ensure ,at its own expense to arrange for and procure, implement all requisite accident prevention tools, first aid boxes, personal protective equipment, fire extinguisher, safety training, Material Safety Data Sheet, pre-employment medical test, etc. for operations & activities including as & when so specified by Discom specifically. , failing which Discom shall be entitled, but not obliged, to provide the same and recover the actual cost thereof from the Contractor's payments.
5. That the Contractor shall engage adequate and competent Safety – Supervisor / Engineer / Manager / Skilled persons at site as per the Para 5 (Qualification and experience of safety personnel) and Annexure 3 of Contract Safety Management.
6. That the Contractor shall engage the competent Site – Supervisor with each group of workers for safe and correct workmanship, proper co-ordination of material and site work as per contract.
7. That the Contractor shall immediately replace supervisor in case it is found to be not up to the level of skill and experience required, but any such replacement shall be only with the prior concurrence of the Discom representative.

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8. That the Contractor and its subcontractors shall abide by all the safety guidelines as per Safety Manual, Contract Safety Management and other guidelines issued from time to time by Discom during the contract period.
9. That in case the Contractor and/or any of its Subcontractor fail to ensure the compliance as required in terms of this undertaking the Contractor shall keep and hold Discom / its directors / officers / employees indemnified against any / all losses / damage / expense / liability / fines / compensation / claims / action / prosecutions or the like which might be suffered by Discom or to which Discom might get exposed to as a result of any breach /wilful negligence /deliberate default on the part of the Contractor /Subcontractor in complying with the same. Contractor shall also furnish any press release, clarification etc. if sought by Discom for any near miss or safety violations, accidents, which are attributable to fault of Contractor.

DEPONENT

VERIFICATION

Verified at ……on this _Day of _____20__ that the contents of the above affidavit are true and correct and nothing material has been concealed therefrom

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ANNEXURE TO

Appendix 3: Safety Terms and Conditions

(Document No - **TPSMS/GSR/STC/009 REV 05**)

(Excerpts of Tata Power Safety Code of Conduct as relevant for Safety Terms & Conditions)

(A) Definitions

- **Order Manager/Engineer in charge:** Order Manager/Engineer in charge is the Tata Power-Division /DISCOM representative, who has the ownership of the given job.
- **Site Safety Management Plan**: It is the safety plan agreed between Contractor and Tata Power-Division/DISCOM. It will contain the entire job specific safety requirement and will be signed by the contractor.
- **Contractor/Business Associate/Vendor (BA)**: An individual or a company that provides services to Tata Power-Division/DISCOM under a signed contract.
- **Emergency:** It is a serious, unexpected, or dangerous situation requiring immediate action, which may result in *loss of life,* loss of revenue/property, business discontinuity. In case of Emergency, services may be procured by selecting the qualified vendor based on the vendor category without the safety bid evaluation and approved by adequate authority of MB level or above.
- **Expert Service jobs:** Jobs which needs expert services of contractor which does not involve direct exposure to the potential risk or work which involves only supervisory work such as expert for AI-ML, expert for transmission and distribution network, expert for civil works, expert on transformers, expert for PSCC, expert for equipment overhaul etc.
- **CEO/Chief/Head of division/Unit/Utility**: Business in charge who is overall custodian of the Tata Power-Division/DISCOM.
- **High Risk Jobs**: A Job or its activities are considered as Very High or High Risk when Order manager apply the "Tata Power Hazard Identification and Risk Analysis" procedure and found safety risk associated with are under Very High or High category. Indicative lists of jobs are given in appendix 14 of this document.
- **Medium Risk Jobs:** Jobs or its activities are considered as medium risk when Order manager apply "Tata Power Hazard Identification and Risk Analysis" procedure and found the same as Medium Risk.
- **Low Risk Jobs:** Any job or its activities are considered as Low or Very low risk while Order manager calculated it by applying "Tata Power Hazard Identification and Risk Analysis" procedure and found it under Low or Very Low category.

(B) **Safety performance retention(R7):**

A certain percentage of the bill value will be retained against every running bill as safety performance retention. The amount will be released with the last invoice or every six-month based on Safety Performance Score of contractors. The retention amount will be calculated based on contract value as below. (R7)

Risk Category-(R7)	Contract Value	Retention Amount (%)
Very high/High risk job/ Medium Risk jobs	Up to 10 Lakhs	2.5
Very high/High risk job/ Medium Risk jobs	10 – 50 Lakhs	2
Low/Very Low Risk jobs	10 – 50 Lakhs	1
Very high/High risk job	0.5 to 10 Cr	2
Medium Risk jobs	0.5 to 10 Cr	1.5
Low/Very Low Risk jobs	0.5 to 10 Cr	1
Very high/High risk job	>10 Cr	1.5
Medium Risk jobs	>10 Cr	1

This safety retention shall be waived for Contractors who have either submitted a Contract Performance Bank Guarantee or have a retention from each running bill for an amount not less than 10% of each bill subject to the express undertaking / understanding that if there are any deductions required to be made for safety non-performance as per the Safety Performance Score, then Tata Power shall recover any such deductions against safety non-performance directly from the monthly bills / final settlement as the case may be failing which it shall be within its right to recover such sum from accounts payable or the CPBG or the retention of the Contractor available with Tata Power for the said contract or any other contract between the Contractor and Tata Power.

(C) **Safety Performance Evaluation & Responsibility of Business Associate / Contractor:** During the time of job execution, regular site inspection will be carried out by the Tata Power-Division / DISCOM officials to evaluate monthly safety performance of the contractor and monthly score will be maintained by the Order Manager. Violations will be dealt as per **CSM F12 Safety Violation Penalty Criteria**.

1. During the progress of the work, concerned site Supervisor/Engineer/Safety representative will visit and inspect the work site regularly and evaluate the safety performance of the contractor based on matrix **Appendix 13** and apply the Consequence management policy/Penalty criteria as applicable.
2. The evaluation criteria include Lead Indicators such as percentage of workers trained in TPSDI, inspection of critical equipment. Lag indicators such as Fatalities, LWDC and man-days lost.
3. In case of job stoppage due to safety violations / unsafe observations at the site, no time extension from PO completion date shall be given to the contractor, if such delays are attributable to contractor.
4. In case of fatality, limb loss or loss of property, vendor must pay for liability, legal, statutory, and additional mutually agreed settlement charges imposed by the appointed committee by Division Chief/CEO. This charge is over and above the retention amount. The committee will finalize penalty amount based on factors such as advice by statutory authorities, contract value and impact of accident etc.

5. Order Manager, Head of Business and functional Chief have the authority to terminate the contract as per **CSM F12 Safety Violation Penalty Criteria** Through contract department.

(D) Other Appendices are attached,

Appendix 6: CSM F6 - Safety Competency Assessment Form (Template).
(This is to be filled by Bidder and submit to Tata Power as part of bid submission).

Appendix 8: CSM F8 - PPE requirements-(R7)

Appendix 9: CSM F9 - Site Safety Management Plan / Method Statement (Template)

Appendix 12: CSM F12 - Safety Violation Penalty Criteria

Appendix 13: Checklist To Be Used During Site Visit

Appendix 14: Indicative List of High-Risk Jobs

---xxx---xxx---xxx---

Appendix 8: CSM F8 - PPE requirements-(R7)

The Contractor shall ensure that the following PPE of Approved standards shall be always available and shall be used by his employees with no exception whatsoever. • PPE shall be conforming to BIS/DGMS/DIN specifications, in good condition and shall be comfortable to his employees, when used. This is indicative. For better clarification refer PPE procedure-***TPSMS/GSP/PPE/023.*** as per safety terms and condition Appendix 3 CFM 3 in detail. R7

PPE Requirement

1	All contractor's employees at site	Safety Florescent Jacket (orange color), Safety helmet & safety shoes with composite or steel toe cap
2	Workers mixing asphalt, cement, lime / concrete	Safety goggle & protective Hand gloves and footwear, Nose mask.
3	Welders / Grinders/Gas cutters	Welding screen/goggles, safety shoes, leather hand gloves, aprons, leg guard
4	Stone breaker	Protective goggle, hearing protection, anti-vibration hand gloves and Protective clothing.
5	Electricians / Linemen	Rubber hand gloves *with correct voltage rating and expiry date normally one year from Manufacturing date-(R7)* & Electrical resistant shoes, Safety helmet with induction strip to alert about presence of voltage for those linemen who climb the poles or work on electrical equipment
6	Workers working at a height of 1.8 Meter or above.	Double lanyard full body harness, fall arrestor and safety net made of reinforced nylon fiber ropes firmly supported with steel structures, Work positioning attachment

PPE Type and Testing Frequency

Sl. No.	Name of PPE	IS / EN Standard	Testing Frequency	Remarks
01	Leather Safety Shoes (Color – Black) with PU toe cap.	IS:15298 (Part-2)	Monthly and visual check every day for any crack or damage in the leather or sole.	

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02	HDPE Safety helmet with chin strap and ratchet type for adjustment for non-Electrical work	IS:2925-1984	Monthly and visual check every day for any crack in shell.	
03	Full body harness (Safety belt)	EN 361	Monthly and visual check every day of the bends and the harness.	
04	Electrical Safety Gloves	EN: 60903 CE marked	Weekly and visual check for any crack and blow test before every work.	Manufactured not beyond 12 months.
05	Full face visor with safety helmet	EN: 166 CE marked (Visor)	Monthly and visual check every day for any crack in shell.	Clear acrylic visor attached with safety helmet.
06	Fireproof jacket for chest protection		Monthly and visual check every day.	
07	Safety helmet with induction Strip for linemen and working for electrical work-Class E	EN 397/2012	Monthly and visual check everyday	Induction Strip alerts presence of voltage
08	Shorting clamps, crocodile clamps, Discharge Rod and Neon tester		Monthly and visual check everyday	For discharging the residual voltage and test before touch

Pictorial View of PPEs for reference purpose

Sl. No.	Name of PPE	IS / EN Standard	Picture
01	Leather Safety Shoes (Color – Black) with PU toe cap.	IS:15298(Part-2) and with test report of electrical resistance.	

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02	HDPE Safety helmet with chin strap and ratchet type for adjustment for Nonelectrical work and electrical work	IS:2925-1984/ EN 397/2012	
03	Full body harness (Safety belt) The straps at shoulder and thigh shall have full pad for comfort. The back shall be so designed that harness straps do not tangle with each other.	EN 361:2002 EN 358 : 2000 IS: 3521:1991/2002	
04	Electrical Safety Gloves – Composite type Soft electrical gloves as per size of individual.	EN: 60903 CE marked	
05	Full face visor with safety helmet	EN: 166 CE marked (Visor)	
06	Fireproof jacket for chest protection		
08	Reflective jacket to each workman	As per Tata Power standard	

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These pictures are indicative. Actual product may vary.

Note:

1. Any other Personal Protection Equipment required beyond above list will be according to BIS or EN Standards.
2. All Personal Protection Equipment will be checked by the engineer in-charge or SAFETY group of company.
3. Safety Representative of the BA must maintain the record of the availability, condition and checking of the PPEs.
4. All tools required as per the contract must be according to respective IS / EN standards.
5. Company may revise or add the above list of PPE and their specifications as and when feel necessary. The information about new specifications /models will be circulated by the Engineer In-charge (EIC), which shall adhere by the business associated in the shortest possible time. The EIC shall issue a memo / instruction to BA with timeline for implementation. Any delay will be treated as non- compliance / safety violations.

Appendix 9: CSM F9 - Site Safety Management Plan / Method Statement

Site Safety Plan / Method Statement (Template)

This Method Statement describes the specific safe working methods which will be used to carry out the described work. It gives details of work procedure with control measures to counter health and safety issues related to this work. The listed content of this Method Statement can be changed/modified subjected to job scope / specifications, but task specific method statement once finalized & approved, that should not be modified during work execution without permission from the approving authority.

Project/Job Name		
Scope of work: -		
Drawing References: -		
Detail of Sub contractors involved: -		
Method Statement Prepared By: - Designation: - (e.g., Site Manager)	Signature	Date

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1.0 Introduction (*Describe purpose of the work, give details of type and scope of work being carried out)*

2.0 Location of Work *(Give site address and precise location on site where work is to be carried out)*

3.0 Safety Document /Specific Approval Required (Details of any safety documents or specific approval i.e., Client specific approval required to undertake the work)

5.0 Role & Responsibilities of Personnel/Parties Involved in activities: Clearly define roles and responsibilities of all personnel involved in activity i.e., Site management staff including subcontractors' staff, Project Manager/Site Manager of principal contractor, Sub Contractor Site Manager, Project Engineer, Safety officer, Competent Supervisory Staff etc.)

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6.0 Working/Activity Description: - *It is important that all operatives should have clear idea of those operational sequences and responsible supervisor must verify their competency prior to their engagement in operation.*

6.1 Pre-Working Checks

6.2 Resources (Equipment, tools including manpower) Details *i.e., Equipment and Tools, specific operational equipment, test kits, lifting resources, Details of materials to be used in operation, including any reference to COSHH assessments in case of use of any chemicals, Details of the manpower allocated to the task, e.g., titles, qualifications, competences, direct manpower, contractors. Details of plant, tools, and equipment to be used for the work, including the availability of relevant statutory documents, checks or inspections etc. Details of fencing, barriers, cones, chains, dangers notices, warning signs etc.*

Tools required for work:

Sr.No	Tools /Equipment /Machine	UOM	Required Qty.	Remark
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

6.4 Operational Sequence of work*: - Full description of the work, setting out the methodology in a sequential manner, including any reference to any identified operational restraints. Also refer here sec. 5.0 responsibilities part for every step of work sequence).*

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S. No	Activity	Details of job sequence	Risk Involved	Control Checks
1.				
2.				
3				
4				
5.				

6.7 Final Checks & restoration of work area after completion of work: *Those checks to be carried out by responsible supervisor in witness of his line hierarchy by use of specific checklist of certain operational checks and once those completed satisfactory, PTW (if applicable) to be closed and isolation arrangements to be restored by removing barricades/cautionary tags.*

7.0 Task Specific Hazards: - *Refer to Task Specific Risk Assessment and attach in appendix*

Attachment: - Specific Risk Assessment

In addition, please provide below control measures in risk assessment *(as applicable).*

Fall Protection Measures: (Where Work at height cannot be avoided)	
Control Measures for Electrical Hazards	
Others Hazard if any (please provide details)	

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Hazardous Substances to be used in job: (Attach MSDS if required)							
	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N

7.0 Emergency Provisions: *Relevant operational possibility of a programme in the case of emergency situation i.e. electrical supply restoration. In addition, emergency response provisions i.e., first aiders, firefighting, and first aid arrangements, nearest onsite/offsite emergency response also to be considered during emergency planning.*

8.0 "5S issues" / Waste Disposal/ Housekeeping and Environmental issues: *Details waste disposal processes and or housekeeping activities, Details of environmental impacts and control measures.*

9.0 Personal Protective Equipment (PPE): *Tick on PPE requirements for the task/Job*

Safety Helmet / Hard Hats		*Safety Shoe / Safety Boots*	
Gum Boot		*Double Lanyard Safety Harness with work positioning attachment*	
Electrical Hand gloves		*Other hand gloves*	
Eye protection		*Respiratory protection*	
Ear Protection		*Electrical Arc flash suit*	
Chemical resistant suit		*Reflective Jackets*	
Any Other		*Any Other*	

10.0 First Aid facilities and Nearby Hospitals Details

- Name of On Site First Aider
- First Aid Box Location
- Location of nearest hospital

11.0 Occupational Health, Fitness and COVID-19 related Preparedness:

• Please give a brief writeup / methodology of your organization's plan to avoid impact of the COVID-19 pandemic at Tata Power working site. • Please give brief details of occupational health and hygiene related interventions planned by your organisation to ensure good health and fitness of workforce at Tata Power site.

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Appendix 12: CSM F12 - Safety Violation Penalty Criteria

Major Violations and Escalation matrix-(R7)

Consequence of safety violation observed not related to incidents or accidents		Violations				
Sl. No.	**Safety Violation**	**1st**	**2nd**	**3rd**	**4th**	**Subsequent violation**
1	Working without required PPE such as Helmet/gloves/safety shoes/Safety harness etc.	A	B	C	D	Will Attract the same penalty as 4th violation
2	Working without proper tools and tackles	A	B	C	D	
3	Poor or bad condition of Crane/Hydra/Vehicle and/or Incompetent driver and/or helper).	B	C	D	E	Termination of Contract and blacklisting after repetition of violations (3 to 4 times as the case may be)
4	Improper Working at Height	B	C	D	E	
5	Untrained /unauthorized workman engaged in high-risk jobs	B	C	D	E	
6	Violation of SOP or WI or LOTO	C	D	E		
7	Working without PTW or LC / Without authorization / Without creating Safe Zone	C	D	E		

Legend	Action to be Taken	Responsibility	Penalty (INR)	Repeat Violations
A	Levy of Penalty	Order manager / EIC	5000	The no. of repeat violations shall be calculated cumulative during the contract period, not on a monthly basis
B	Memo to BA and Levy of Penalty	Order manager / EIC	10000	
C	Memo to BA and Levy of Penalty	Order manager / EIC	25000	
D	Memo to BA and Levy of Penalty	Order Manager / EIC	50000	
E	Memo to BA, Levy of Penalty, Termination of Contract, Blacklist	Order Manager / EIC	100000	

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Other Violations and Penalty

Penalty shall be imposed on the contractors under the following circumstances for breaching the contractual agreements. The list is not exhaustive, but indicative.

Sl. No.	Description of Violation	Severity	Penalty (INR)
1.	Unhygienic/Bad condition of PPE	2	500
2.	Unsafe Act/Condition of Severity 4	4	4000
3.	Unsafe Act/Condition of Severity 5	5	5000
4.	No Earthling of Electrical equipment	5	5000
5.	Working without efficient supervision	4	4000
6.	Non-reporting of incidents	3	3000
7.	Starting the job without Toolbox Talk	4	4000
8.	Electric cable tied with metal wire / Use of damaged electrical cable / Use of two core cable	3	3000
9.	Rubber mat not available in front of electrical panels.	3	3000
10.	Inserting naked wire into the socket instead of a plug	5	5000
11	Inflammable materials stored inside PSS/FCC/Distribution Room	5	5000
12	Water accumulation found near electrical panels / equipment	5	5000
13	Grinding wheel/ Coupling/ Piling winch/other rotating parts without guard	4	4000
14	Inadequate illumination of working area	3	3000
15	Bringing inside PSS/FCC or any other work area any chemicals without approval.	5	5000
16	Loose materials in work area which can fall down or fly during a storm	5	5000
17	Misusing emergency facilities like fire hydrant line/ hose box/ spray system/ eye wash etc.	3	3000
18	Entering restricted areas like switch yard, hazardous material storage room etc. without authorization	3	3000
19	Not using 24 V lamp inside confined spaces	3	3000
20	Bypassing/overriding safety interlocks	5	5000
21	Working besides road without proper barricading and monitoring of traffic	5	5000

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22	Smoking in prohibited area (Closed Go-downs, Storage of flammable material, Storage of Gas cylinders, PSS , Offices etc.)	3	3000
23	Improper stacking of materials in Storage Yard	4	4000
24	Sleeping at workplace	3	3000
25	First aid box not available / in locked condition	2	2000
26	Appointment of subcontractor without his Safety Bid Evaluation and/or without the permission of engineer in charge or Order manager.	5	5% of order value
27	Bad Housekeeping with respect to ***TPSMS/GSP/GHK/022*** • 1st Instant • 2nd instant • 3rd instant • 4th instant • Subsequent instants	2	• 1000 • 2000 • 5000 • 10000 • 10000
28	Violations related to vehicles with respect to ***TPSMS/CSP/RSP/015.*** • Parking without wheel choke • Parking in undesignated area • Heavy vehicle without helper or co-driver • Seat belt not available / not used • Driver without license • Heavy vehicles without reverse horn • Using mobile phone while driving • Lights/mirrors not working /broken	3	1000 per each violation
28	Violation in Gas cutting and Gas cylinder handling • Cylinder valve without guard • No flashback arrester • Leaky DA/Oxygen hose • Cylinders not kept in secured manner • Cylinder trolley not available • Cylinders are transported by manual rolling	5	2000 per each violation
29	Violations in Lifting Operations w.r.t. to *TPSMS/CSP/HEMS/005* • Hook latch missing • Load raised or swung over people or occupied areas of building • Persons standing within the swing area of the crane • No barricading of crane working area • Use of damaged lifting tools and tackles	5	2000 per each violation

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	• Lifting tools and tackles not tested / Test certificate expired • Crane operator without proper license • Angular loading • Lifting / shifting heavy material without guide rope • Using mobile phone during loading and unloading jobs		
30	Violation in Scaffolding work w.r.t. to TPSMS/CSP/SCAF/007 • Unstable scaffolding/nonstandard Scaffolding in use • Handrails/mid rails/toe guards missing • Safety harness not anchored on fixed structure • Opening found in working platform	5	2000 per violation
31	Violation in Excavation Work w.r.t. to TPSMS/CSP/EXS/002 • Loose material falling into excavated pit • Water logging in excavated pits / trenches • Inadequate or no barricading • Undercut / cave in found on sides of excavated pits	4	2000 per violation
32	Caution boards, danger signs (luminescent /red) along with emergency contact number are not found displayed.	3	3000
34	Spillage of hazardous material/chemicals during transportation	4	4000

Penalty for Incidents / Accidents-(R7)

Consequence of incident / Accident		Incident / Accident				
Sr.No.	**Type of Injury**	**1st**	**2nd**	**3rd**	**4th**	**Action Required**
1	Major Injury (Bone injury or burn or hospitalization >48 hrs.) Non-fatal	**F**	**F**	**G**	G	
2	Major Injury (Bone injury or burn or hospitalization >48 hrs.) Non-Fatal (Two or more non-Fatal in one event)	**G**	**G**	**H**		**Intolerable**
3	Single fatality	**G**	**H**			
4	Multiple fatalities (Two or more fatalities in one event). Anywhere in Tata power.	**H**				

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Legend	Action to be taken	Responsibility	Penalty (INR)	
F	Memo to BA and Levy of Penalty	Order Manager/Engineer in charge	200000	The no. of violations shall be calculated cumulative during the contract period for all contracts in SBU, not on a monthly basis
G	Memo to BA and Levy of Penalty	Order Manager/Engineer in charge	500000	
H	Memo to BA, Levy of Penalty, Termination of Contract and Blacklisting the BA	Order Manager/Engineer in charge	1000000	

Appendix -13: CHECKLIST TO BE USED DURING SITE VISIT

Checklist to be used: During site visit to check the adequacy Safety systems.			
		Observation	Score* (1-5)
1	Check the adequacy of safety policy and Safety Management system of the contractor.		
2	Does the contractor have written down safety procedures?		
3	Check the records of Near miss, unsafe act, unsafe conditions, and incidents.		
4	Check the organization setup to implement the safety systems at site (safety officer, safety supervisor)		
5	Check whether safety meeting and toolbox talk carried out regularly and records maintained or not.		
6	Is the process of incident investigation adequate or not?		
7	Verify incident reporting and recording system		
8	Check the usage of equipment/tools and tackles.		
9	Check for housekeeping at site		
10	Check the use of PPEs and general behavior of workforce towards safety		
	Total Score		
	Site Visit Score		

Score*- rating on the scale of 1-5 to be given based on the observations on site. Score of 1 is the lowest and core of 5 is the highest.

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Appendix 14: Indicative List of High-Risk Jobs

Indicative high-risk jobs are given below. This is not an exhaustive list. This is only indicative.

Sl. No.	Jobs
1	Transmission Line Tower Erection on columns, near live lines, In congested areas, In creeks, In the Sea.
2	Conductor Stringing on Tower Using Tensioner & Puller in the area such as Line Crossing, Near Live lines, Congested Areas, Road Crossing, Bridge Crossing, Railway line Crossing, In creeks, In the Sea
3	Cable Pulling by Using winch Machine in City and Rural Areas
4	Hot Washing of HT and Extra HT lines, Towers and switchyards equipment
5	Maintenance / Testing and Replacement of High Voltage (33 KV etc.) Switchyard equipment
6	Installation of Lifts
7	Installation of EOT Cranes
8	Tower Dismantling
9	Working on H Frame /Pole mounted Transformers
10	Excavation in operational Area having power cables in receiving station
11	Identification and spiking of cable / disconnection of cables from poles
12	Working on Electrical Panels
13	Working on live electrical switch yard, Material handling and equipment repair/installation.
`14	All activities that require climbing on a pole/structures/Towers/Transformers
15	Cable laying and termination jobs
16	Excavation beyond 5 feet near existing building and structures
17	Working in confined Spaces
18	Stringing of new conductors over poles

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CORPORATE ENVIRONMENT POLICY

Tata Power is committed to a clean, safe and healthy environment, and we shall operate our facilities in an environmentally sensitive and responsible manner. Our commitment to environmental protection and stewardship will be achieved by:

- Complying with the requirements and spirit of applicable environmental laws and striving to exceed required levels of compliance wherever feasible
- Ensuring that our employees are trained to acquire the necessary skills to meet environmental standards
- Conserving natural resources by improving efficiency and reducing wastage
- Making business decisions that aim towards sustainable development
- Engaging with stakeholders to create awareness on sustainability

(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018

TATA POWER
Lighting up Lives!

CORPORATE SUSTAINABILITY POLICY

At Tata Power, our Sustainability Policy integrates economic progress, social responsibility and environmental concerns with the objective of improving quality of life. We believe in integrating our business values and operations to meet the expectations of our customers, employees, partners, investors, communities and public at large

- We will uphold the values of honesty, partnership and fairness in our relationship with stakeholders
- We shall provide and maintain a clean, healthy and safe working environment for employees, customers, partners and the community
- We will strive to consistently enhance our value proposition to the customers and adhere to our promised standards of service delivery
- We will respect the universal declaration of human rights, International Labour Organization's fundamental conventions on core labour standards and operate as an equal opportunities employer
- We shall encourage and support our partners to adopt responsible business policies, Business Ethics and our Code of Conduct Standards
- We will continue to serve our communities:
  - By implementing sustainable Community Development Programmes including through public/private partnerships in and around our area of operations
  - By constantly protecting ecology, maintaining and renewing bio-diversity and wherever necessary conserving and protecting wild life, particularly endangered species
  - By encouraging our employees to serve communities by volunteering and by sharing their skills and expertise
  - By striving to deploy sustainable technologies and processes in all our operations and use scarce natural resources efficiently in our facilities
  - We will also help communities that are affected by natural calamities or untoward incidence, or that are physically challenged in line with the Tata Group's efforts

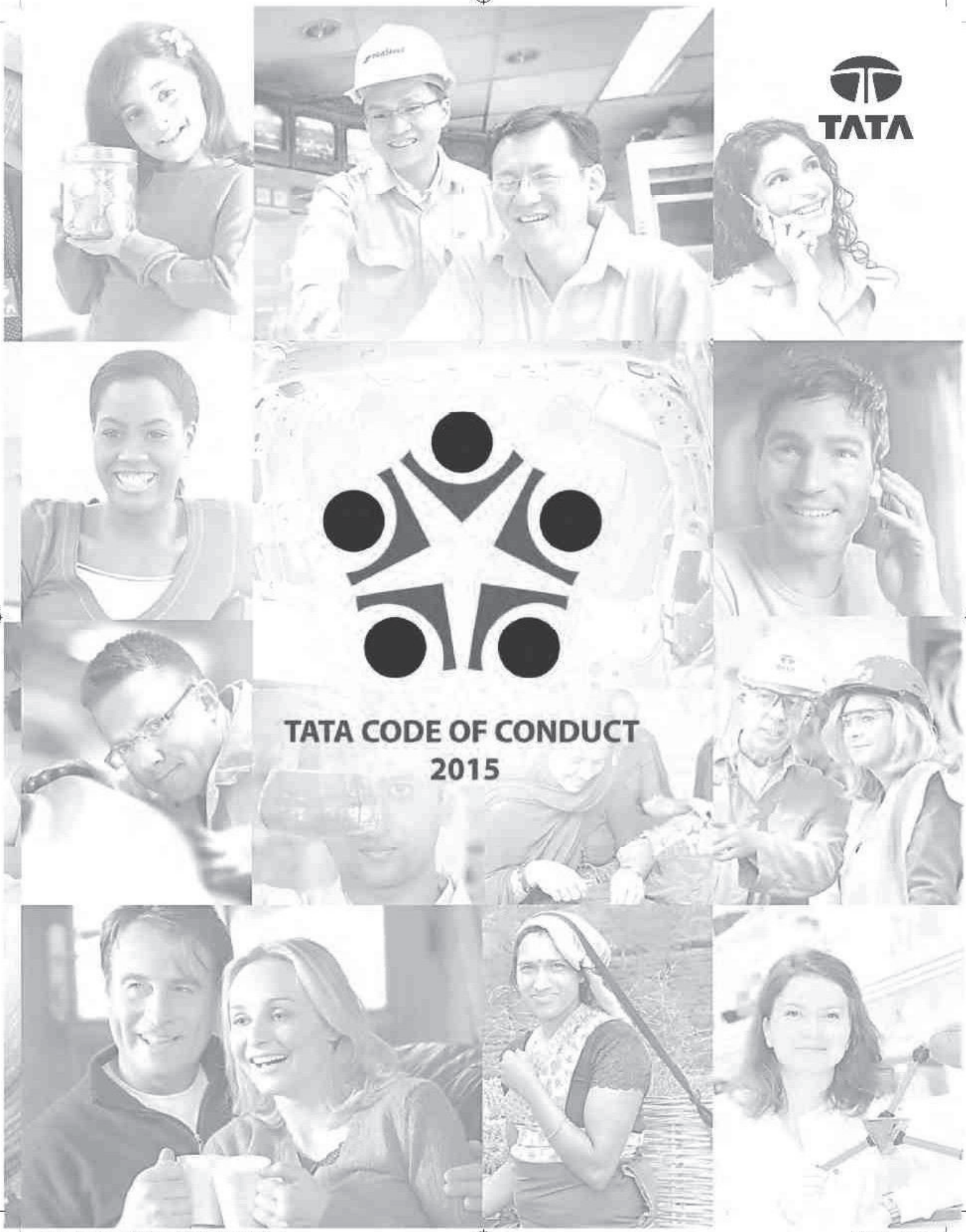
The management will commit all the necessary resources required to meet the goals of Corporate Sustainability.

(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018

TATA POWER

Lighting up Lives!



TATA

TATA CODE OF CONDUCT 2015

LEADERSHIP THAT INSPIRES

For over 100 years, the Tata group has been led by visionaries who have stayed true to the vision of the founder, Jamsetji Tata.
A vision that placed the greater good of society at par with business growth.
A vision that put into practice pioneering social initiatives that changed the way responsible business was run.
And a vision that brought into the group a strong social conscience.

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We do not claim to be more unselfish, more generous or more philanthropic than other people. But we think we started on sound and straightforward business principles, considering the interests of the shareholders our own, and the health and welfare of the employees, the sure foundation of our success.

Jamsetji Tata
Founder of the Tata group
Chairman (1868 – 1904)

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FOREWORD

Tata companies have consistently adhered to the values and ideals articulated by the Founder for over 150 years. The Tata Code of Conduct was first formalized by Mr Ratan Tata. It articulates the Group's values and ideals that guide and govern the conduct of our companies as well as our colleagues in all matters relating to business. Today, the Code is a bedrock on which we base our individual, as well as leadership commitments to core Tata values.

The Tata Code of Conduct outlines our commitment to each of our stakeholders, including the communities in which we operate, and is our guiding light when we are sometimes faced with business dilemmas that leave us at ethical crossroads. The Code is also dynamic in that it has been periodically refreshed in order to remain contemporary and contextual to the changes in law and regulations. However it remains unaltered at its core.

Our stellar reputation and success as a business entity has been defined by the powerful commitment and adherence to the core values and principles expressed in this Code, by all our employees, directors and partners. I trust every Tata colleague and Tata company will continue to not only comply with the laws and regulations that govern our business interests around the world, but will continue to set new standards of ethical conduct that will generate deep respect and inspire emulation by others.

N. Chandrasekaran
21st February, 2017



A. OUR VALUES

TATA has always been values-driven. The five core values that underpin the way we conduct our business activities are:



INTEGRITY

We will be fair, honest, transparent and ethical in our conduct; everything we do must stand the test of public scrutiny.

UNITY

We will invest in our people and partners, enable continuous learning, and build caring and collaborative relationships based on trust and mutual respect.

RESPONSIBILITY

We will integrate environmental and social principles in our businesses, ensuring that what comes from the people goes back to the people many times over.

PIONEERING

We will be bold and agile, courageously taking on challenges, using deep customer insight to develop innovative solutions.

EXCELLENCE

We will be passionate about achieving the highest standards of quality, always promoting meritocracy.

These universal values serve as the foundation for the Tata Code of Conduct. They find expression within the value system of every Tata company.

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B. SCOPE AND PURPOSE OF THIS CODE

1. This Code sets out how we behave with:
   - our employees, or those who work with us;
   - our customers;
   - the communities and the environment in which we operate;
   - our value-chain partners, including suppliers and service providers, distributors, sales representatives, contractors, channel partners, consultants, intermediaries and agents;
   - our joint-venture partners or other business associates;
   - our financial stakeholders;
   - the governments of the countries in which we operate; and
   - our group companies.
2. In this Code, "we or us" means our company, our executive directors, officers, employees and those who work with us, as the context may require.
3. The term "our group companies" in this Code typically means companies Tata Sons intends for this Code to apply to, and / or to whom Tata Sons has issued this Code.
4. This Code sets out our expectations of all those who work with us. We also expect those who deal with us to be aware that this Code underpins everything we do, and in order to work with us they need to act in a manner consistent with it.

REMEMBER...

It is our commitment to protect our reputation and our brand equity by adhering to the values and principles set out in this Code. By doing so, we strengthen our unique culture and identity.

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OUR CORE PRINCIPLES



> The Tata philosophy of management has always been, and is today more than ever, that corporate enterprises must be managed not merely in the interests of their owners, but equally in those of their employees, of the consumers of their products, of the local community and finally of the country as a whole.

J.R.D. Tata
Chairman, Tata Sons (1938 – 1991)

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C. OUR CORE PRINCIPLES

1. We are committed to operating our businesses conforming to the highest moral and ethical standards. We do not tolerate bribery or corruption in any form. This commitment underpins everything that we do.
2. We are committed to good corporate citizenship. We treat social development activities which benefit the communities in which we operate as an integral part of our business plan.
3. We seek to contribute to the economic development of the communities of the countries and regions we operate in, while respecting their culture, norms and heritage. We seek to avoid any project or activity that is detrimental to the wider interests of the communities in which we operate.
4. We shall not compromise safety in the pursuit of commercial advantage. We shall strive to provide a safe, healthy and clean working environment for our employees and all those who work with us.
5. When representing our company, we shall act with professionalism, honesty and integrity, and conform to the highest moral and ethical standards. In the countries we operate in, we shall exhibit culturally appropriate behaviour. Our conduct shall be fair and transparent and be perceived as fair and transparent by third parties.
6. We shall respect the human rights and dignity of all our stakeholders.
7. We shall strive to balance the interests of our stakeholders, treating each of them fairly and avoiding unfair discrimination of any kind.
8. The statements that we make to our stakeholders shall be truthful and made in good faith.
9. We shall not engage in any restrictive or unfair trade practices.
10. We shall provide avenues for our stakeholders to raise concerns or queries in good faith, or report instances of actual or perceived violations of our Code.
11. We shall strive to create an environment free from fear of retribution to deal with concerns that are raised or cases reported in good faith. No one shall be punished or made to suffer for raising concerns or making disclosures in good faith or in the public interest.
12. We expect the leaders of our businesses to demonstrate their commitment to the ethical standards set out in this Code through their own behaviour and by establishing appropriate processes within their companies.
13. We shall comply with the laws of the countries in which we operate and any other laws which apply to us. With regard to those provisions of the Code that are explicitly dealt with under an applicable law or employment terms, the law and those terms shall take precedence. In the event that the standards prescribed under any applicable law are lower than that of the Code, we shall conduct ourselves as per the provisions of the Code.

REMEMBER...

"Good faith" means having a reasonable belief that the information you have provided is truthful. It does not mean having 'all the evidence' about the potential violation or case reported.

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OUR EMPLOYEES



Once you got the best people, the people who shared our values and ideals, we left them free to act on their own. We do not fetter them. We encourage them and give them opportunities for leadership.

J.R.D. Tata
Chairman, Tata Sons (1938 – 1991)

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D. OUR EMPLOYEES

Equal opportunity employer

1. We provide equal opportunities to all our employees and to all eligible applicants for employment in our company. We do not unfairly discriminate on any ground, including race, caste, religion, colour, ancestry, marital status, gender, sexual orientation, age, nationality, ethnic origin, disability or any other category protected by applicable law.
2. When recruiting, developing and promoting our employees, our decisions will be based solely on performance, merit, competence and potential.
3. We shall have fair, transparent and clear employee policies which promote diversity and equality, in accordance with applicable law and other provisions of this Code. These policies shall provide for clear terms of employment, training, development and performance management.

Q&A

A job requirement entails extensive travel. One of the candidates has excellent relevant experience and qualifications. However, this candidate is a single parent. As a result, I feel such a situation would significantly hinder this candidate's ability to cope with the job requirement. What should I do?

In accordance with the Code, the decision to recruit an employee should be based upon merit. We cannot make a presumption that the candidate would not be able to meet the travel requirements of the job. All eligible candidates should be provided with equal opportunity to demonstrate or justify that they can cope with the travel requirements of the job. Being a single parent cannot be a ground to be discriminated against at any stage of recruitment or ongoing employment in our company.

REMEMBER...

We do not tolerate harassment in any form and therefore we expect every employee to discourage such misdemeanours in the workplace.

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Dignity and respect

4. Our leaders shall be responsible for creating a conducive work environment built on tolerance, understanding, mutual cooperation and respect for individual privacy.
5. Everyone in our work environment must be treated with dignity and respect. We do not tolerate any form of harassment, whether sexual, physical, verbal or psychological.
6. We have clear and fair disciplinary procedures, which necessarily include an employee's right to be heard.
7. We respect our employees' right to privacy. We have no concern with their conduct outside our work environment, unless such conduct impairs their work performance, creates conflicts of interest or adversely affects our reputation or business interests.

Human rights

8. We do not employ children at our workplaces.
9. We do not use forced labour in any form. We do not confiscate personal documents of our employees, or force them to make any payment to us or to anyone else in order to secure employment with us, or to work with us.

Bribery and corruption

10. Our employees and those representing us, including agents and intermediaries, shall not, directly or indirectly, offer or receive any illegal or improper payments or comparable benefits that are intended or perceived to obtain undue favours for the conduct of our business.

REMEMBER...

Violation by even a single employee of any law relating to anti-bribery, anti-corruption, anti-competition, data privacy, etc. could result in severe financial penalties and cause irreparable reputational damage to the company.

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Gifts and hospitality

11. Business gifts and hospitality are sometimes used in the normal course of business activity. However, if offers of gifts or hospitality (including entertainment or travel) are frequent or of substantial value, they may create the perception of, or an actual conflict of interest or an 'illicit payment'. Therefore, gifts and hospitality given or received should be modest in value and appropriate, and in compliance with our company's gifts and hospitality policy.

Freedom of association

12. We recognise that employees may be interested in joining associations or involving themselves in civic or public affairs in their personal capacities, provided such activities do not create an actual or potential conflict with the interests of our company. Our employees must notify and seek prior approval for any such activity as per the 'Conflicts of Interest' clause of this Code and in accordance with applicable company policies and law.

REMEMBER...

As a general rule, we may accept gifts or hospitality from a business associate, only if such a gift:

- has modest value and does not create a perception (or an implied obligation) that the giver is entitled to preferential treatment of any kind;
- would not influence, or appear to influence, our ability to act in the best interest of our company;
- would not embarrass our company or the giver if disclosed publicly.

The following gifts are never appropriate and should never be given or accepted:

- gifts of cash or gold or other precious metals, gems or stones;
- gifts that are prohibited under applicable law;
- gifts in the nature of a bribe, payoff, kickback or facilitation payment*;
- gifts that are prohibited by the gift giver's or recipient's organisation; and
- gifts in the form of services or other non-cash benefits (e.g. a promise of employment).

(*'Facilitation' payment is a payment made to secure or speed up routine legal government actions, such as issuing permits or releasing goods held in customs.)

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Working outside employment with us

13. Taking employment, accepting a position of responsibility or running a business outside employment with our company, in your own time, with or without remuneration, could interfere with your ability to work effectively at our company or create conflicts of interest. Any such activity must not be with any customer, supplier, distributor or competitor of our company. Our employees must notify and seek prior approval for any such activity as per the 'Conflicts of Interest' clause of this Code and in accordance with applicable company policies and law.

Integrity of information and assets

14. Our employees shall not make any wilful omissions or material misrepresentation that would compromise the integrity of our records, internal or external communications and reports, including the financial statements.

15. Our employees and directors shall seek proper authorisation prior to disclosing company or business-related information, and such disclosures shall be made in accordance with our company's media and communication policy. This includes disclosures through any forum or media, including through social media.

16. Our employees shall ensure the integrity of personal data or information provided by them to our company. We shall safeguard the privacy of all such data or information given to us in accordance with applicable company policies or law.

17. Our employees shall respect and protect all confidential information and intellectual property of our company.

18. Our employees shall safeguard the confidentiality of all third party intellectual property and data. Our employees shall not misuse such intellectual property and data that comes into their possession and shall not share it with anyone, except in accordance with applicable company policies or law.

19. Our employees shall promptly report the loss, theft or destruction of any confidential information or intellectual property and data of our company or that of any third party.

Q&A

I am an accountant in the finance department of my company. Due to my artistic skills, I received an offer to pen cartoons for a children's publication for which I would receive compensation. I plan to undertake this activity during week-ends. What should I do before accepting this offer?

Before accepting the offer, you should ascertain whether the company policies and rules require you to make a disclosure to your supervisor so that the company may determine whether your undertaking this activity adversely affects our company's interests. On confirmation from the company that it does not do so, you would be free to take up the activity. It is also your duty to bring to the attention of the company whenever there is any change in the situation you have disclosed.

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20. Our employees shall use all company assets, tangible and intangible, including computer and communication equipment, for the purpose for which they are provided and in order to conduct our business. Such assets shall not be misused. We shall establish processes to minimise the risk of fraud, and misappropriation or misuse of our assets.

21. We shall comply with all applicable anti-money laundering, anti-fraud and anti-corruption laws and we shall establish processes to check for and prevent any breaches of such laws.

Insider trading

22. Our employees must not indulge in any form of insider trading nor assist others, including immediate family, friends or business associates, to derive any benefit from access to and possession of price sensitive information that is not in the public domain. Such information would include information about our company, our group companies, our clients and our suppliers.

Q&A

Our company has recently announced the launch of a new business initiative. In connection with this, your friend who is a journalist with a leading business newspaper has asked you to provide some information that he could cover in his forthcoming article. He has promised not to quote you, or reveal your identity. Should you be giving him this information?

No. You should not be sharing information of this nature with the media, even if it is assured that the source would remain anonymous. Only authorised personnel in the company are permitted to speak to the media and provide information of this nature.

Our company has a "Use of Social Media" policy that lays down the "dos and don'ts" for use of social media even if you may access such media on your own time. Why is there such a policy?

External communication is a serious matter. It must be carefully managed because information put out with reference to our company or its businesses needs to be clear, truthful and not violate any undertakings we have given to other parties. In each business there are managers nominated to authorise and make different types of statements to the outside world. These managers should be consulted about any request for information you may receive or information you think we should give out.
In using social media, in particular blogs or social networking sites, you should exercise great caution while talking about our company or the business we do. It may feel like you are chatting with friends or expressing a personal opinion but even while doing so you cannot share any confidential information of our company.

REMEMBER...

We must respect the property rights of others by never misusing their assets, intellectual property or trade secrets, including the copying or downloading of unauthorised software, trademarks, copyrighted material or logos. We should never make unauthorised copies of computer software programs or use unlicensed personal software on company computers.

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Prohibited drugs and substances

23. Use of prohibited drugs and substances creates genuine safety and other risks at our workplaces. We do not tolerate prohibited drugs and substances from being possessed, consumed or distributed at our workplaces, or in the course of company duties.

Conflicts of interest

24. Our employees and executive directors shall always act in the interest of our company and ensure that any business or personal association *including close personal relationships* which they may have, does not create a conflict of interest with their roles and duties in our company or the operations of our company. Further, our employees and executive directors shall not engage in any business, relationship or activity, which might conflict with the interest of our company or our group companies.

25. Should any actual or potential conflicts of interest arise, the concerned person must immediately report such conflicts and seek approvals as required by applicable law and company policy. The competent authority shall revert to the employee within a reasonable time as defined in our company's policy, so as to enable the concerned employee to take necessary action as advised to resolve or avoid the conflict in an expeditious manner.

26. In the case of all employees other than executive directors, the Chief Executive Officer / Managing Director shall be the competent authority, who in turn shall report such cases to the Board of Directors on a quarterly basis. In case of the Chief Executive Officer / Managing Director and executive directors, the Board of Directors of our company shall be the competent authority.

Q&A

You are responsible for maintaining our company's customer database. One of your friends is starting a business venture and requests you to share a few particulars from this database for marketing purposes of his business. He assures you that he would keep the data as well as his source confidential. Should you do so?

No. You should respect the confidentiality of customer information and not share any part of the database with any person without due authorisation.

You have access to revenue numbers of different business units of our company. While having a conversation with you over evening drinks, your friend enquires about the financial performance of our company. You do not share detailed information with your friend, but share approximate revenue figures. Is this conduct of yours correct?

No, it is not. You are not permitted to share financial information of our company with others who do not need to know this information. Financial information should always be safeguarded and disclosed only on a need-to-know basis after obtaining requisite approvals. Sharing of any price sensitive information that is not generally available with the public could also lead to violation of applicable insider trading laws.

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27. Notwithstanding such or any other instance of conflict of interest that exists due to historical reasons, adequate and full disclosure by interested employees shall be made to our company's management. At the time of appointment in our company, our employees and executive directors shall make full disclosure to the competent authority, of any interest leading to an actual or potential conflict that such persons or their immediate family (including parents, siblings, spouse, partner, children) or persons with whom they enjoy close personal relationships, may have in a family business or a company or firm that is a competitor, supplier, customer or distributor of, or has other business dealings with, our company.

REMEMBER...

A conflict of interest could be any known activity, transaction, relationship or service engaged in by an employee, his/her immediate family (including parents, siblings, spouse, partner, and children), relatives or a close personal relationship, which may cause concern (based upon an objective determination) that the employee could not or might not be able to fairly perform his/her duties to our company.

Examples of Potential Conflicts of Interest

A conflict of interest, actual or potential, arises where, directly or indirectly, an employee or executive director:

(a) engages in a business, activity or relationship with anyone who is party to a transaction with our company;

(b) is in a position to derive an improper benefit, personally or for any family member or for any person in a close personal relationship, by making or influencing decisions relating to any transaction;

(c) conducts business on behalf of our company or is in a position to influence a decision with regard to our company's business with a supplier or customer where a relative of, or a person in close personal relationship with, an employee or executive director is a principal officer or representative, resulting in a personal benefit or a benefit to the relative;

(d) is in a position to influence decisions with regard to award of benefits such as increase in salary or other remuneration, posting, promotion or recruitment of a relative or a person in close personal relationship employed in our company or any of our group companies;

(e) undertakes an activity by which the interest of our company or our group companies can be compromised or defeated; or

(f) does anything by which an independent judgement of our company's or our group companies' best interest cannot be exercised.

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28. If there is a failure to make the required disclosure and our management becomes aware of an instance of conflict of interest that ought to have been disclosed by an employee or executive director, our management shall take a serious view of the matter and consider suitable disciplinary action as per the terms of employment. In all such matters, we shall follow clear and fair disciplinary procedures, respecting the employee's right to be heard.

Examples of activities normally approved (post-disclosure) as per applicable company policy

Acceptance of a position of responsibility (whether for remuneration or otherwise) in the following cases would typically be permitted, provided the time commitments these demand do not disturb or distract from the employee's primary duties and responsibilities in our company, and are promptly disclosed to the relevant competent authority:

(a) Directorships on the Boards of any of our group companies, joint ventures or associate companies.

(b) Memberships/positions of responsibility in educational/professional bodies, where such association will promote the interests of our company.

(c) Memberships or participation in government committees/bodies or organisations.

Q&A

You are in a relationship with a colleague who has been recently moved into your team and would now be reporting to you. What should you do?

Romantic or close personal relationships with another employee where a reporting relationship exists and one is responsible for evaluating the other's performance, is likely to create a conflict of interest. In such a situation, you would need to report the potential conflict to your supervisor.

Your company is submitting a proposal to a company in which you were previously employed. You have confidential information pertaining to your previous employer, which you believe will help your present employer in winning the contract. Should you share this information?

No. You should not share this information with your company since it relates to confidential information of a third party. Your company respects its employees' duty to protect confidential information that they may have relating to their previous employers.

You are the purchasing manager in the procurement department of your company. You receive an invitation from a supplier to attend a premier sporting event as her guest. This particular supplier is one of the vendors who has submitted a proposal for an open tender issued by your company. Should you accept the invitation?

No. You should not accept the invitation in this instance. Since you are in a key decision-making role for the tender, any unusual benefit that you receive could be perceived as an inducement that could compromise your objectivity.

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OUR CUSTOMERS



We have continued to enjoy prosperity, even with adverse times to fight against. Our relations with all concerned are the most friendly. We have maintained the same character for straight-forward dealing with our constituents and customers. Our productions have continued to be of the same high quality, and therefore command the best reputation and realise the highest prices. … I mention these facts only to point out that with honest and straight-forward business principles, close and careful attention to details, and the ability to take advantage of favourable opportunities and circumstances, there is a scope for success.

Jamsetji Tata
Founder of the Tata group
Chairman, Tata Sons (1868 – 1904)

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E. OUR CUSTOMERS

Products and services

1. We are committed to supplying products and services of world-class quality that meet all applicable standards.
2. The products and services we offer shall comply with applicable laws, including product packaging, labelling and after-sales service obligations.
3. We shall market our products and services on their own merits and not make unfair or misleading statements about the products and services of our competitors.

Export controls and trade sanctions

4. We shall comply with all relevant export controls or trade sanctions in the course of our business.

Fair competition

5. We support the development and operation of competitive open markets and the liberalisation of trade and investment in each country and market in which we operate.
6. We shall not enter into any activity constituting anti-competitive behaviour such as abuse of market dominance, collusion, participation in cartels or inappropriate exchange of information with competitors.
7. We collect competitive information only in the normal course of business and obtain the same through legally permitted sources and means.

Dealings with customers

8. Our dealings with our customers shall be professional, fair and transparent.
9. We respect our customers' right to privacy in relation to their personal data. We shall safeguard our customers' personal data, in accordance with applicable law.

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Q&A

You are the Regional Sales Manager of our company. You have become a member of an "informal group", on an instant messaging service, whose members are the regional sales heads of our company's competitors. The administrator of the group has requested an in-person meeting to informally discuss market conditions and brainstorm on "pricing strategy" from an industry perspective. What should you do?

Any meeting with competitors, especially to discuss "pricing strategy", could be an attempt to promote an anti-competitive practice or manipulate prices. You should respond by declining this invitation and exiting the "informal group". You should also report this incident to your supervisor and your Legal department.

You are attending a customer meeting with a colleague, and your colleague makes an untruthful statement about the company's services. What should you do?

You should assist your colleague in correcting the inaccuracy during the meeting if possible. If this is not possible, raise the issue with your colleague after the meeting to enable him/her or the company to correct any misrepresentation made to the customer.

While working on a customer project, you receive a call from your colleague. He used to manage that customer account before you took over his role. He recalls that he had worked with the customer on developing a new ordering system which he thinks would be beneficial for another customer and requests you to send him the project details. What should you do?

You must not share this information without specific approval of the customer; you are not permitted to use a customer's assets, including software, for another customer or for any personal use.

REMEMBER...

Striving for excellence in the standards of our work and in the quality of our goods and services is a core Tata value. It is the unwavering practice of this value that builds and sustains customer trust in our brand.

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OUR COMMUNITIES AND THE ENVIRONMENT



> In a free enterprise, the community is not just another shareholder in business but is in fact the very purpose of its existence.

Jamsetji Tata
Founder of the Tata group
Chairman, Tata Sons (1868 – 1904)

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F. OUR COMMUNITIES AND THE ENVIRONMENT

Communities

1. We are committed to good corporate citizenship, and shall actively assist in the improvement of the quality of life of the people in the communities in which we operate.
2. We engage with the community and other stakeholders to minimise any adverse impact that our business operations may have on the local community and the environment.
3. We encourage our workforce to volunteer on projects that benefit the communities in which we operate, provided the principles of this Code, where applicable, and in particular the 'Conflicts of Interest' clause are followed.

The environment

4. In the production and sale of our products and services, we strive for environmental sustainability and comply with all applicable laws and regulations.
5. We seek to prevent the wasteful use of natural resources and are committed to improving the environment, particularly with regard to the emission of greenhouse gases, consumption of water and energy, and the management of waste and hazardous materials. We shall endeavour to offset the effect of climate change in our activities.

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OUR VALUE-CHAIN PARTNERS



If we had done some of the things that some other groups have done, we would have been twice as big as we are today. But we didn't, and I would not have it any other way.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

(on the pace of expansion of the Tata group in the 1960s and 70s)

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G. OUR VALUE-CHAIN PARTNERS

1. We shall select our suppliers and service providers fairly and transparently.
2. We seek to work with suppliers and service providers who can demonstrate that they share similar values. We expect them to adopt ethical standards comparable to our own.
3. Our suppliers and service providers shall represent our company only with duly authorised written permission from our company. They are expected to abide by the Code in their interactions with, and on behalf of us, including respecting the confidentiality of information shared with them.
4. We shall ensure that any gifts or hospitality received from, or given to, our suppliers or service providers comply with our company's gifts and hospitality policy.
5. We respect our obligations on the use of third party intellectual property and data.

Q&A

You head the procurement function in our company. You have tight budgetary constraints for a project that you are working on. In order to complete the project within the targeted costs, you intend to request your supplier to provide you an exceptional discount on this project order on the understanding that you would "make it up to him" in future orders. Would you be violating the Code?

Yes, you would. Inducement in any form, including future benefits to the supplier, could compromise your ability to act objectively and in the best interests of the company and therefore must be avoided.

REMEMBER...

Our value-chain partners would include our suppliers and service providers, distributors, sales representatives, contractors, channel partners, consultants, intermediaries and agents; joint-venture partners and other business associates.

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OUR FINANCIAL STAKEHOLDERS



Ethical behaviour in business – in every sphere and with all constituents – has been the bedrock on which the Tata group has built, and operates, its enterprises. This has been an article of faith for the group ever since its inception, a fundamental element of our cherished heritage and the essence of our way of life.

Ratan Tata
Chairman, Tata Sons (1991 – 2012)

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H. OUR FINANCIAL STAKEHOLDERS

1. We are committed to enhancing shareholder value and complying with laws and regulations that govern shareholder rights.
2. We shall inform our financial stakeholders about relevant aspects of our business in a fair, accurate and timely manner and shall disclose such information in accordance with applicable law and agreements.
3. We shall keep accurate records of our activities and shall adhere to disclosure standards in accordance with applicable law and industry standards.

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GOVERNMENTS



Business, as I have seen it, places one great demand on you; it needs you to impose a framework of ethics, values, fairness and objectivity on yourself at all times. It is not easy to do this; you cannot impose it on yourself forcibly because it has to become an integral part of you.

Ratan Tata
Chairman, Tata Sons (1991 – 2012)

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I. GOVERNMENTS

Political non-alignment

1. We shall act in accordance with the constitution and governance systems of the countries in which we operate. We do not seek to influence the outcome of public elections, nor to undermine or alter any system of government. We do not support any specific political party or candidate for political office. Our conduct must preclude any activity that could be interpreted as mutual dependence/favour with any political body or person, and we do not offer or give any company funds or property or other resources as donations to any specific political party, candidate or campaign.

   Any financial contributions considered by our Board of Directors in order to strengthen democratic forces through a clean electoral process shall be extended only through the Progressive Electoral Trust in India, or by a similar transparent, duly-authorised, non-discriminatory and non-discretionary vehicle outside India.

Government engagement

2. We engage with the government and regulators in a constructive manner in order to promote good governance. We conduct our interactions with them in a manner consistent with our Code.

3. We do not impede, obstruct or improperly influence the conclusions of, or affect the integrity or availability of data or documents for any government review or investigation.

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OUR GROUP COMPANIES



I do not think anyone was on par with Jamsetji as an industrial visionary. But that is not the sole reason why I have been an admirer of Jamsetji. The major reason was his sense of values, sterling values, which he imparted to this group. If someone were to ask me, what holds the Tata companies together, more than anything else, I would say it is our shared ideals and values which we have inherited from Jamsetji Tata.

J.R.D. Tata
Chairman, Tata Sons (1938 – 1991)

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J. OUR GROUP COMPANIES

1. We seek to cooperate with our group companies, including joint ventures, by sharing knowledge, physical resources, human and management resources and adopting leading governance policies and practices in accordance with applicable law including adherence to competition law, where relevant.
2. We shall strive to achieve amicable resolution of any dispute between us and any of our group companies, through an appropriate dispute resolution mechanism so that it does not adversely affect our business interests and stakeholder value.
3. We shall have processes in place to ensure that no third party or joint venture uses the TATA name/brand to further its interests without proper authorisation.
4. Our Board of Directors shall consider for adoption policies and guidelines periodically formulated by Tata Sons and circulated to group companies.

Q&A

You are in the process of selecting potential vendors for an IT project in our company. In the final shortlist of two companies, one is a new start-up with limited references and a lower price-quotation, while the other is a Tata company with thirty years of implementation experience and good references, but a marginally higher quote for the same job. With all other parameters of choice being nearly equal, which company should you select for the job?

While price is undoubtedly an important criterion for decision making, it is clearly not the only one to be evaluated. You may also need to consider good customer references, proven track record and shared value systems in order to decide on your IT partner.

You are in the process of selecting potential vendors for a project. One of the three finalists is a group company. In reviewing the final proposals, you rank the group company second out of the three proposals based on pricing and total cost of ownership, and select the first-ranked vendor. Is this the right decision?

Yes. You should select the vendor that, on its own merits, is the vendor that is most appropriate for your company's requirements. You should not select a group company only because of its affiliation.

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RAISING CONCERNS

We encourage our employees, customers, suppliers and other stakeholders to raise concerns or make disclosures when they become aware of any actual or potential violation of our Code, policies or law. We also encourage reporting of any event (actual or potential) of misconduct that is not reflective of our values and principles.

Avenues available for raising concerns or queries or reporting cases could include:

- immediate line manager or the Human Resources department of our company
- designated ethics officials of our company
- the 'confidential reporting' third party ethics helpline (if available)
- any other reporting channel set out in our company's 'Whistleblower' policy.

We do not tolerate any form of retaliation against anyone reporting legitimate concerns. Anyone involved in targeting such a person will be subject to disciplinary action.

If you suspect that you or someone you know has been subjected to retaliation for raising a concern or for reporting a case, we encourage you to promptly contact your line manager, the company's Ethics Counsellor, the Human Resources department, the MD/CEO or the office of the group's Chief Ethics Officer.

Q&A

My supervisor has asked me to do something which I believe may be illegal. I am afraid if I do not do what I am told, I could lose my job. Should I do it?

No. Breaking the law is never an option. Discuss the situation with your supervisor to be certain that you both understand the facts. If your concerns are not resolved, contact a higher level supervisor, the Ethics Counsellor, the Legal department or report them via the company's confidential reporting system, if available.

I feel that my supervisor is treating me unfairly for reporting a concern to the Ethics Counsellor. What should I do?

Retaliation against anyone who raises a concern is a violation of the Code. You should therefore promptly report this action of your supervisor to the Ethics Counsellor or the MD/CEO of your company or via the company's confidential reporting system, if available.

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ACCOUNTABILITY

This Code is more than a set of prescriptive guidelines issued solely for the purpose of formal compliance. It represents our collective commitment to our value system and to our core principles.

Every person employed by us, directly or indirectly, should expect to be held accountable for his/her behaviour. Should such behaviour violate this Code, they may be subject to action according to their employment terms and relevant company policies.

When followed in letter and in spirit, this Code is *'lived'* by our employees as well as those who work with us. It represents our shared responsibility to all our stakeholders, and our mutual commitment to each other.

SPEAK UP...

If you are unsure whether a particular action you are about to take is consistent with the principles set forth in the Code, ask yourself:

- Could it directly or indirectly endanger someone or cause them injury?
- Is it illegal/unlawful or out of line with our policies and procedures?
- Does my conscience reject it? Does it conflict with my personal values?
- Would I feel uncomfortable if the story appeared in the media? Would it shame my company, spouse, partner, parent or child?
- Does it 'feel' wrong?

If the answer to any of these questions is "Yes", please stop and consult your reporting manager, the Ethics Counsellor, the Human Resource department, the Legal department or any member of the senior management team, to assist you in making the decision.

When faced with a dilemma: Stop, Think, Act Responsibly

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NOTE

The Code does not provide a comprehensive and complete explanation of all expectations from a company standpoint or obligations from a stakeholder standpoint.

Our employees have a continuing obligation to familiarise themselves with all applicable law, group-level advisories and policies, company-level policies, procedures and work rules as relevant. For any guidance on interpretation of the Code, we may seek support from our company's Ethics Counsellor or from the group's Chief Ethics Officer, as appropriate.

All joint ventures are encouraged to adopt the Tata Code of Conduct (TCOC) or a code of conduct that incorporates all elements of the TCOC.

This version of the Tata Code of Conduct supersedes all earlier versions and associated documents and stands effective from 29th July, 2015.

For any query or clarification on the Code, please contact the office of the group's Chief Ethics Officer via email at: ethicsoffice@tata.com.

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TATA CODE OF CONDUCT – 2015

I acknowledge that I have received the Tata Code of Conduct.

I have read the Tata Code of Conduct and I acknowledge that as a Tata employee, I am required to comply with the guidelines described therein and failure to do so may subject me to action as per my employment terms and relevant company policies.

If I have a concern about a violation, or a potential violation of the Tata Code of Conduct, I understand that there are channels available to me in my company to report such concerns. By making use of these channels when necessary, I will play my part in maintaining the high ethical standards to which we hold ourselves.

Signature: _____

Date: _____

Name: _____

Department: _____

Address: _____

_____

_____

(Please submit this declaration to your Ethics Counsellor or the Human Resource department of your company.)

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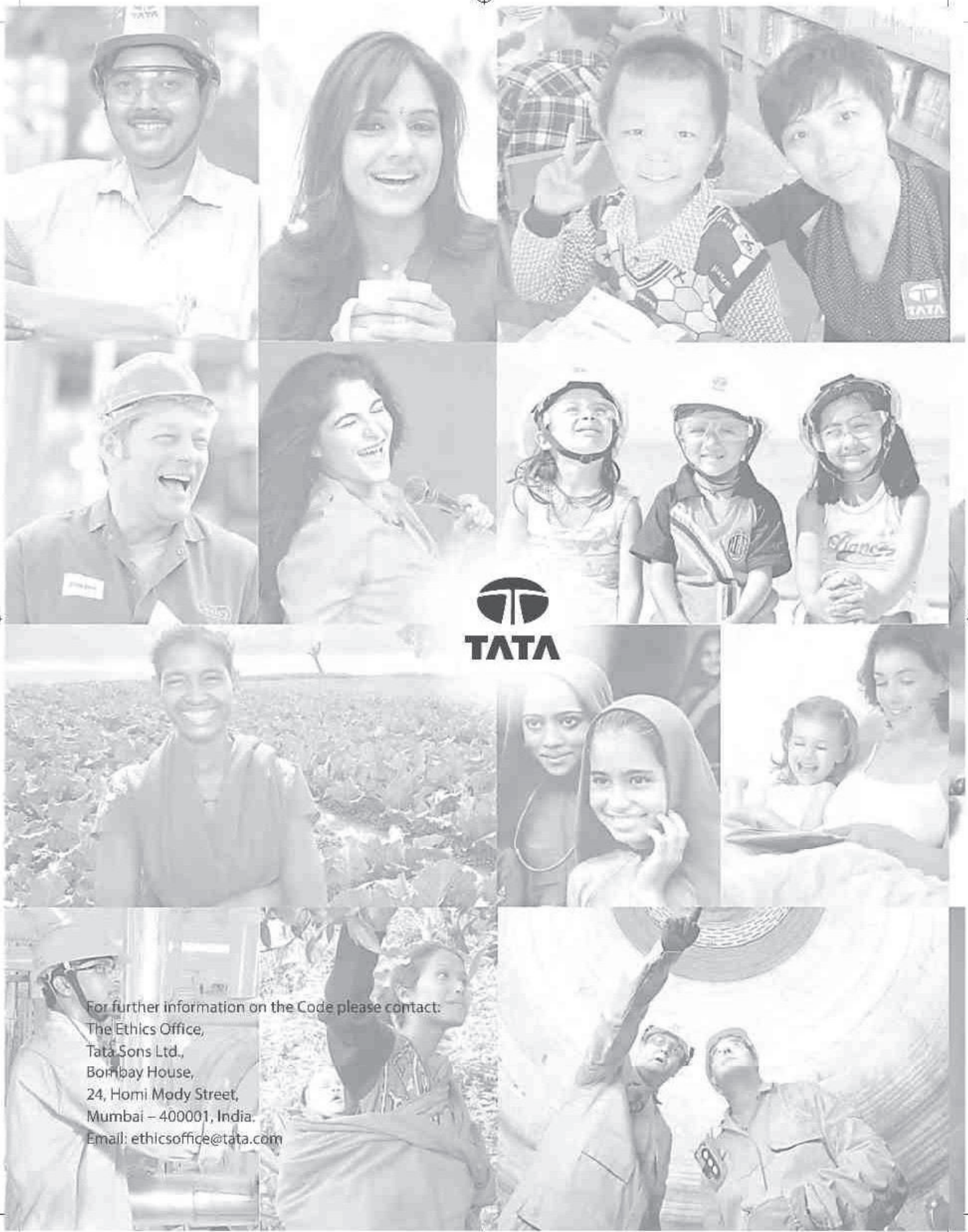
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TATA

For further information on the Code please contact:
The Ethics Office,
Tata Sons Ltd.,
Bombay House,
24, Homi Mody Street,
Mumbai – 400001, India.
Email: ethicsoffice@tata.com

CONFIDENTIAL

Section F.1: EMD Format

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FORMAT F.1

Format of BID BG / EMD

Whereas (Name of the Contractor), a Company incorporated under the Indian Companies Act 1956, having its Registered office at _____, (hereinafter called the "BIDDER") has in response to your Invitation to Bid against Enquiry No. _____dated _____, for (name of work), offered to supply and/or execute the works as contained in Employers letter dated _____.

AND WHEREAS BIDDER is required to furnish to you a Bank Guarantee for the sum of Rs._____/-(Rupees ____ only) as Earnest Money against Bidder's offer as aforesaid.

AND WHEREAS we, (name of the bank) having our Registered Office at _____and Branch office at _____, have at the request of Bidder, agreed to give you this Guarantee as hereinafter contained.

NOW THEREFORE, in lieu of earnest money deposit, we, the undersigned, hereby covenant that the aforesaid Bid of the BIDDER shall remain open for acceptance by you during the period of validity as mentioned in the Bid Document or any extension thereof as requested by you and if Bidder shall for any reason back out, whether expressly or impliedly, from this said Bid during the period of its validity or any extension thereof as aforesaid, we hereby guarantee to you the payment of the sum of Rs._____/-(Rupees ____ only) on demand and without demur and notwithstanding the existence of any dispute between you and the BIDDER in this regard and we hereby further agree as follows:

(a) You shall have the right to file/make a claim on us under the Guarantee for a further period of six months from the said date of expiry.

(b) That this guarantee shall not be revoked during its currency without your written express consent.

(c) That you may without affecting this guarantee grant time or other indulgence to or negotiate further with BIDDER in regard to the conditions contained in the said Bid

document and thereby modify these conditions or add thereto any further conditions as may be mutually agreed upon between you and BIDDER.

(d) That the guarantee hereinbefore contained shall not be affected by any change in the constitution of our Bank or in the constitution of BIDDER.

(e) That any account settled between you and BIDDER shall be conclusive evidence against us of the amount due hereunder and shall not be questioned by us.

(f) That this guarantee commences from the date hereof and shall remain in force till BIDDER, if his Bid is accepted by you, furnishes the Contract Performance Guarantee as required under the said specifications and executes formal Contract Agreement as therein provided or till ____Days (__days) from the date of submission of the Bid by the BIDDER i.e. (expiry date), whichever is earlier.

(g) That the expression, BIDDER and Bank, and OWNER herein used shall, unless such an interpretation is repugnant to the subject or context, include their respective successors and assignees.

(h) Notwithstanding anything herein contained, our liability under this guarantee is limited to Rs._____/-(Rupees _____only) and the Guarantee will remain in force upto and including and shall be extended from time to time for such period or periods as may be desired by you. Unless a demand or claim under this Guarantee is received by us in writing within six months from (expiry date), i.e. on or before (claim period date), we shall be discharged from all liabilities under this guarantee thereafter.

(i) Any claim/extension under the guarantee can be lodgeable at issuing outstation bank or at Mumbai branch and claim will also be payable at Mumbai Branch. **(To be confirmed by Mumbai Branch by a letter to that effect)**

Notwithstanding anything contained herein above:

a) Our liability under this Bank Guarantee shall not exceed Rs._____/-(Rupees _____ only).
b) This Bank Guarantee shall be valid upto ---------- 200.
c) Our Liability to make payment shall arise and we are liable to pay the guaranteed amount or any part there of under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before ---------- 200.