

The Tata Power Company Ltd

Tender Reference: CC25NP022



OPEN TENDER NOTIFICATION

Document Date: 10th July 2024

OPEN TENDER NOTIFICATION

FOR

**Civil work- Micro tunnelling for EHV Cable laying below
Railway track at Byculla location, Mumbai**

Tender Enquiry No: CC25NP022

**(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**

The Tata Power Company Ltd

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Procedure for Participating in Tender

Tender Enquiry No.	Work Description	EMD (Rs.)	Tender Participati on Fee	Last date and time for Payment of Tender Participation Fee*	Last date and time for bid submission
CC25NP022	Civil work- Micro tunnelling for EHV Cable laying below Railway track at Byculla location, Mumbai	Rs. 2,50,000/-	Rs. 2000/-	18 th July 2024 1500 Hrs	01 st August 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,

- Interested Vendors to refer to the Section C of the tender (Prequalification criteria).
- Eligible and Interested Bidders to submit duly signed and stamped letter on Bidder's letterhead indicating.
 - Tender Enquiry number
 - Name of authorized person
 - Contact number
 - e-mail id
 - Details of submission of Tender Participation Fee
- 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

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	CC25NP022
Description	Civil work- Micro tunnelling for EHV Cable laying below Railway track at Byculla location, Mumbai
Type of Tender	Firm Order
Period	Till the completion of Contract.
Tender Fee	Rs 2,000/-
Earnest Money Deposit (EMD)	Rs 2,50,000 /- Rs Two lakhs Fifty Thousand 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	10 th July 2024 onwards
(b)	Last date and time for Payment of Tender Participation Fee to get e-tender link for bid submission*	Till 18 th July' 2024 1500 Hrs.
(c)	Date & Time of Site visit.	19 th July 2024 @ 11:00 Hrs.
(d)	Last Date of receipt of pre-bid queries, if any.	By 22 nd July' 2024 1500 Hrs.
(e)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	By 24 th July' 2024 1500 Hrs.
(f)	Last date and time of receipt of Bids	By 01 st August' 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:

- Documentary evidence in support of Technical, Commercial qualifying criteria
- 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)*
- Duly filled Technical and Commercial Deviation Sheets
- Duly filled formats like Authorization affidavit form
- Unpriced Commercial Bid*

The technical / un-priced commercial bid shall be properly indexed and is to be submitted in Soft Copy through 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 ENVELOPE 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 Qualified 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 Contract 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.

---XXX---

The Tata Power Company Ltd		<i>OPEN TENDER NOTIFICATION</i>
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Section B: Format of Technical & Commercial Pre bid Queries

CONFIDENTIAL

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-Qualification Requirement, Safety Pre-Qualification Requirement, Technical Set of Document

Pre-Bid Query has to be sent in editable Excel file fomrat only

Pre-Bid Query has to be sent through e-mail in Tata Power E-Tender System

[illegible]

Format for Commercial Pre-Bid Queries

Package Name

Bidder :

Pre-Bid Query has to be sent in editable Excel file format only

Pre-Bid Query has to be sent through e-mail in Tata Power E-Tender System

[illegible]

The Tata Power Company Ltd	 TATA	<i>OPEN TENDER NOTIFICATION</i>
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Section C.1: Pre-Qualification requirement

CC25NP022 -Civil work- Micro tunnelling for EHV Cable laying below Railway track in Byculla location, Mumbai

C.1 Pre-qualification Requirement

S No	Parameter	Tata Power Requirement	Documents To be submitted by Bidder to ascertain meeting of Pre-qualification requirement	Bidder's Response
1	Experience	Bidder must have experience in design, construction and commissioning of at least three nos. of project for 1400mm dia ID steel pipe laying 4m below ground level by micro tunneling method during the past 5 calendar years. From these projects at least one of the project should be for pipe laying below railway tracks and for such project bidder should have taken the permission from Railway Authorities. 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.	Bidder to submit credentials for supporting the noted criteria. Owner has the right to reject the bid in case it is observed that the Bidder does not meet the relevant experience for the subject works	
2	ISO Certifications	Vendor should possess ISO-9001, ISO-14001 and OHSAS-18001 / ISO- 45001 Certification or they should provide an undertaking that they will obtain these certifications for their organization if the work is awarded to them.	Copy of each certificate to be attached or undertaking letter to be attached.	
3	Commercial Capability	Average annual turnover of the Vendor for last three financial years shall not be less than Rs. 800 lakhs.	Copy of audited Balance Sheet and P&L Account to be submitted in this regard for last 3 years.	
	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

The Tata Power Company Ltd	TPC0DL TPS0DL	 TATA TATA POWER	TPN0DL TPW0DL	Contractor's Safety Code of Conduct
Document no TPSMS/GSP/ CSM/015/REV 07				Date of Issue: 01/08/2023

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						
<u>Others(R7)</u>						

Instruction to Bidders:

- Indicate the overall site manpower deployment schedule as above
- 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*

- Against each category, indicate minimum educational qualification and work experience

The Tata Power Company Ltd	TPC0DL TPS0DL	 TATA TATA POWER	TPN0DL TPW0DL	Contractor's Safety Code of Conduct
Document no TPSMS/GSP/ CSM/015/REV 07				Date of Issue: 01/08/2023

- 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.

The Tata Power Company Ltd	TPC ~~ODL~~ TPS ~~ODL~~	 TATA TATA POWER	TPN ~~ODL~~ TPW ~~ODL~~	Contractor's Safety Code of Conduct
Document no TPSMS/GSP/ CSM/015/REV 07				Date of Issue: 01/08/2023

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

The Tata Power Company Ltd	TPC ~~ODL~~ TPS ~~ODL~~	 TATA TATA POWER	TPN ~~ODL~~ TPW ~~ODL~~	Contractor's Safety Code of Conduct
Document no TPSMS/GSP/ CSM/015/REV 07				Date of Issue: 01/08/2023

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.

SI 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

THE TATA POWER COMPANY LIMITED

110KV PAREL GRANT ROAD CABLE PROJECT

EPC SPECIFICATION FOR CABLE LAYING BELOW RAILWAY TRACK AT BYCULLA

(SPECIFICATION NO – CA/SPEC/043/2024)



Civil & Estate

Revision	Date	Revision History	Approvals		
			Prepared By	Checked By	Approved By
R0	13-05-2024	New	Anushka Sawant	Paresh Mestri	Sambrit Chakraborty

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Annexure 1.1	Cross-section of 1400mm dia. MS pipe
Annexure 1.2	Standard field quality plan for General Civil Works (GCW)

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1 INTRODUCTION:

- 1.1 Tata Power Company Limited (Tata Power) hereinafter called the "OWNER" or "PURCHASER", proposes to lay 110KV cable in pipe below railway tracks by micro tunneling at Byculla, Mumbai.

2 QUALIFICATION REQUIREMENTS

- 2.1 The Bidder should meet the qualifying requirements as noted below:
- 2.1.1 Bidder must have experience in design, construction and commissioning of at least three nos. of project for 1400 mm dia. ID steel pipe laying 4m below ground level by micro tunneling method during the past 5 calendar years. From these projects at least one of the project should be for pipe laying below railway tracks and for such project bidder should have taken the permission from Railway Authorities.

3 SYSTEM DESCRIPTION AND SCOPE

- 3.1 The specific requirement briefly covers the following:
- 3.1.1 Engineering, obtaining permissions from Railway Authority, Procurement, Testing, Construction, Erection, Commissioning, and Handing over of the following:
- a. Laying of 1400mm diameter ID MS pipe of 60 m length and 4 m below railway track by Micro tunneling
 - b. Laying of 9 nos. HDPE pipes of 250 mm size, 2 nos. HDPE pipes of 200 mm size and 2 nos. HDPE pipes of 90 in 1400 diameter ID MS pipe
 - c. Any other structures as functionally necessary for successful commissioning of the project.
- 3.1.2 Obtaining permissions from Railway and any other statutory authority to complete the work mentioned in clause 3.1.1.
- 3.2 The detailed description of the components of work are as noted below:
- 3.2.1 EPC Contractor is responsible for entire design and detail engineering of the project. Contractor shall prepare "Good for Construction" drawings, Methodology for execution (micro tunneling) and submit to the OWNER and approval must be sought from the OWNER prior to submission to the Railway Authority for permission and procurement,

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supply, fabrication, erection, construction at the project site. Cathodic protection arrangement as per standard procedure of railway to protect MS pipe life for 35 years to be provided.

- 3.2.2 Preparing and submitting necessary documents such as design, drawings, methodology, etc. to the railway and any other statutory authority.
- 3.2.3 Obtaining permissions from Railway Authority and any other statutory authority for execution of the Project.
- 3.2.4 Obtaining caution order from Railways and maintain safety precautions as per requirement of Railway Safety.
- 3.2.5 Obtaining permission for movement through private land owners / Societies including necessary security deposits and necessary reinstatements.
- 3.2.6 Jacking and receiving pits will be in MCGM area and private property. Bidder to obtain permission for execution of the same from MCGM and private property land owners.
- 3.2.7 Micro tunneling for installation of pipe including but not limited to Micro tunneling system, dewatering, hoisting, lifting, control equipment.
- 3.2.8 Geotechnical investigation to be done by the BIDDER to verify the various features for design.
- 3.2.9 Shoring protection work (Sheet pile/ Structural Steel shoring) as necessary for safe excavation shall be designed and executed by the EPC Contractor and same shall be retained up to cable pulling is done.
- 3.2.10 All safety precautions such as PPE, Hand Gloves, Temporary barricading, stable side slopes, berms, etc. must be adhered to during all works. Tata Power safety standards to be followed. Safety precautions also w.r.t COVID 19 to be followed as suggested by Tata Power.
- 3.2.11 Jacking and Retrieval/Receiving pit construction complete but not limited to excavation in all kinds of soils and/or rock, clearing away vegetation, shoring as mentioned above, dewatering, keeping the pit dry till completion of all the activities of micro tunneling, compacted backfilling the pit, levelling and disposal of surplus unusable earth and/or rock to disposal areas as per Local statutory authorities like MCGM/ NMMC' norms as directed, removing shoring and back filling with approved earth brought from outside in layers not exceeding 200mm thk. and compacted to 95% density, restoration of surface features as per specifications and as directed by the Engineer. All necessary statutory permissions shall be in scope of EPC contractor.
- 3.2.12 All systems required for micro tunneling such as launch seal, jacking frame in jacking pit, control room, hydraulic system D.G. set, slurry system, etc.
- 3.2.13 Monitoring track levels during micro tunneling. There shall not be any abnormalities during micro tunneling.
- 3.2.14 Facilitating laying of 6 nos. of 110kV cables in HDPE pipe

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- 3.2.15 Laying of HDPE pipes in 1400mm diameter ID MS pipe and encasing of HDPE pipe and filling the annular space with STB (87% sand, 11% fly ash and 2% cement) with all material like GI Pipe, Gunniting machine etc., as per methodology as approved by Tata Power.
- 3.2.16 Structural steel supports in 1400 dia. ID MS pipe for laying HDPE pipes for cables.
- 3.2.17 PCC and RCC works for thrust wall, etc.
- 3.2.18 All PCC and RCC works shall be ready mix concrete complying IS 4926.
- 3.2.19 Providing and placing monsoon protection shed as per plan area of pits of height upto 3.5 meter with openable cover to facilitate the crane movement, lowering of pipe etc. inclusive of all materials, tools, and tackles etc. complete.
- 3.2.20 Access ladder to be provided as per Tata Power Safety Standard for Jacking Pit and Retrieval Pit.
- 3.2.21 Lighting arrangement for 24 hrs working during Micro tunneling operation
- 3.2.22 Safety Nets as per requirement and as directed by Engineer In charge to be provided.
- 3.2.23 Barricading / Making enclosure of entire area by GI Sheet on both the pits including necessary framing with structural steel & GI Sheet, access gates of suitable size, dismantling and disposal of the same after work completion.
- 3.2.24 Repair and restore damaged property from tunnel operation. Restoring to its original condition before being disturbed.
- 3.2.25 The existing services / utilities (Cable, water supply, sewerage system etc.) may need to be shifted / relocated / rerouted / held at position to facilitate construction as per the requirement of project. EPC Contractor shall prepare new layout/scheme for the same as per the requirement of the site conditions, submit to OWNER for approval and EPC Contractor shall execute the same.
- 3.2.26 Arranging Gravels / Bags of gravels required in case of emergency during boring.
- 3.2.27 Any other works for successful commissioning of the project is under the scope of EPC Contractor.
- 3.2.28 Bidder has to ensure compliance of all other necessary statutory requirements such as but not limited to Collector's permissions (Royalty), permissions from Debris Management Cell of Statutory authority including relevant payments for the same at no extra cost to the Owner.
- 3.2.29 Construction / Potable water and power supply arrangements shall be under the scope of the contractor for the entire duration of the contract.
- 3.2.30 Any enabling works, temporary structures such as site office, canteen, labour shed, cement / material shed, fencing, security etc., wherever applicable shall be under the scope of contractor including necessary permissions for the same. No extra shall be paid under this work to the EPC contractor. Site cleaning, debris removal, access making by backfilling or dismantling of any structure, relocation or trimming of tree with permission etc.

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- 3.2.31 Bidder shall provide the porta cabin for the site office of owner. No extra shall be paid under this work to the EPC contractor.
- 3.2.32 EPC Contractor shall be responsible for the preparation, submission and approval of "As built drawing" after successful completion of the project.
- 3.2.33 All software's used while designing and detailing, shall be licensed and latest version, like Staad Pro. MS Excel, Adobe and AutoCAD etc. Bidder to submit the required number of approved hard copy and soft copy as specified "Engineering data and drawings" along with supporting design calculation/ files.
- 3.2.34 Bidder must visit site and assess the various practical constructability aspects prior to quoting for this tender enquiry. The bidder shall submit the project schedule and bid guarantees along with the bid document.

3.3 SPECIAL NOTES TO BIDDERS:

- 3.3.1 The above is only a brief indicative scope of work which helps the bidder to understand the nature of works involved in this project. The bidder is advised to visit the project site and thoroughly refer the above scope of work, detailed technical specifications and tender purpose drawings before submitting the bid documents to the OWNER. The tender purpose drawings are indicative and may undergo changes during detail engineering phase of the project. In addition to this, BIDDER shall assume whatever is necessary for successful completion and commissioning of the project. Such assumptions must be clearly mentioned in the bid.
- 3.3.2 Bidders to confirm any Technical Deviations in the Technical deviation sheet only. Any deviations mentioned anywhere else in the bid submission will not be considered.
- 3.3.3 In case of conflict between clauses of different sections of this specification, the following sections will govern
- Chapter 1, Scope of work
 - Annexure 1- Tender purpose drawings.
 - Chapter 1, Other clauses
 - Chapter 2
- 3.3.4 The Documents shall be submitted through Document management system 'WRENCH'. Necessary training on Wrench Software will be provided to Bidders representative by Consultant. Master Document List (MDL) shall be prepared by contractor and submitted for Owners approval.

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4 TERMINAL POINTS

4.1 Not Applicable

5 EXCLUSIONS

5.1 Supply of 110kV cable system and Fiber optic cable system.

6 PROJECT MILESTONE

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

Milestone *	Target
PO placement	Zero Date
Engineering of the Project	1 month from zero date
Submission of documents to Railway Authority for Approval	1.5 month from zero date
Approval from Railway Authority	7 months from zero date
Clearance for starting Construction Activities	7.5 months from zero date
Completion of all construction activities	12 months from zero date
Handover to OWNER	12.5 months from zero date

Based on the above milestones, the Bidder shall prepare a detail project schedule and shall submit the same with the bid.

Time is the essence of this contract. The BIDDER shall, within one week of receipt of the Letter of Intent has to submit to the OWNER for his approval, a detailed work schedule before starting the work to achieve completion schedule both interim and ultimate. After the OWNER has agreed with the schedule, the BIDDER shall prepare detailed program of each work front/activity breaking it down giving daily/weekly quantifiable/measure of progress. The schedules are to be reviewed periodically with the OWNER to ensure that the completion date will be met or to institute corrective steps (at no extra cost to the OWNER) to adhere to the completion dates. The OWNER reserves the right to revise the schedule at his discretion in order to keep up to the completion date and to suit the project requirement and such alterations shall not entitle the BIDDER to any extra payment.

The BIDDER shall arrange for the mobilisation of all equipment, material, personnel and all other resources to progress the work at the site to suit the completion dates of works of

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scope of enquiry. No financial, time extension or other claims for idling or under-utilisation of BIDDER's resources will be entertained or paid by OWNER unless certified by OWNER's ENGINEER.

The whole works must be proceeded with, within such sections and at such times and in such order and manner as described in these specifications and as directed by the ENGINEER. No extra payment or relaxation in the rates will be permitted on account of this.

To achieve the completion schedule stipulated, BIDDER shall furnish along with the bid a list of machinery, details of microtunneling system, and other equipment he proposes to employ in the work. BIDDER shall provide and maintain all equipment and plants necessary in good working conditions to perform the work at site. All arrangements for transporting machinery, equipment, men and material to and from the site shall be made by the BIDDER at his own expense.

BIDDER shall identify suitable quarries for uninterrupted supply of coarse and fine aggregates and make necessary arrangements for transportation of the same. Since quarries are located faraway, BIDDER shall at all time have a reserve storage of coarse and fine aggregates to meet peak requirement for one month

The BIDDER shall make his own arrangements for providing accommodation for all staff outside our premises and necessary storage space for equipment and consumables such as but not limited to petrol, diesel, lubricants, oxygen, acetylene, welding rods, etc., together with sufficient quantity of spare parts for efficient and uninterrupted execution of the work.

The BIDDER shall furnish the ENGINEER with two levels of report in the frequency noted below:

		<u>Frequency</u>	<u>Required by Date</u>
RL1:	Report Level 1	Monthly	29 th of each month for reporting period until 27 th .
RL2:	Report Level 2	Weekly	Friday evening for week stating from Friday to Thursday.

Report Level 1: This report to give in brief describing the summary of the progress / milestones achieved on each of the major fronts during the month accompanied with Photographs. The other details shall be given in the following format:

ID no	Activity Group	%of progress in that Month		Cum% progress		Reasons for shortfall and steps taken to make up
		Sch.	Act.	Sch.	Act.	

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Report Level 2 : Report should be given in the following format:

ID no	Activit y Grou p	Origin al comp date	Scop e of work (mea sured)	% progress in the month		Cum % progres s		Rea sons for dela y	Steps to cover shortfa ll	Targe t next week	Remaining duration to complete the activity
				Sc h	Act	Sc h	Ac t				

Apart from this the BIDDER is required to submit a daily report of the skilled labour and plant, equipment and other resources deployed by him at the project site. This shall include the resources of the sub-BIDDER if any.

Bidder should also maintain daily log for following

- a. Maintain daily activity log during jacking operations for casing (pipe). Submit to Owner's Engineer for record purposes on a daily basis including:
 - i) Start and finish time of casing pipe advancement.
 - ii) Total length of casing pipe installed.
 - iii) Maximum jacking force exerted during installation of each casing pipe section including forces required to re-initiate jacking following periods of system shutdown.
 - iv) General description for each discernible ground condition mined.
 - v) Settlement monitoring readings.
- b. Where Microtunneling system utilizes an electronic data logger, set up so that the above information is recorded and can be readily identified.
 - i) Identify known errors with recorded data and explain in daily log submittal.

Extension of contract period only under force majeure conditions for completion of work shall be granted by the OWNER, equal to the time 'Force Majeure' conditions were in existence and as applicable to this contract. Monsoon or inclement weather shall not be considered as a reason for extension of time.

Idle time charges for any reason whatsoever shall not be entertained by the OWNER

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If the BIDDER fails to maintain the stipulated time of completion specified hereinabove, he shall be liable to pay penalty as set out in 'General Conditions of Contract'. It shall be clearly understood that failure to meet interim completion dates shall also attract penalty.

BIDDER'S SCOPE OF SUPPLY

The BIDDER will be required to provide at his own cost all facilities for his office, warehouse, tool room, change room or any other building/structure required to execute his work.

BIDDER will establish his own office / shed for his worker/staff. The BIDDER's office/shed will be porta-cabin type. Only the shed for storing Cement will be in brick masonry. In addition the office/shed will have proper ventilation lighting and sanitary facilities. BIDDER shall plan their site facilities and obtain clearance from the OWNER before construction of the Office/shed

All royalties will be paid by the BIDDER as also all tolls, local and other taxes, etc. at no extra cost to OWNER. The rates quoted for excavation will include Collector's permissions for Excavation permits, Royalty payments, disposal in designated areas as approved by OWNER / statutory authorities etc. Obtaining permissions for debris disposal from any statutory authorities beyond plant premises and relevant payments for the same in BIDDER's scope.

All materials supplied by the BIDDER will be of the best quality and will conform to this specification. Approval in writing will be obtained from OWNER before any alternative or equivalent material is proposed to be used by the BIDDER.

BIDDER will obtain all necessary permits and licenses before commencement of work at no extra cost to OWNER.

The BIDDER will have PF coverage, for all workmen in his permanent employee as well as those temporarily hired by him for the said project. He will also have ESIC cover for all workmen, permanent as well as temporary if required by law. The cost for both the above viz. PF as well as ESIC will be deemed to have been covered in the rate quoted by Bidder. The OWNER will not pay any extra charges over and above the rates quoted for these statutory payments. Successful bidder shall obtain registration under BOCW act on receipt of order and shall comply with all conditions as per BOCW act.

MATERIALS SUPPLIED BY BIDDER

All materials supplied by the BIDDER will be of the best quality and will conform to the given specifications. Approval in writing will be obtained from the ENGINEER, before any alternative or equivalent material is used, other than what is specifically mentioned in the drawings.

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The BIDDER will get tested all material supplied by him in an OWNER approved laboratory, as directed by ENGINEER or as specified in the corresponding code of practice, at no extra cost to the OWNER. This is in addition to furnishing the Manufacturer's Test Certificate where available.

7 PROJECT INFORMATION

1.0	Owner	The Tata Power Company Limited Transmission Projects Dharavi Receiving station, Near Shalimar Industrial estate, Matunga, Mumbai 400019 Maharashtra, India Tel. 022-67172701,
2.0	Consultant	Nil
3.0	Location of the plant	Byculla Mumbai, Maharashtra 400010
4.0	Nearest Rail head	Site is connected by rail at Byculla, Mumbai.
5.0	Transport	Access roads are available for movement of materials to site. Movement of heavy materials would be through existing roads/rail up to site.
6.0	Plant Elevation	About 6 m above mean sea level
7.0	Climatic conditions	
7.1	Temperatures:	
(a)	Maximum dry bulb temperature	36.7 ⁰ C
(b)	Minimum dry bulb temperature	18.3 ⁰ C
(c)	Design temperature for electrical equipment / devices	50 ⁰ C
(d)	Design humidity	95%

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7.2 Relative humidity

- (a) Maximum during monsoon 100%
- (b) Minimum during December to January 22%

8.0 Rainfall Annual average rainfall is about 2500 to 3100 mm (most of which occurs during the monsoon season from June to September)

9.0 Wind data

Calculations for wind effect shall be in accordance with IS: 875 (Part-3) taking into account the following:

- (i) Basic wind speed = 44 m/sec
- (ii) Factor K1, K2, K3 = as per IS 875 Part-3
- (iii) Category of terrain = as per IS 875

10.0 Seismic conditions The proposed site is located in seismic zone III as per the Indian Standard IS 1893 and importance factor of 1.75.

11.0 Air Quality Atmosphere polluted with industrial gases and wastes because of proximity to petroleum refineries and fertilizer complex.

12.0 Sea water temperature

- (a) Maximum 36.7° C
- (b) Minimum 22.8° C
- (c) Average 29.8° C

13.0 Auxiliary Power Supply: In bidder's scope

Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following system:

(a)	Construction Power Supply	415V, 3 phase, 4 wire, 50Hz AC supply solidly grounded
(b)	The above voltages may vary as follows: All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance. AC supply Voltage variation $\pm 10\%$ Frequency variation $\pm 5\%$	

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	Combined voltage & frequency variation 10%

8 TECHNICAL PARAMETER (INCL. DATA SHEET):

8.1 CODES AND STANDARDS:

All the codes should be of latest version.

Refer other chapters and annexures for specific jobs. The list of codes and standards mentioned in the following paragraphs are indicative. BIDDER to consider any other code as functionally required for successful completion of the project. Indian standard codes are recommended for all the works unless otherwise mentioned.

8.1.1 GENERAL CODES

- i. National Building Code of India:
- ii. IS 875 (Part 1) – Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures (Part 1 – Dead Loads)
- iii. IS 875 (Part 2) – Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures (Part 2 – Imposed Loads)
- iv. IS 875 (Part 3) – Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures (Part 3 – Wind Loads)
- v. IS 1893 (Part 1) – Criteria for Earthquake Resistant Design of Structures (Part1 – General Provisions and Buildings)
- vi. IS 1893 (Part 4) – Criteria for Earthquake Resistant Design of Structures (Part4 – Industrial Structures including Stack-Like Structures))
- vii. IRC 6 – Standard Specifications and code of practice for road bridges
- viii. Code of Practice for Microtunneling & Pipe Jacking Suited Indian Conditions (2nd Revised Edition)
- ix. Relevant Railway norms

8.1.2 STRUCTURAL STEEL:

- i. IS 800 – General Construction in Steel - Code of Practice.
- ii. IS 814 – Covered electrodes for manual metal arc welding of carbon and carbon manganese steel
- iii. IS 816 – Code of Practice for Use of metal arc welding for general construction in mild steel
- iv. IS 1363: (Parts 1 to 3) – Hexagon head bolts, screws and nuts of product grade C.
- v. IS 1364: (Parts 1 to 5) – Hexagon head bolts, screws and nuts of product grades A & B

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- vi. IS 1367: (Part 1 to 20) – Technical supply conditions for threaded steel fasteners
- vii. SP:6 (Parts 1 to 7) – Handbook for Structural Engineers
- viii. IS: 4759- Hot dip Zinc coatings on structural steel and other allied products specification.

8.1.3 REINFORCED CONCRETE AND MASONRY WORKS:

- i. IS 456 – Plain and Reinforced Concrete – Code of Practice.
- ii. IS 5249- Determination of dynamic properties of soil, method of test.
- iii. IS 8009: (Parts I and II) - Code of practice for calculation of settlement of foundations.

8.1.4 Any other code not mentioned here but required to for the completion of the project to be followed.

8.2 DESIGN REQUIREMENTS

8.2.1 Site Grading: Contractor shall carry out the survey of plots with reference to the nearest permanent GTS bench mark.

- a. Geotechnical data: Geotechnical investigation has been carried out in the plots attached as Annexure 1.2 is for information only. To reconfirm the values EPC contractor may carry out the geotechnical investigations. Based on the geotechnical investigation report Bidder to design the alignments, scheme, shoring, etc.

8.2.2 Casing Pipe:

- a. HDPE pipes shall be laid in 1400 diameter MS casing pipe of 60m length and 4m below railway track.
- b. Pipe shall be capable of withstanding earth pressure, live load surcharge/loads due to railway line, overburden earth load, installation forces due to jacking and other construction or temporary loads
- c. The walls of pipe shall be as per IRS bridge substructure code
- d. Permissible stresses shall be as per IRS bridge code

8.2.3 Jacking and Retrieval/Receiving Pits:

- a. These working pits shall be provided between which casing is installed by means of Microtunneling technique for Microtunnel jacking and equipment retrieval.

8.2.4 Drive: Section of casing pipe to be installed by Microtunneling from Jacking Pit to Retrieval/Receiving Pit.

8.2.5 Microtunneling:

- b. Casing pipe shall be installed by jacking pipe behind a remotely controlled, steerable, guided Microtunnel Boring Machine (MTBM) which fully supports excavated face

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c. Perform Microtunneling so as not to interfere with, interrupt or endanger surface and activity thereon.

8.2.6 Reference Level: All elevations will be marked with reference to finished ground elevation EL+/-0.00m.

8.2.7 The system shall be designed adhering to the clearances and norms of railways.

8.2.8 Loads & Load Combinations:

All structures will be designed for the most critical combinations of dead loads, imposed loads, equipment loads, crane loads, steam piping (static and dynamic) and wind loads, seismic loads, temperature loads and any other loading condition which can occur during the design life of the facility. The loads and load combinations shall be as per IS 875(all parts) and IRC 6.

8.2.9 Reinforced Concrete Structures

8.2.9.1 Cement of OPC (43 grade min), concrete of M30 grade with max water cement ratio of 0.4 and minimum cementitious content of 360 kg/cubic meter of concrete conforming to IS: 8112 / IS: 12269 will be used for all structures.

8.2.9.2 Plain cement concrete of grade M15 will be used below brick wall / block wall, and as blinding layer below all foundations, pile caps, trenches and other underground structure. Minimum thickness will be 75mm.

8.2.9.3 Reinforcement Steel: For all reinforcement steel conforming, generally to the requirement of IS: 1786 will be used. The grade of reinforcement steel should be Fe 500D.

8.2.10 Steel Structures

8.2.10.1 Structural steel will conform to Grade E 250 (Fe 410W) of IS: 3589 for pipe

8.2.10.2 Structural steel will conform to Grade E 250 (Fe 410W) quality A of IS: 2062 for rolled

8.2.10.3 Steel members for plates, steel conforming to Grade E 250 (Fe 410W) quality B (killed) of IS: 2062 will be used. For crane girders steel conforming to Grade E 250 (Fe 410W) quality C (killed) will be used.

8.2.10.4 Joints shall be fully welded around circumference of pipe. Weld of sufficient strength to withstand forces at pipe joints without any distortion of pipes to be provided.

8.2.10.5 Minimum thickness of pipe shall be as per railway norms.

8.2.10.6 Minimum thickness of structural steel members and plates shall be 6 mm.

8.2.10.7 Minimum thickness of the weld shall be 6 mm.

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9 CONSTRUCTION REQUIREMENTS FOR THE EQUIPMENT / SYSTEM

- 9.1 Refer tender purpose drawing
- 9.2 Dewatering: When water is encountered, develop and maintain dewatering system of sufficient capacity to remove water continuously, keeping excavations free of water until backfill operation is in progress.
- 9.3 Obstructions during Microtunneling. Remove, clear, or otherwise make it possible for Microtunneling system and casing pipe to progress or through any obstructions encountered. The same shall be at no additional cost to the Owner.

10 QUALITY REQUIREMENTS (INCLUDING SQP AND FQP)

- 10.1 Refer Annexure-1.2 to 1.3.

11 INSPECTION, TESTING AND PERFORMANCE REQUIREMENTS ALONG WITH WARRANTY

- 11.1 As per agreed quality plan
- 11.2 Run Test: Test full system on completion of set up and before commencing drive.
- 11.3 Drive Start Up: Before commencement of any drive, demonstrate to Owner that required set up procedures and system checks are complete and required materials are at hand to commence drive. Do not commence drive until construction of Receiving Pit has been completed.

12 DATA SUBMISSION BY BIDDER

12.1 ALONG WITH BID

- 12.1.1 Dully filled in schedules, listed in clause 13.
- 12.1.2 Confirmation to adherence to Standard Quality Assurance Plan (SQP), and Standard Field Quality Plan (SFP)
- 12.1.3 Project Schedule to be prepared and submitted by the bidder along with the bid documents
- 12.1.4 Supporting documents for bidder qualification criteria
- 12.1.5 Acceptance of Specification by duly signing all the pages and submitting stamped copy of project technical specification.
- 12.1.6 Duly signed un-priced copy of price schedule along with technical bid.
- 12.1.7 Bidder to refer Standard Specifications in Chapter 2 for submission of required documents along with Technical Bid.
- 12.1.8 List of equipment to be used.

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12.2 AFTER AWARD OF CONTRACT

12.2.1 Master Document list (MDL)

12.2.2 Technical data sheets and Type tests reports of all equipment's covered under this specification.

12.2.3 GA drawing

12.2.4 Layout drawings

12.2.5 Civil detail drawings and design calculation

12.2.6 Quality Assurance Plan (QAP), Manufacturing Quality Plan (MQP), Field Quality plan (FQP)

12.2.7 Bidder to submit Operation and maintenance manual

12.2.8 Bidder to refer Standard Specifications in Chapter 2 for submission of required documents after award of contract

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13 SCHEDULES**C1 - SCHEDULE OF QUANTITIES AND PRICES**

Item No.	Item description	Quantity	Unit	Rate (Rs)	Amount (Rs)
1	Engineering, taking permissions from Railway Authority, laying of 1400 mm diameter ID MS pipe by microtunneling, Laying of HDPE pipes with STB encasing, facilitating cable laying through these pipes and all other associated works as per tender enquiry and subsequent clarifications issued till date	1	LS		

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C2- PROJECT TIME SCHEDULE

Seal of the Company

Signature

Designation

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

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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.

Seal of the Company

Signature

Designation

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C4- SCHEDULE OF EQUIPMENTS

As part of the proposal, the BIDDER shall indicate below, the list of equipment to be used by him.

Sr. No.	Equipment	No.	Remarks

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

Seal of the Company

Signature

Designation

CHAPTER 2

CHAPTER # 2.1

**Project Specific Design Guidelines for Civil, Structural and
Architectural works
FOR
“EARTHWORK IN EXCAVATION AND FILLING INCLUDING
DEWATERING”**

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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 criteria in main specification.

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 OWNER for Information/ Approval. The CONTRACTOR shall follow strictly such drawings.

6. LAYOUT REQUIREMENTS FOR THE EQUIPMENT

As per detailed drawing

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7 CONSTRUCTION REQUIREMENTS

As per Codes and standards (clause no: 4), technical parameters (Clause no: 8) and Quality requirement (Clause no: 9).

8 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 OWNER 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 OWNERS 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.

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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 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 OWNER 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 :
- '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.
 - 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.
 - Mud - A mixture of soil and water in fluid or weak solid state.
 - 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.
 - Hard Rock (Requiring Blasting) - Any rock or boulder for the excavation of which blasting is required.
 - 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 OWNER 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

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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 OWNER, at his own cost outside the lines shown on the drawings or directed by the OWNER. 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 OWNER 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 OWNER. 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 OWNER 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 OWNER. 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.

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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 OWNER.

All fill material will be subjected to the OWNER'S approval, if any material is rejected by the OWNER, 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 OWNER after the fill work is completed.

No earth fill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with as directed by the OWNER. 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 OWNER (95% of proctor density). Earth shall be rammed with approved mechanical compaction machines. Usually no manual compaction shall be allowed unless the OWNER 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 OWNER 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.

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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 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.

9 QUALITY REQUIREMENTS (INCLUDING SQP AND FQP)

As per approved SQP and FQP and Annexures.

10 INSPECTION, TESTING AND PERFORMANCE REQUIREMENTS ALONG WITH WARRANTY

As per approved SQP and FQP and Annexures.

11 DATA SUBMISSION BY BIDDER

11.1 With the Bid - Not Applicable

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

CHAPTER 2

CHAPTER # 2.2

**PROJECT SPECIFIC DESIGN GUIDELINES FOR CIVIL,
STRUCTURAL AND ARCHITECTURAL WORKS
FOR**

Concrete and allied works

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1. INTRODUCTION

This specification covers the general requirements for concreting works.

2. PRE-QUALIFYING REQUIREMENTS AND APPROVED VENDOR LIST

Refer Bidder's Qualifying Requirements of the main specification

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 OWNER from time to time. The decision of OWNER 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

a.	IS: 455	Specification for Portland slag cement.
b.	IS: 1489-(Parts 1 & 2)	Specification for Portland-Pozzolana cement
c.	IS: 8112	Specification for 43 grade ordinary portland cement

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d.	IS: 383	Specification for coarse and fine aggregates from natural sources for concrete
e.	IS:432-(Parts 1 & 2)	Specification for mild steel and medium tensile steel bars and hard-drawn steel wires for concrete reinforcement
f.	IS: 1566 - (Part II)	Specification for hard-drawn steel wire fabric for concrete reinforcement.
g.	IS: 1786	Specification for high strength deformed steel bars and wires for concrete reinforcement.
h.	IS: 2062	Specification for Hot rolled low, medium and high tensile structural steel
i.	IS: 9103	Specification for admixtures for concrete
j.	IS: 2645	Specification for integral cement waterproofing compounds.
k.	IS: 4900	Specification for plywood for concrete shuttering work
l.	IS: 3812	Pulverized Fuel Ash

Material Testing

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

Material Storage:

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

Concrete Mix Design:

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

Concrete Testing:

a.	IS: 1199	Method of sampling and analysis of concrete

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

Equipment

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

Code of Practice

a.	IS: 456	Code of practice for plain and reinforced concrete
b.	IS: 3370-(Parts 1 to 4)	Code of practice for concrete structures for storage of liquids.
c.	IS: 2502	Code of practice for bending and fixing of bars for concrete reinforcement.
d.	IS: 5525	Recommendation for detailing of reinforcement in reinforced concrete works.
e.	IS: 2751	Code of practice for welding of mild steel plain and deformed bars used for reinforced concrete construction.
f.	IS: 3558	Code of practice for use of immersion vibrators for consolidating concrete.
g.	IS: 4326	Code of practice for earthquake resistant design and construction of buildings.
h.	IS: 4014-(Parts 1 & 2)	Code of practice for steel tubular scaffolding
i.	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

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Construction Safety

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

5. DESIGN REQUIREMENTS**DRAWINGS**

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

6. LAYOUT REQUIREMENTS FOR THE EQUIPMENT

As per detailed drawing

7. CONSTRUCTION REQUIREMENTS

As per Codes and standards (clause no: 4), technical parameters (Clause no: 8) and Quality requirement (Clause no: 9).

8. TECHNICAL PARAMETERS OF EQUIPMENT INCLUDING DATA SHEET

Technical Parameters

8.1 GENERAL

8.1.1 OWNER 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 OWNER'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 OWNER and after establishing their performance suitability based on previous data, experience or tests.

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8.2 MATERIALS

8.2.1 CEMENT

- 8.2.1.1 Unless otherwise called for by 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 OWNER.
- 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 OWNER 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 OWNER.
- 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.
- 8.2.2.6 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.

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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 OWNER, 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 OWNER 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 OWNER. 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.

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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 whichever 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 OWNER. 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

- a. 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

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CONTRACTOR shall exercise great care while designing the concrete mix and executing the works to achieve the desired result.

- b. 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.

- c. It shall be CONTRACTOR's sole responsibility to carry out the mix designs at his own cost. He shall furnish to OWNER 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.
- d. Range of slumps which shall generally be used for various types of construction unless otherwise instructed by the OWNER shall be as per clause 7.1 of IS 456.

8.5.2.2 Batching & Mixing of Concrete

- a. 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.

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- b. 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 OWNER 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.
- c. 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 OWNER. 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

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.

8.5.3.2 Batching & Mixing of Concrete

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 OWNER the drawings and calculations for the design of the formwork shall be submitted to OWNER 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.

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- 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 OWNER. 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 OWNER. 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.

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- 8.6.11 Forms for substructure may be omitted when, in the opinion of OWNER, 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 OWNER, 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 OWNER. 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:
- Development of adequate concrete strength;
 - Permissible deflection at time of striking form work;
 - Curing procedure employed - its efficiency and effectiveness;
 - Subsequent surface treatment to be done;
 - Prevention of thermal cracking at re-entrant angles;
 - Ambient temperatures; and
 - 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 OWNER. For Portland Pozzolana/slag cement the stripping time shall be suitably modified as directed by the OWNER. 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.

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

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- 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 from 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:
- Continuously between construction joints and predetermined abutments.
 - Without disturbance to forms or reinforcement.
 - 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.
 - Without dropping in a manner that could cause segregation or shock.
 - In deep pours only when the concrete and formwork is designed for this purpose and by using suitable chutes or pipes.
 - Do not place if the workability is such that full compaction cannot be achieved.
 - 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.
 - If placed directly onto hardcore or any other porous material, dampen the surface to reduce loss of water from the concrete.
 - Ensure that there is no damage or displacement to sheet membranes.
 - 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.

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- 8.10.6 Concrete may be conveyed and placed by mechanically operated equipment after getting the complete procedure approved by OWNER. 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 OWNER. 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 OWNER. 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:
- Premature drying out, particularly by solar radiation and wind;
 - Leaching out by rain and flowing water;
 - Rapid cooling during the first few days after placing;
 - High internal thermal gradients;
 - Low temperature or frost;
 - 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 OWNER, 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 OWNER, 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 OWNER 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.

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8.13 CONSTRUCTION JOINTS AND KEYS

- 8.13.1 Construction joints will be as shown on the drawing or as approved by OWNER. 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 OWNER.
- 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 OWNER.
- 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 OWNER. 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

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- 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 OWNER 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 OWNER 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.

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

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 OWNER'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 OWNER, 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.

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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 OWNER. All such rectification shall be done by the CONTRACTOR to the entire satisfaction of the OWNER 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 OWNER 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 OWNER in-charge shall approve hydro test procedure.

8.22 OPTIONAL TEST

8.22.1 If the OWNER 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

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be approved by the OWNER, 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, OWNER 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 OWNER 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 OWNER 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 OWNER. Materials rejected by OWNER 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 OWNER 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 acceptance criteria of IS 456 in addition to the requirements given below individually and collectively.
- Properties of constituent materials;
 - Characteristic compressive strength;
 - Specified mix proportions;
 - Minimum cement content;
 - Maximum free-water/cement ratio;
 - Workability;
 - Temperature of fresh concrete;

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- 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 OWNER'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 OWNER may review and decide whether remedial measures are feasible and so as to render the work acceptable. The OWNER shall in that case direct the CONTRACTOR to undertake and execute the remedial measures. These shall be expeditiously and effectively implemented by the CONTRACTOR. Nothing extra shall become payable to the CONTRACTOR by the OWNER for executing remedial measures.

9. QUALITY REQUIREMENTS (INCLUDING SQP AND FQP)

As per approved SQP and FQP (Refer Annexure-1)

10. INSPECTION, TESTING AND PERFORMANCE REQUIREMENTS ALONG WITH WARRANTY

As per approved SQP and FQP

11. DATA SUBMISSION BY BIDDER

11.1. With the Bid - Not Applicable

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

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CONCRETE POUR CARD

CLIENT:

DATE:

POUR NO. :

PROJECT:

STRUCTURE:

CONTRACTOR:

MAX AGGREGATE SIZE SLUMP: MM/ MM

DRG. NO. :

START/COMPLETION TIME:

CONCRETE GRADE/QUANTITY: M / M³

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.		VERIFIED TEST CERTIFICATE FOR CEMENT /STEEL	YES/NO	YES/NO	
6.		ADEQUENCY OF MATERIALS/EQUIPMENT FOR POUR	YES/NO	YES/NO	
7.		EMBEDED PARTS CHECKED (LOCATION & PLUMB)	CIVIL		
	MECHANICAL				
	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:

- EACH ITEM TO BE CHECKED & SIGNED BY THE RESPECTIVE ENGINEERS.
- ITEMS 8 TO 13 (BOTH INCLUSIVE) TO BE FILLED BY ONLY OWNER.
- EACH POUR TO HAVE SEPARATE CARDS, IN TRIPLICATE ONE EACH FOR CLIENT, TCE & SITE OFFICE. FORM 279
- 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.

2.

CHAPTER 2

CHAPTER # 2.3

**PROJECT SPECIFIC DESIGN GUIDELINES FOR CIVIL,
STRUCTURAL AND ARCHITECTURAL WORKS
FOR
“ERECTION OF STRUCTURAL STEEL”**

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1. INTRODUCTION

This specification covers the general requirements for erection of structural steel.

2. PRE-QUALIFYING REQUIREMENTS AND APPROVED VENDOR LIST

Refer bidder qualification.

3. SYSTEM DESCRIPTION AND SCOPE

Scope:-

This specification covers the general requirements for erection of structural steel. It covers the supply and delivery of all necessary materials, labour, scaffolding, tools, tackles, equipment and everything that is necessary for the satisfactory completion of the job on schedule.

4. CODES & STANDARDS.

The following specifications, standards and codes are made a part of this specification. All standards, specifications and codes of practice referred to herein shall be the latest editions, including all applicable official amendments and revisions.

In case of discrepancy between this specification and other documents referred to herein, this specification shall govern. In case of discrepancy between tender drawings and this specification, the tender drawings shall govern.

APPLICABLE CODES

IS:800	Code of Practice for General Construction in Steel
IS:801	Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members in General Building Construction
IS:806	Code of Practice for Use of Steel Tubes in General Building Construction
IS:4000	High Strength Bolts in Steel Structure - Code of Practice
IS:7205	Safety Code for Erection of Structural Steel Work
IS:12843	Tolerances for erection of Steel Structures

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5. DESIGN REQUIREMENTS

DRAWINGS

The EPC BIDDER (BIDDER) shall furnish drawings wherever required. The drawings shall be submitted to OWNER for Information/ Approval. The BIDDER shall follow strictly such drawings.

6. LAYOUT REQUIREMENTS

As per detailed layout drawing. Refer Section A for details.

7. CONSTRUCTION REQUIREMENTS

As per Codes and standards (clause no: 4), technical parameters (Clause no: 8) and Quality requirement (Clause no: 9).

8. TECHNICAL PARAMETERS INCLUDING DATA SHEET

8.1 ERECTION SCHEME

Each Bid shall be accompanied by a broad erection scheme with dates and estimated completion time for various parts of the work prepared by them after a thorough study of the drawings for planning purpose and the site conditions. This erection scheme shall describe the methods proposed to be employed by BIDDER for transporting his equipments, tools, tackles, gas cylinders, electrodes and all that is necessary to site, unloading, transporting within the site, handling, assembling, hoisting and erecting of the structural steel components and the type, capacity and quantity of equipment that BIDDER proposes to bring to site for all these operations. The scheme shall also indicate the strength and trade wise composition of the work force and supervisory personnel that will be deployed by BIDDER for the various operations.

8.2 ERECTION PROGRAMME

8.2.1 The BIDDER shall submit a detailed erection programme within two weeks from approval of structural drawings. This programme shall be accompanied by a layout plan identifying the areas proposed for unloading, main storage, subsidiary storage, assembly and the transportation of equipment and fabricated material between the storage and work areas. The layout shall clearly indicate the points at which proposed erection begins, direction in which it is proposed to progress, the deployment of equipment, access route for cranes to reach work areas, etc. The locations and extent of site offices and stores, labour quarters if any, layout of electrical cables and water pipes from the tap-off points shall also be

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indicated in detail on the above layout. Full details of the method of handling, transport, hoisting and erection including false work/staging, temporary bracing, guying, etc. shall be furnished by BIDDER in this erection schedule along with complete details of the quantity and capacity of the various items of erection equipment that will be used. A site organization chart showing the number of supervisory personnel, and the number and composition of the various gangs shall also accompany the erection schedule.

- 8.2.2 Any modifications to the erection schedule directed by OWNER for the reasons of inadequacy of the quantity and/or capacity of the erection equipment, erection personnel and supervisors, temporary bracing, guying etc., or safety of the erection methods, or stability of the erected portions of structures, or unsuitability of the erection sequence due to interference with the work of other agencies shall be incorporated by BIDDER and the work shall be carried out in accordance with the revised schedule. Approval by OWNER shall not relieve BIDDER from the responsibility for the safe, sound, accurate and timely erection of structural steel work as required by OWNER. BIDDER shall also make no extra claims for bringing additional equipment to site for erection, if so directed by OWNER. BIDDER shall be deemed to have visualized all erection problems while bidding for the work and no additional compensation shall be claimed on this account.

8.3 SITE OPERATIONS

- 8.3.1 An experienced and qualified Superintendent shall be in full time charge of the job.
- 8.3.2 BIDDER shall complete all preliminary works at site well before the arrival of structural steel, such as establishment of a well-equipped and adequately staffed site office, stores, unloading gantry, unloading and pre-assembly yard, labour quarters if any, electrical and water connections, electrical winches, derricks, cranes, compressors, all tools and tackles, welding sets, torque wrenches, spud wrenches, staging, etc. as well as experienced erection and supervisory personnel as part of this contract and any other work that may be necessary so as to start erection immediately after the arrival of the first batch of steel at site.
- 8.3.3 BIDDER shall furnish at his own expense, the necessary non-inflammable staging and hoisting materials or equipment required for the erection work and shall remove and take them away after completion of the job. BIDDER shall also provide necessary passageways, fences, safety belts, helmets, lights and other fittings to the satisfaction of OWNER and to meet the rules of local authorities and for protection to his labours and materials. A licensed electrician shall be kept on the job for the entire duration of the work to maintain BIDDER's electrical equipment and connections.

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- 8.3.4 BIDDER shall protect all existing plant, structures, piping, conduits, equipment and facilities against damage during erection. Any damage caused by BIDDER shall be rectified entirely at BIDDER's cost, to the satisfaction of OWNER. If work has to be carried out adjacent to existing switch yards or electrical installations which are live, BIDDER must ensure suitable safety precautions in consultation with OWNER.
- 8.3.5 If a portion of the work of the project area cannot be made available to BIDDER for his activities due to operations being carried out by other agencies, he shall suitably modify his sequence of operations so as to continue work without interruption. BIDDER shall work in coordination with other agencies working on the project site and plan his work suitably so as not to hinder the progress of construction at site.
- 8.4 ACCEPTANCE OF STEEL, ITS HANDLING & STORAGE
- 8.4.1 Point of delivery of fabricated steel shall be at site.
- 8.4.2 BIDDER shall carefully check the steel to be erected at the time of acceptance. Any fabrication defects observed should be brought to the notice of OWNER.
- 8.4.3 No dragging of steel shall be permitted. All shall be stored 300mm above ground on suitable packing to avoid damage. It shall be stored in the order required for erection, with erection marks visible. All storage areas shall be prepared and maintained by BIDDER. Steel shall not be stored in the vicinity of areas where excavation or grading will be done and, if so stored temporarily, this shall be removed by BIDDER well before such excavation and/or grading commences to a safe distance to avoid burial under debris.
- 8.4.4 Scratched or abraded steel shall be given a two primer coats and two finish coats of painting for protection after unloading and handling prior to erection. First coat of primer will be given in shop after surface preparation but before despatch to erect at site after surface preparation as described below. The second coat of primer will be applied after erection and final alignment of the erected structures. Two finish coats will also be applied after erection. All milled and machined surfaces shall be properly protected from rust/corrosion by suitable coating and also from getting damaged.
- 8.5 ANCHOR BOLTS & FOUNDATIONS
- 8.5.1 BIDDER shall carefully check the location and layout of anchor bolts embedded in foundations constructed, to ensure that the structures can be properly erected as shown on

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the approved drawings, any discrepancy in the anchor bolts/foundation shall be reported to OWNER.

- 8.5.2 Levelling of column bases to the required elevation may be done by providing shims. All shim stock required for keeping the specified thickness of grout and in connection with erection of structures on foundations, crane brackets or at any other locations shall be of good M.S. plates and shall be supplied by BIDDER at his cost.
- 8.5.3 A certain amount of cleaning of foundations and preparing the area is considered normal and shall be carried out by BIDDER at no extra cost to OWNER.
- 8.5.4 Where beams bear in pockets or on walls, bearing plates shall be set and levelled as part of the work. All grouting under column base plates or beam bearing plates will be carried out by BIDDER, unless the grouting is specifically excluded from the BIDDER'S scope.
- 8.6 ASSEMBLY & CONNECTIONS
- 8.6.1 Field connections may be effected either by bolting, welding or by use of high strength friction grip bolts as specified and as shown on the design and erection drawings.
- 8.6.2 All field connection work shall be carried out in accordance with an approved shop drawings. All bolts, nuts, washers, rivets, electrodes required for field connections shall be supplied by Erector free of cost.
- 8.6.3 All assembling shall be carried on a level platform.
- 8.6.4 Drifts shall be used only for drawing the work to proper position and must not be used to such an extent as to damage the holes. Size of drifts larger than the nominal diameter of hole shall not be used. Any damaged holes or burrs must be rectified to the satisfaction of OWNER.
- 8.6.5 Corrections of minor misfits and reasonable amount of reaming shall be considered as a part of erection. Any error in the shop, which prevents proper fit on a moderate amount of reaming and slight chipping or cutting, shall be immediately reported to OWNER.
- 8.7 ERECTION
- Erected of structural steel work shall be inspected as per the approved Field quality plan (FQP) by OWNER.

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Rust preventive / masking type shall be used after inspection of the weld joint to avoid rusting of the weld joints.

- 8.7.1 All structural steel shall be erected as shown on the drawings. Proper size steel cable slings, etc., shall be used for hoisting. Guys shall not be anchored to existing structures, foundations, etc. unless so permitted by OWNER in writing. Care shall be taken to see that ropes in use are always in good condition.
- 8.7.2 Steel columns in the basement, if any, are to be lowered and erected carefully with the help of a crane and/or derrick without damaging the basement walls steel or floor.
- 8.7.3 Structural steel frames shall be erected plumb and true. Frames shall be lifted at such points that they are not liable to buckle and deform. Trusses shall be lifted only at node points. In the case of trusses, roof girders, all of the purlins and wind bracing shall be placed simultaneously and the columns shall be erected truly plumb on screed bars over the pedestals. All steel columns and beams shall be checked for plumb and level individually before and after connections are made. Temporary bracings shall be introduced wherever necessary to take care of all loads to which the structure may be subjected, including erection equipment and the operation thereof. Such bracings shall be left in place as long as may be required for safety and stability.
- 8.7.4 Chequered plates shall be fixed to supporting members by tack welding or by countersunk bolts/screws as shown/specified in relevant drawings and/or as directed by OWNER. The edges shall be made smooth and no burrs or jagged ends shall be left. While splicing, care should be taken so that there is continuity in pattern between the two portions. Care should also be taken to avoid distortion of the plate while welding. The erection of chequered plates shall include:
- Welding of stiffening angles/vertical stiffening ribs.
 - Cutting to size and making holes to required shape wherever necessary to allow service piping and/or cables to pass through.
 - Splicing as shown in relevant drawings.
 - Smoothing of edges.
 - Fixing of chequered plates by tack welding or by countersunk bolts.
 - Providing lifting hooks for ease of lifting.

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8.7.5 As erection progresses, the work shall be securely bolted to take care of all dead load, wind, seismic and erection stresses.

8.7.6 No welding or final bolting shall be done until the structure has been properly aligned and approved by OWNER. No cutting, heating or enlarging of the holes shall be carried out without the prior written approval of OWNER.

8.8 INSPECTION

8.8.1 OWNER or their authorized representatives shall have free access to all parts of the job during erection and all erection shall be subjected to their approval. In case of faulty erection, all dismantling and re-erection required will be at BIDDER's cost. No paint shall be applied to field welds or bolts until these have been approved by OWNER.

8.9 TOLERANCES

Tolerances mentioned below shall be achieved after the entire structure or part thereof is in line, level and plumb. The tolerances specified below do not apply to steel structures where the deviations from true position are intimately linked with and directly influence technological process. In such cases, the tolerances on erected steel structures shall be as per recommendations of process technologists/suppliers which will be indicated in the drawings.

8.9.1 Columns

8.9.1.1 Deviation of column axes at foundation top level with respect to true axes

a.	In longitudinal direction	: ± 5 mm
b.	In lateral direction	: ± 5 mm

8.9.1.2 Deviation in the level of bearing surface of columns at foundation top with respect to true level : ± 5 mm

8.9.1.3 Out of plumbness (verticality) of column axis from true vertical axis, as measured at column top:

a.	For columns up to and including 15 meters in height	: ± 1/1000 of column height in mm or ±15mm whichever is less
b.	For columns exceeding 15 meters in height	: ± 1/1000 of column height in mm or ± 20 mm whichever is less

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8.9.1.4	Deviation in straightness in longitudinal transverse planes of column at any height	: $\pm 1/1000$ of column height and in mm or ± 10 mm point along the whichever is less
8.9.1.5	Difference in erected position of adjacent pairs of columns along length or across width of building prior to connecting trusses / beams with respect to true distance	: ± 10 mm
8.9.1.6	Deviation in any bearing or seating level with respect to true level	: ± 5 mm
8.9.1.7	Deviation in differences in bearing levels of a member on adjacent pair of columns both across and along the building	: ± 10 mm
8.9.2	<u>Trusses and Beams</u>	
8.9.2.1	Shift at the centre of span of top chord : member with respect to the vertical plane passing through the centre of bottom chord	: $\pm 1/250$ of height of truss in mm or ± 15 mm whichever is less
8.9.2.2	Lateral shift of top chord of truss at the centre of span from the vertical plane passing through the centre of supports of the truss	: $\pm 1/1500$ of span of truss in mm or ± 15 mm whichever is less
8.9.2.3	Lateral shift in location of truss from its true vertical position	: ± 10 mm
8.9.2.4	Lateral shift in location of purlin true position	: ± 5 mm
8.9.2.5	Deviation in difference of bearing levels of trusses or beams from the true difference	: i) ± 20 mm for trusses ii) For beams : Depth < 1800mm : ± 6 mm Depth > 1800mm : ± 10 mm

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8.9.2.6	Deviation in sag in chords and diagonals	:	1/1500 of length in mm or of truss between node points 10mm whichever is smaller
8.9.2.7	Deviation in sweep of trusses, beams etc.	:	1/1000 of span in mm in the horizontal plane subject to a maximum of 10 mm
8.9.3	<u>Crane Girders & Rails</u>		
8.9.3.1	Shift in the centre line of crane rail with respect to centre line of web of crane girder	:	± 5 mm
8.9.3.2	Shift in plan of alignment of crane rail with respect to true axis of crane rail at any point	:	± 5 mm
8.9.3.3	Difference in alignment of crane rail in plan measured between any two points 2 m apart along rail	:	± 1 mm
8.9.3.4	Deviation in crane track with respect to time gauge		
	a. For track gauges upto and including 15 metres	:	± 5 mm
	b. For track gauges more than 15 metres	:	$\pm [5 + 0.25 (S-15)]$ where S in metres is true gauge
8.9.3.5	Deviation in the crane rail level at any point from true level	:	1/1200 of the gauge distance or ± 10 mm whichever is less
8.9.3.6	Difference in the crane rail actual levels between any two points 2 metres apart along the rail length	:	± 2 mm

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8.9.3.7 Difference in levels between crane track rails at

a.	Supports of crane girders	:	± 15 mm
b.	Mid span of crane girders	:	± 20 mm

8.9.3.8 Relative shift of crane rail surfaces at a joint in plan and elevation : 2 mm subject to grinding of surfaces for smooth transition

8.9.3.9 Relative shift in the location of crane stops (end buffers) along the crane tracks with track gauge S in mm : 1/1000 of track gauge S in mm subject to maximum of 20 mm

8.10 CLEAN UP OF WORK SITE

8.10.1 During erection, the BIDDER shall without any additional payment, at all times keep the working and storage areas used by him, free from accumulation of waste materials or rubbish. Before completion of erection, he shall remove or dispose of in a satisfactory manner all temporary structures, waste and debris and leave the premises in a condition satisfactory to OWNER.

9. QUALITY REQUIREMENTS (INCLUDING SQP AND FQP)

As per approved SQP and FQP attached as separate Annexure

10. INSPECTION, TESTING AND PERFORMANCE REQUIREMENTS ALONG WITH WARRANTY

As per approved SQP and FQP attached as separate Annexure

11. DATA SUBMISSION BY BIDDER

11.1 Along With Bid - Not Applicable

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

CHAPTER 2

CHAPTER # 2.4

PROJECT SPECIFIC DESIGN GUIDELINES FOR CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS FOR “PAINTING OF STRUCTURAL STEEL”

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1. INTRODUCTION

This specification covers the general requirements for painting structural steel work involving the supply and delivery of all necessary materials, labour, scaffolding, tools and equipment.

2. PRE-QUALIFYING REQUIREMENTS AND APPROVED VENDOR LIST

Refer bidder qualification.

3. SYSTEM DESCRIPTION AND SCOPE

Scope:

This specification covers the general requirements for painting structural steel work involving the supply and delivery of all necessary materials, labour, scaffolding, tools and equipment. This document covers the aspects of surface treatment, application of primer paint and finish painting.

4. CODES & STANDARDS

The following Standard Specifications and Codes of Practice are made a part of this specification. All standards and codes referred to herein shall be the latest editions including all applicable official amendments and revisions.

APPLICABLE CODES

IS:110	Ready Mixed paint, brushing, grey filler for enamels for use over primers.
IS:158	Ready Mixed paint, Brushing, Bituminous, Black, Lead free, Acid, alkali and heat resisting.
IS:159	Ready Mixed paint, Brushing, Acid resisting.
IS:341	Black Japan, Types A, B and C
IS:1477	Codes of Practice for painting of ferrous metals in buildings.
	Part I - Pretreatment
	Part II - Painting
IS:2074	Ready Mixed paints, Red Oxide Zinc chrome priming.
IS:2339	Aluminium paint for general purposes, in Dual container
IS:2932	Specification for enamel, synthetic, exterior, type 1,
	(a) Undercoating (b) finishing
IS:2933	Specification for enamel, exterior, type 2,
	(a) undercoating, (b) finishing
IS:5905	Sprayed aluminium and zinc coatings on Iron and Steel.
IS:6005	Code of practice for phosphating of Iron and Steel.

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IS:9862	Specification for ready mixed paint, brushing, bituminous, black, lead free, acid, alkali, water & chlorine resisting.
IS:13183	Aluminium paint, Heat resistant.
IS:13607	Ready Mixed paint, Finishing, general purposes, to Synthetic specification
SIS-05-5900	Swedish Standard

5. DESIGN REQUIREMENTS

DRAWINGS

The EPC Contractor (CONTRACTOR) shall furnish drawings wherever required. The drawings shall be submitted to OWNERS ENGINEER for Information/ Approval. The CONTRACTOR shall follow strictly such drawings.

6. LAYOUT REQUIREMENTS FOR THE EQUIPMENT

As per detailed approved layout drawing

7. CONSTRUCTION REQUIREMENTS

As per Codes and standards (clause no: 4), technical parameters (Clause no: 8) and Quality requirement (Clause no: 9).

8. TECHNICAL PARAMETERS OF EQUIPMENT INCLUDING DATA SHEET

Technical Parameter:-

8.1 SURFACE TREATMENT

- 8.1.1 All the surfaces of steel work to be painted shall be thoroughly cleaned of all loose mill scale, rust, grease, dirt and other foreign matter. The type of surface treatment shall be as specified in the respective item of work. The workmanship shall generally conform to the requirements of IS 1477-Part I.
- 8.1.2 Oil and grease removal shall be carried out either by solvent cleaning or by using alkali type degreasing agents. To remove grease material the surface shall be cleaned with solvents containing emulsifier. After cleaning, the surface shall be washed with water. When the surface has cement pelts or salts, the cleaning shall be done with strong alkalis. After cleaning, water rinsing and subsequent passivation by dilute chromic acid rinsing shall be carried out to ensure that no traces of alkali is left on the surface. The procedure for cleaning by above mentioned methods shall be as per manufacturer's instructions.
- 8.1.3 Derusting and descaling of steel shall be carried out either manually, mechanically or chemically.

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8.1.3.1 Manual or Hand Tool Cleaning

Loose mill scale, loose rust and loose paint shall be removed by wire brushing, scrapping, chipping and rubbing with abrasive paper or steel wool. This method shall not be employed when the surface has firmly adhering mill scale. After hand tool cleaning, the surface shall be rubbed with sand paper so as to ensure that no loose material exists and the surfaces shall be dusted off.

8.1.3.2 Mechanical Cleaning

8.1.3.2.1 Power Tool Cleaning

This shall be carried out by employing power operated wire brushes. Power tool cleaning shall be resorted to only if sand/shot blasting is not possible/permissible and high quality of surface preparation is required.

The surface prior to such cleaning shall be cleaned of dust, grease etc. and heavier layers of rust shall be removed by chipping.

8.1.3.2.2 Flame Cleaning

Hard mill scale and rust shall be removed through Oxy- acetylene flame. The work shall be carried out by trained workmen to ensure that only mill scale is removed without affecting the parent steel. The work shall be carried out carefully on welded surfaces so that the strength of weld is not affected due to heating.

8.1.3.3 Shot Blasting

8.1.3.3.1 Shot blasting shall be resorted to only after removal of grease, oil and other contaminants. The work shall be carried out by impinging under pressure of air, a jet of granulated steel (steel grits) on to the metal surface. The process shall ensure complete removal of rust and firmly adhering mill scale. Special care shall be taken on weld areas to remove flux and spatter. Blasting shall ensure an even colour of the surface and the surface shall have silver grey colour. Precautions shall be taken when shot blasting of light gauge steel surfaces to ensure that buckling does not occur to continuous impingement of steel shots under high velocity.

8.1.4 Chemical Cleaning (Pickling)

8.1.4.1 The cleaning shall be done by pickling in sulphuric, hydrochloric or phosphoric acids. Pickling shall be carried out in accordance with detailed procedure as given in IS 6005.

8.1.4.2 Washing after pickling shall remove all traces of the acids. All work pieces shall be thoroughly inspected and in particular the inaccessible corners.

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8.2 MATERIALS

8.2.1 Primer Paint

8.2.1.1 Anti-corrosive primers shall be either lead based or lead free types. Red lead primer shall conform to relevant Indian standards and red oxide zinc chrome primer shall conform to IS 2074.

8.2.2 Finish Paint

8.2.2.1 Synthetic enamel painting for undercoat and finish coat shall conform to IS 2932/IS 2933.

8.2.2.2 Acid, alkali and heat resistant bituminous paint shall conform to IS 158.

8.2.2.3 Acid, alkali, water and chlorine resisting bituminous paint shall conform to IS 9862.

8.2.2.4 Heat resistant aluminium paint shall conform to IS 13183.

8.2.2.5 Epoxy primer and epoxy paint shall be of the type as specified in Civil Design Specific Requirement Sheet.

8.2.2.6 Chlorinated rubber based paint shall be of the approved manufacture or any equivalent approved manufacture.

8.2.3 All the materials shall be of the best quality from an approved manufacturer. CONTRACTOR shall obtain prior approval of the OWNER for the brand of manufacture and the colour/shade prior to procurement for usage in the works.

8.2.4 Primer and finish paints shall be compatible with each other to avoid cracking and wrinkling. As such it is recommended that the primer and finish paint shall be from the same manufacturer.

8.2.5 The colour and shade shall conform to IS Standards referred to in Appendix 'D' of IS 1477- Part II. To facilitate choosing the correct shade/number from the alternatives available, CONTRACTOR shall adopt trial painting in small patches in consultation with and as directed by the OWNER.

8.2.6 All paint delivered to the fabrication shop/site shall be ready mixed, in original sealed containers, as packed by the manufacturer. Thinner shall not be permitted for usage unless specifically directed by the OWNER.

8.2.7 Paints shall be stirred thoroughly to keep the pigment in suspension.

8.2.8 CONTRACTOR shall at his own cost arrange for testing of paints as per relevant Indian Standards in standard laboratory whenever OWNER wants the tests to be carried out for each batch of paints. Test results shall be submitted to the OWNER for obtaining approval.

8.3 WORKMANSHIP

8.3.1 Painting shall be carried out only on thoroughly dry surfaces.

8.3.2 No painting shall be done in frosty/foggy weather or when the humidity is high enough to cause condensation on the surface to be painted. Paint shall not be applied when the temperature of the surface to be painted is at 5°C or lower.

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- 8.3.3 Primers shall adhere to the surface firmly and offer a key to the subsequent coats.
- 8.3.4 The application of paint film shall serve the twin purpose of protecting the steel from corrosion and giving the decorative appearance. A paint which gives the steel adequate protection over a long period together with good appearance shall therefore be adopted.
- 8.3.5 Workmanship shall generally conform to requirements specified in IS:1477-Part II.
- 8.3.6 It is essential to ensure that immediately after preparation of the surfaces, the first coat of primer paint shall be applied by brushing and working it well to ensure a continuous film without "holidays". After the first coat becomes hard dry a second coat of primer shall be applied by brushing to obtain a film free from holidays.
- 8.3.7 Structural steel surfaces shall be given the first coat of primer at shop and the second coat after it is erected in position. Further, any abraded surfaces of the first coat during transport from shop to site and during erection shall be provided with a touch-up coat of the primer.
- 8.3.8 The dry film thickness of each coat of primer shall be not less than 25 microns.
- 8.3.9 Application of finishing paints shall be carried out within the shortest possible time interval after primer since the primer coats are too thin to give adequate corrosion protection to the steel surface over a long duration.
- 8.3.10 Filler coats shall be applied to fill dents and to obtain a smooth finish wherever necessary. Only factory prepared filler suitable for steel work shall be used. Fillers prepared by whiting and linseed oil by craftsmen at site shall never be used as such fillers may be unbalanced and incompatible with primer and finishing coats. Application of filler shall be done with good 'putty knife' and necessary skill. Filler applied shall be just sufficient to fill the depression or unevenness and it shall be restricted to the minimum. It shall be applied in thin layers. In filling depression or unevenness, due as many coats as are necessary may be applied allowing each layer to dry hard. The hardened coat shall be cut down by wet rubbing before the subsequent coat is applied. Where necessary, filler coats shall be applied over the undercoats also.
- 8.3.11 Painting shall be carried out either by brushing or by spraying. CONTRACTOR shall procure the appropriate quality of paint for this purpose as recommended by the manufacturer.
- 8.3.12 After the second coat of primer is hard dry, the entire surface shall be wet rubbed cutting down to a smooth uniform surface. When the surface becomes dry, the undercoat of paint of optimum thickness shall be applied by brushing/spraying with minimum of brush marks. The coat shall be allowed to hard-dry. The under coat shall then be wet rubbed cutting down to a smooth finish, taking adequate care to ensure that at no place the undercoat is completely removed. The surface shall then be allowed to dry.
- 8.3.13 The first finishing coat of paint shall be applied by brushing or by spraying and allowed to hard-dry. The gloss from the entire surface shall then be gently removed and the surface dusted off. The second finishing coat shall then be applied by brushing or by spraying.

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- 8.3.14 At least 24 hours shall elapse between the application of successive coats. Each coat shall vary slightly in shade and this shall be got approved by the OWNER.
- 8.3.15 Minimum dry film thickness of each coat of finish paint of synthetic enamel shall be 25 microns. Minimum dry film thickness of other finish paints shall be as specified in the respective item of work.
- 8.3.16 The thickness of film shall be measured by an Elcometer to be supplied by the CONTRACTOR. The CONTRACTOR shall calibrate the Elcometer frequently for different settings. Necessary calibrating accessories should be kept ready for calibration/testing of Elcometer at any time.
- 8.3.17 Epoxy primer and epoxy paint shall be applied within the specified pot life all as per recommendations of the manufacturer.
- 8.3.18 Surfaces inaccessible after assembly shall receive two coats of primer prior to assembly.
- 8.3.19 Surfaces inaccessible after erection, including top surfaces of floor beams supporting grating or chequered plate shall receive one additional coat of finish paint over and above the number of coats specified prior to erection.
- 8.3.20 Portion of steel members embedded/to be encased in concrete shall not be painted. Joints to be site welded shall have no shop paint for at least 50mm from the welding zone. Similarly, the steel surfaces shall not be painted in areas where connection is by use of friction grip bolts. On completion of the joint, the surfaces shall receive the painting as specified.
- 8.3.22 CONTRACTOR shall provide suitable protection as necessary to prevent paint finishes from splashing on equipment, floors, walls etc.
- 9. QUALITY REQUIREMENTS (INCLUDING SQP AND FQP)**
As per approved SQP and FQP and Annexure.
- 10. INSPECTION, TESTING AND PERFORMANCE REQUIREMENTS ALONG WITH WARRANTY**
As per approved SQP and FQP and Annexure.
- 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.

CHAPTER 2

CHAPTER # 2.5

**PROJECT SPECIFIC DESIGN GUIDELINES FOR CIVIL,
STRUCTURAL AND ARCHITECTURAL WORKS
FOR
“SUPPLY AND FABRICATION OF STRUCTURAL STEEL”**

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	SUPPLY AND FABRICATION OF STRUCTURAL STEEL	

1. Introduction.

This specification covers the general requirements for supply where specified, detailing fabrication and delivery at site of structural steel.

2. Pre-Qualifying Requirements and Approved Vendor List

Refer bidder qualification and attached approved vendor list.

3. System Description and Scope

This specification covers the general requirements for supply where specified, detailing fabrication and delivery at site of structural steel.

This specification also covers design of all connections and substituted members, preparation of all shop fabrication drawings, inspection and shop painting of structures.

4. Codes & Standards.

The following specifications, standards and codes are made a part of this specification. All standards, specifications and codes of practices referred to herein shall be the latest editions including all applicable official amendments and revisions.

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: 808	Dimensions for Hot Rolled Steel sections
IS: 814	Covered Electrodes for Manual Metal Arc Welding of Carbon and Carbon Manganese Steel
IS: 1161	Steel Tubes for structural purposes
IS: 1363	Hexagon Head Bolts, Screws and Nuts of product (Parts 1 to 3) Grade C (Size range M5 to M64)
IS: 1367	Technical Supply Conditions for Threaded Fasteners (All Parts)
IS: 1852	Rolling and Cutting Tolerances for Hot Rolled Steel Products
IS: 2062	Hot Rolled Low, medium and high tensile, structural steel.
IS: 2074	Ready Mixed Paint, Air drying, Red Oxide Zinc Chrome and Priming
IS: 3502	Steel Chequered Plate

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IS: 3757	High Strength Structural Bolts
IS : 5369	General Requirements for Plain Washers and Lock Washers
IS: 5372	Taper Washers for Channels
IS: 5374	Taper Washer for Me Beams
IS: 6610	Heavy Washers for Steel Structures

Code of Practice

IS: 800	Code of Practice for General Construction in Steel
IS: 816	Code of Practice for use of Metal Arc Welding for General construction in Mild Steel
IS: 822	Code of Procedure for Inspection of Welds
IS: 1182	Recommended Practice for Radiographic examination of Fusion - Welded Butt Joints in Steel Plates
IS: 1200	Method of Measurement in Building Civil Engineering Works
IS: 1477	Code of Practice for Painting of (Parts 1 & 2) Ferrous Metals in Buildings
IS: 2595	Code of Practice for Radiographic Testing
IS: 3658	Code of Practice for Liquid Penetrant Flaw Detection
IS: 4000	High strength bolts in Steel Structures - Code of Practice
IS: 5334	Code of Practice for Magnetic Particle Flaw Detection of Welds
IS: 7215	Tolerances for Fabrication of Steel Structures
IS: 9595	Recommendations for Metal Arc Welding of Carbon and Carbon Manganese Steel

5. Design Requirements

DRAWINGS

The EPC Contractor (CONTRACTOR) shall furnish drawings wherever required. Such drawings are required to show member design forces, size and orientation of each member, location/size of openings, connection design, structural steel detailing, fabrication drawings, sequence of priorities etc. The drawings shall be submitted to OWNER for Information/ Approval. The CONTRACTOR shall follow strictly such drawings.

6. Layout Requirements for the equipment

As per detailed drawing

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7. Operational Requirements

Not Applicable

8. Technical Parameters of Equipment including Data Sheet

Technical Parameters

8.1 STEEL MATERIALS

Steel materials shall comply with the IS specifications laid down under clause 4.0 and/or as called for on the design drawings.

All materials used shall be new, unused and free from defects. (Re-rolled Materials shall not be used) and all materials shall be procured from OWNERS accepted source only.

8.2 DRAWINGS PREPARED BY THE CONTRACTOR

8.2.1 Preparation of design drawings shall be under scope of the CONTRACTOR. These drawings shall be submitted to the OWNER for Approval. These design drawings shall show all the levels, forces on members where necessary, size and orientation of each member, location/size of openings etc.

8.2.2 The OWNER reserves the right to make changes. Revisions to drawings, even after release for preparation of shop drawings, are very likely to be made to reflect additional data/details received and updated requirements. Revisions to drawings and any new drawings made to include additional work by the CONTRACTOR shall be considered a part of this specification and contract. The OWNER shall not entertain any extra claims on this account.

8.2.3 The CONTRACTOR shall prepare all fabrication and erection drawings for the entire work. All the drawings for the entire work shall be prepared in metric units. The drawings shall preferably be of one standard size and the details shown there in shall be clear and legible.

8.2.4 The CONTRACTOR shall not commence detailing and preparation of shop drawings unless, design drawings/ documents are officially approved by OWNER. The CONTRACTOR shall be responsible for the correctness of all fabrication drawings. Fabrication drawings shall be revised by the CONTRACTOR to reflect all revisions in design drawings as and when such revisions are suggested/ directed by the OWNER.

8.2.5 All fabrication drawings shall be submitted to the OWNER for approval.

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- 8.2.6 No fabrication drawings will be accepted for OWNER approval unless checked and approved by the CONTRACTOR's qualified structural engineer and accompanied by an erection plan showing the location of all pieces detailed. The CONTRACTOR shall ensure that connections are detailed to obtain ease in erection of structures and in making field connections.
- 8.2.7 Fabrication shall be started by the CONTRACTOR only after OWNER approval of fabrication drawings. Approval by the OWNER of any of the drawings shall not relieve the CONTRACTOR of the responsibility for correctness of OWNER & design of connections, workmanship, fit of parts, details, material, errors or omissions of any and all work shown thereon. The OWNER approval shall constitute approval of only the size of members, dimensions and general arrangement but shall not constitute approval of the connections between members and other details.
- 8.2.8 The drawings prepared by the CONTRACTOR and all subsequent revisions etc. shall be at the cost of the CONTRACTOR for which no separate payment will be made.
- 8.3 FABRICATION
- 8.3.1 General
- All workmanship and finish shall be of the best quality and shall conform to the best approved method of fabrication. All materials shall be finished straight and shall be machined/ground smooth true and square where so specified. All holes and edges shall be free of burrs. Shearing and chipping shall be neatly and accurately done and all portions of work exposed to view shall be neatly finished. Unless otherwise directed/ approved, reference may be made to relevant IS codes for providing standard fabrication tolerance. Material at the shops shall be kept clean and protected from weather.
- 8.3.2 Connections
- 8.3.2.1 Shop/field connections shall be as per approved fabrication drawings.
- 8.3.2.2 In case of bolted connections, taper washers or flat washers or spring washers shall be used with bolts as necessary. In case of high strength friction grip bolts, hardened washers be used under the nuts or the bolt heads whichever are turned to tighten the bolts. The length of the bolt shall be such that at least one thread of the bolt projects beyond the nut, except in case of high strength friction grip bolts where this projection shall be at least three times the pitch of the thread.
- 8.3.2.3 In all cases where bearing is critical, the unthreaded portion of bolt shall bear on the members assembled. A washer of adequate thickness may be provided to exclude the threads from the bearing thickness, if a longer grip bolt has to be used for this purpose.

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- 8.3.2.4 All connections shall be designed for loads indicated in the design drawing unless otherwise specified in the design drawings. Splices shall be designed for the full strength of the members.
- 8.3.2.5 All bolts, nuts, washers, electrodes, screws etc. shall be supplied/brought to site 10% in excess of the requirement in each category and size.
- 8.3.2.6 All members likely to collect rain water shall have drain holes provided.
- 8.3.3 **Straightening**
All materials, shall be straight and, if necessary, before being worked shall be straightened and/or flattened by pressure and shall be free from twists. Heating or forging shall not be resorted to without the prior approval of the OWNER in writing.
- 8.3.4 Cutting, punching, drilling, welding and fabrication tolerances shall be generally as per relevant IS codes.
- 8.3.5 **Rolling and Forming**
Plates, channels, R.S.J. etc., for circular bins, bunkers, hoppers, gantry girders, etc., shall be accurately laid off and rolled or formed to required profile/ shape as called for on the drawings. Adjacent sections shall be match-marked to facilitate accurate assembly, welding and erection in the field.
- 8.3.6 **High Strength Friction Grip Bolting**
- 8.3.6.1 Inspection after tightening of bolts shall be carried out as stipulated in the appropriate standards depending upon the method of tightening and the type of bolt used.
- 8.3.7 **Welding**
- 8.3.7.1 Welding procedure shall be submitted to OWNER for approval. Welding shall be entrusted to only qualified and experienced welders who shall be periodically tested and graded as per welding procedure specification (WPS) & welder qualification shall be established at site under owner OWNER as per ASME sec-IX. / AWS D.1.1.
- 8.3.7.2 While fabricating plated beams and built up members, all shop splices in each component part shall be made before such component part is welded to other parts of the members. Wherever weld reinforcement interferes with proper fit-up between components to be assembled for welding, these welds shall be ground flush prior to assembly.
- 8.3.7.3 Approval of the welding procedure by the OWNER shall not relieve the CONTRACTOR of his responsibility for correct and sound welding without undue distortion in the finished structure.
- 8.3.7.4 No welding shall be done when the surface of the members is wet nor during periods of high wind.

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8.3.7.5 Each layer of a multiple layer weld except root and surfaces runs may be moderately peened with light blows from a blunt tool. Care shall be exercised to prevent scaling or flaking of weld and base metal from overweening.

8.3.7.6 No welding shall be done on base metal at a temperature below -5 Deck. Base metal shall be preheated to the temperature as per relevant IS codes.

8.3.7.7 Electrodes other than low-hydrogen electrodes shall not be permitted for plate thicknesses of 32 mm and above (consumable used shall be approved by owner. Only approved makes of electrodes shall be allowed for welding).

8.3.7.8 Inspection of Welds

All welds shall be inspected for flaws by any of the methods described under clause 8.4 "Inspection". The choice of the method adopted shall be to the approval of OWNER.

(In case necessary to join the rolled section (ISMC to ISMC and ISMB to ISMB) by Butt joint, specific approval the approval for the same shall be obtained from the owner and 10 % length of such joints shall be Radiographed.)

Minimum of 10 % of the fillet & butt welds shall be tested by DPT / MPT

8.3.7.9 The repairing of defective welds shall be carried out as directed by the OWNER without damaging the parent metal. When a crack in the weld is removed, magnetic particle inspection or any other equally positive means as prescribed by the OWNER shall be used to ensure that the whole of the crack and material up to 25 mm beyond each end of the crack has been removed. Cost of all such tests and operations incidental to correction shall be to the CONTRACTOR's account.

8.3.8 Tolerances

The dimensional and weight tolerances for rolled shapes shall be in accordance with IS: 1852 for indigenous steel and equivalent applicable codes for imported steel. The tolerances for fabrication of structural steel shall be as per IS: 7215.

8.3.9 End Milling

Where compression joints are specified to be designed for bearing, the bearing surfaces shall be milled true and square to ensure proper bearing and alignment.

8.4 INSPECTION

8.4.1.1 The CONTRACTOR shall give due notice to the OWNER in advance of the works getting ready for inspection. All rejected material shall be promptly removed from the shop and replaced with new material for the OWNER approval/ inspection. The fact that certain material has been accepted at the CONTRACTOR's shop shall not invalidate final rejection at site by the OWNER if it fails to conform to the requirements of these specifications, to be in proper condition or has fabrication inaccuracies which prevents proper assembly nor shall it invalidate any penalty which the OWNER may make because of defective or unsatisfactory materials and/or workmanship.

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- 8.4.1.2 No materials shall be painted or dispatched to site without inspection and approval by the OWNER unless such inspection is waived in writing by the OWNER.
- 8.4.1.3 The CONTRACTOR shall provide all the testing and inspection services and facilities for shop work except where otherwise specified.
- 8.4.1.4 For fabrication work carried out in the field the same standard of supervision and quality control shall be maintained as in shop fabricated work. Inspection and testing shall be conducted in a manner satisfactory to the OWNER.
- 8.4.2 Inspection and tests on structural steel members shall be as set forth below:
- 8.4.2.1 **Material Testing**
If mill test reports are not available for any steel materials supplied by the CONTRACTOR the same shall be got tested by the CONTRACTOR to the OWNER satisfaction to demonstrate conformity with the relevant specification. (Only in NABL Approved Lab)
- 8.4.3 **Magnetic Particle Test**
Where welds are examined by magnetic particle testing, such testing shall be carried out in accordance with relevant IS codes. If heat treatment is performed, the completed weld shall be examined after the heat treatment. All defects shall be repaired and retested. Magnetic particle tests shall be carried out using alternating current. Direct current may be used with the permission of the OWNER.
- 8.4.4 **Liquid Penetrant Inspection**
In the case of welds examined by Liquid Penetrant Inspection, such tests shall be carried out in accordance with relevant IS Code. All defects shown shall be repaired and rechecked.
- 8.4.5 **Radiographic Inspection**
All full strength butt welds shall be radiographed in accordance with the recommended practice for radiographic testing as per relevant IS code.
- 8.4.6 **Dimensions, Workmanship & Cleanliness**
Members shall be inspected at all stages of fabrication and assembly to verify that dimensions, tolerances, alignment, surface finish and painting are in accordance with the requirements shown in the approved fabrication drawings.
- 8.4.7 **Test Failure**
In the event of failure of any member to satisfy inspection or test requirement, the CONTRACTOR shall notify the OWNER or his authorized representative. The CONTRACTOR must obtain permission from the OWNER before repair is undertaken. The quality control procedures to be followed to ensure satisfactory repair shall be subject to approval by the OWNER.
- 8.4.8 The OWNER has the right to specify additional testing as he deems necessary, and the additional cost of such testing shall be borne by the OWNER, only in case of successful

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testing.

- 8.4.9 The CONTRACTOR shall maintain records of all inspection and testing which shall be made available to the OWNER or his authorized representative.

8.5 SHOP MATCHING

For other steel work, such as columns along with the tie beams/bracings may have to be shop assembled to ensure satisfactory fabrication, obtaining of adequate bearing areas etc. if so desired by the OWNER. All these shop assemblies shall be carried out by CONTRACTOR at no extra cost to the OWNER.

8.6 DRILLING HOLES FOR OTHER WORKS

As a part of this Contract, holes in members required for installing equipment or steel furnished by other manufacturers or other contractors shall be drilled by the CONTRACTOR at no extra cost to the OWNER. The information for such extra holes will be supplied by the OWNER.

8.7 MARKING OF MEMBERS

- 8.7.1 After checking and inspection, all members shall be marked for identification during erection. This mark shall correspond to distinguishing marks on approved erection drawings and shall be legibly painted and stamped on it. The erection mark shall be stamped with a metal dye with figures at least 20 mm high and to such optimum depth as to be clearly visible.

- 8.7.2 All erection marks shall be on the outer surface of all sections and near one end, but clear of bolt holes. The marking shall be so stamped that they are easily discernible when sorting out members. The stamped marking shall be encircled boldly by a distinguishable paint to facilitate easy location.

- 8.7.3 Erection marks on like pieces shall be in identical locations. Members having lengths of 7.0 m or more shall have the erection mark at both ends.

8.8 ERRORS

Any error in shop fabrication which prevents proper assembling and fitting up of parts in the field by moderate use of drift pins or moderate amount of reaming will be classified by the OWNER as defective workmanship. In case OWNER rejects such material or defective workmanship, the same shall be replaced by the materials and workmanship conforming to the OWNER requirements by CONTRACTOR free of cost at site.

8.9 PAINTING

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8.9.1 All fabricated steel material, except those galvanized shall receive protective paint coating as specified refer separate section.

9. QUALITY REQUIREMENTS (INCLUDING SQP AND FQP)

As per approved SQP and FQP and Annexure

10. INSPECTION, TESTING AND PERFORMANCE REQUIREMENTS ALONG WITH WARRANTY

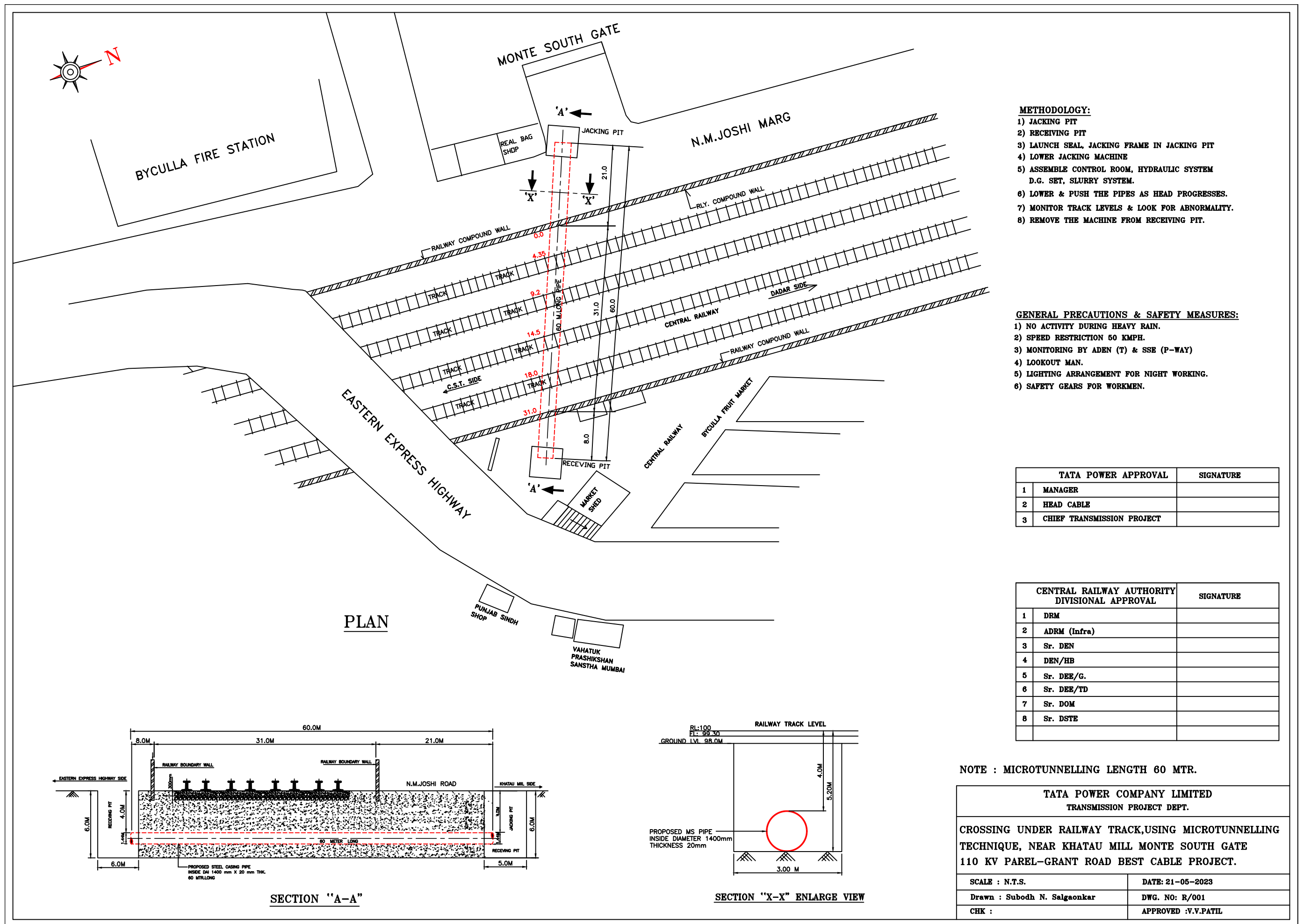
As per approved SQP and FQP and Annexure

11. DATA SUBMISSION BY BIDDER

11.1. With the Bid - Not Applicable

11.2. After award of contract - SQP, FQP, Field test report and drawings.
(Site fabrication inspection shall be done as per the approved field quality plane (FQP).
Contractor/agency shall submit the FQP at least 15 days before start of job.).

ANNEXURE - 1.0



ANNEXURE - 1.1

ANNEXURE - 1.2

TATA POWER

The Tata Power Company Limited
Corporate Engineering-Quality Assurance
Inspection & Testing

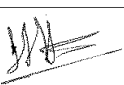
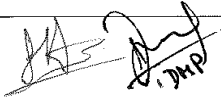


QA/IT/2013/FQP/CIVIL/001

STANDARD FIELD QUALITY PLAN (FQP)

Date of Issue:

STANDARD FIELD QUALITY PLAN FOR GENERAL CIVIL WORKS (GCW)

				 23/12/13	
R0	Issue for use	SPS / 30.07.2013	SPS, DMP & ST 28.08.2013	SS	
Rev. No.	Reason for Revision	Prepared By & Date	Checked By & Date	Approved By & Date	Issued by

PTO

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 - 4.2 Coarse Agg
 - 4.3 Fine Agg
 - 4.4 Lime / Surkhi/Water
 - 4.5 Concrete Admix
5. PCC / RCC
6. Reinforcement
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8. Drainage Work
9. Precast Concrete Str
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15. Wood Work
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 - 26.1 Fibre Board Ceiling
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ITEM DESCRIPTION

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 - 28.9 Painting Wood Works
 - 28.10 Painting of Steel Work
29. Structural Steel Work
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39. Fencing with Chain Links / B Wire
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41. ACC Sheeting Work
42. Decorative Texture Coat
43. Precast Paving Work

LEGENDS: MTC: Material Test Certificate, SR: Site Record, LB: Log Book, IR: Inspection Report, TR: Test Report, MDR: Mix Design Reports, AM: Approved Methodology, ELTR: External Lab Test Report, CR: Calibration Report, BBS: Bar Bending Schedule.

Note: Technical specifications shall be referred to for items not mentioned in the FQP.

N O T E	A). Statutory requirements shall be complied by the contractor. B). For stage Inspections relevant copies of the documents shall be furnished for Tata Power review. C). Identification stamp on materials shall be preserved / got transferred by Tata Power at Appropriate stages. (If required). D). The extent indicated in column 6 is 100% in the contractor's scope. However, Tata power may inspect this column or random samples at its discretion. 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 shall have valid calibration certificate with its traceability to national Standard.
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.



TATA POWER CO. LTD. (QA, I & T DEPARTMENT)

DIVISION: _____

FIELD QUALITY PLAN (FQP) – GCW

Doc No. TPCL /QA /FQP-GCW / 01

Rev : A Date : 30.07.13

SR. NO.	COMPONENT, Activity / operation	CHARACTERISTICS	TYPE OF CHECK	CLASS OF CHECK	EXTENT OF CHECK	REF. DOCUMENT / ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
1.0	FQA SETUP:							
1.1	Setting up of FQA Laboratory by agency		Physical	A	One Time	Technical Specifications	SR	Functioning of laboratory equipment in proper working condition to be verified on monthly basis
1.2	Availability of requisite laboratory setup & equipments in good working conditions before commencement of concerned activity.		Physical	A	Before Start of work	Do	SR	Vendor has to submit calibration certificates of all newly procured / available equipments
1.3	Ensure Calibration and Validation of Laboratory, Survey and other specified required Equipments / Instruments at site.		Physical	A	Lab Equip -Yearly Survey Equip - Half yearly or as and when required in case of deviations	NABL Standards or relevant IS codes.	SR	Equipments / Instruments in non conforming conditions will not be accepted.
1.4	Verification of QA & QC Manpower deployment by agency. Availability of QA & QC manpower based on deployment schedule		Physical	A	One Time or as and when required	Technical Specifications	SR	The QA & QC manpower and requisite laboratory shall be available at least 15 days prior to start of an activity (Applicable for Major Projects)

1.5	Verification of availability of construction equipments in working conditions		Physical	B	Monthly	Contract Document Kick-off Meeting MOM	SR	—
1.6	Material Source Finalization		Physical	A	Once Per Source	DO	SR	Test reports along with recommendations from specialist agency to be submitted to TPCL.. The sampling shall be carried out such that the test results of the materials are available before use.
2.0	SURVEY							
2.1	Survey	Grid pillars	Measuring Tapes, Survey Instruments	B	100%	Technical Specifications / Drawings	SR	All Records to be Reviewed Before Start of Work.
		Survey equipment inspection / Calibration	Review Calibration Report t	B	100%	Technical Specifications / Drawings	CR	
		R.L. transfer from permanent B.M.	Digital theodolite/ Total station/ Auto level	B	100%	Technical Specifications / Drawings	SR	
		Initial levels of area, contour plans etc.	Digital theodolite/ Total station/ Auto level	B	100%	Technical Specifications / Drawings	SR	
		Protection of Control points, Permanent Bench Mark	Protection Measures	B	100%	Technical Specifications / Drawings	SR	
		As Build Survey	Physical Verification	A	100%	As Build Drawings	SR	

3.0	EARTH WORK: FOR FOUNDATIONS, TRENCHES, BASEMENTS, PITS etc.							
3.1	Site Grading	Initial levels of area	Cutting or Filling Levels	B	100%	Drawings / Specifications	SR	Records duly signed by all concerned Shall be Submitted with R A Bills
		Filling material tests	Physical and Chemical Tests	B	100%	Drawings / Specifications	TR	
		Compaction test	Field Testing	B	100%	Drawings / Specifications	TR	
		Final levels of area	Survey Measurement	B	100%	Drawings / Specifications	SR	
3.2	Excavation - Soil	Geotechnical Survey of Soil Strata	Review of Test Report	A	100%	Drawings / Specifications	IR / Site Log book	SBC & Other Properties of Soil.
		Initial levels of area	Survey Measurement	B	100%	Drawings	SR	Excavation Methodology shall be get approved before start of work In municipal areas, Challan showing proof of dumped soil in demarcated dumping areas to be attached with the RA bills.
		Layout, Excavation	Marking	B	100%	Drawings	SR	
		Sub-soil water, shoring, strutting	Physically	B	100%	Specifications	SR	
		Obstacles- underground pipes, cables etc.	Review of Schème	B	100%	Schème	SR	
		Excavation with proper side slopes, Shoring & Dewatering.	Physically	B	100%	Drawings / Specifications	SR	
		Final level of excavation	Measurement	B	100%	Drawings / Specifications	SR	
		Disposal / proper stacking of excavated earth in demarked area.	Visually	B	Randomly	Drawings / Specifications	SR	

3.3	Excavation in Hard rock by blasting (if applicable / Prohibited)	Receipt & Storage of explosives	Physically	B	100%	Indian explosive act 1940 /all statutory norms	Site log book	
		Blasting operation	Physically	B	100%	IS 4081 & approved Drawings / scheme	Site log book	
		Excavation in Ordinary & Hard Rock (Where Blasting is Prohibited)	Physically	B	100%	As per approved drawing / scheme	SR	
		Disposal / proper stacking of excavated earth in demarked area.	Visually	B	Randomly	Drawings / Specifications	SR	
3.4	Back Filling (Material Suitability of Borrow area)	Grain Size Analysis (GSA)	Testing	A	Once in every 2000cum for each type & source of fill of fill material subjected to a min. of 2 samples	IS : 2720 (Pt. IV)	SR / TR	Suitability of fill material is to be checked for each source of borrowed area.
		Liquid & Plastic Limit	Testing	A	Once in every 2000cum for each type & source of fill material subjected to a min. of 2 samples	IS : 2720 (Pt. V)	SR / TR	
		Shrinkage Limit	Testing	A	Once in every 5000 cum for each type & source of fill of fill material subjected to a min. of 2 samples	IS : 2720 (Pt. VI)	SR / TR	
		Free Swell Index	Testing	A	Once in every 5000 cum for each type & source of fill of fill material.	IS : 2720 (Pt. XI)	SR / TR	

		OMC / MDD	Testing	A	Once in every 2000 cum for each type & source of fill of fill material.	IS : 2720 (Pt. VII)	SR / TR	
3.5	Back Filling (Site Inspection & Testing)	Construction Methodology	Approval	A	Before Start of Activity	Specifications	AM	Field Inspection Checklist Shall be Prepared Component Wise & Same Shall be Submitted with RA bills
		Treatment of soil (if any)	Anti Termite or Bitumen Coating	B	Before Start of Filling	Drawings / Specifications	IR	
		Cutting and capping of tie rods & any other Repair	Physical	B	Before Start of Backfilling	Drawings / Specifications	IR	
		Protection of sleeves, nut and bolts etc.	Physical	B	Before Start of Backfilling	Back Filling (Material Suitability of Borrow area)	IR	
		Verification of type of compactor and Capacity of compactor	Physical	B	Before Start of Backfilling	Drawings / Specifications	IR	
		Filling in layers, Layer Thickness, Watering ,Consolidation, Compaction	Field Testing	B	1 sample each compacted layer / 10 foundations or 200 sqm area	IS : 2720 (Pt. XXIX)	IR / TR	
		Filling to required level	Surveying	B	100%	Drawings / Specifications	SR	Level Sheet shall be Submitted with RA Bills.
		Check for completion of underground utility activities	Physical	B	100%	Drawings	SR	To be jointly inspected and signed by concerned engineers
3.6	Ant Termite Work	Application Methodology	Approval	A	Before Start of Activity	Specifications	AM	Field Inspection Checklist Shall be Prepared Component Wise & Same to be Submitted with Respective RA Bills.
		Approved Material	Review MTC	A	Each Lot	IS:6313 Specifications	MTC	
		Site Preparation & Compaction	Physically	B	100%	Drawings / Specifications	IR	

		Dia. & Depth of Holes	Physically	B	100%	Drawings / Specifications	IR	
		No. of Holes & Spacing	Physically	B	100%	Drawings / Specifications	IR	
		Mix Proportion & Rate of Application	Physically	B	100%	Mnfr Specifications	IR	
		Guarantee bond	Review Legal Document	A & B	100%	Specifications	Stamp Paper	
4.0	PCC / RCC AND CAST IN- SITU CONCRETE: RAW MATERIALS							
4.1	CEMENT: OPC / Portland slag cement complying with the requirements of IS 269, IS-12269, IS-1489, IS-8112 and IS 455 - 1989 respectively shall be used for making plain and reinforced concrete, cement grout and mortar. Other types of cement may be used depending upon the requirements of certain jobs with the approval of the Client / Consultant. All Physical and Chemical tests to be done in NABL certified lab as per relevant IS codes for material Suitability for its approval prior start of work.							Each consignment of Cement shall be duly correlated with MTC. If cement is stored more than 90 days in godown of contractor, same shall be retested for setting time & compressive strength
	Field Inspection	Ensured that the cement is stored in weather tight covered storage on raised platform as per IS : 4082	Visual	B	100% covered storage	IS : 4082	IR	
		FIFO System	Visual	B	Random	Specifications	IR	
4.2	Field Testing	Normal Consistency	Testing	A	Each Lot / Batch	IS : 4031 / 8112 / 12269/ 1489 / Specifications	MTC / TR	MTC Should be compared w.r.t Field Tests
		Setting Time						
		Fineness						
		Soundness						
		Specific Gravity						
		Compressive Strength						
4.3	COARSE AGGREGATES : All Physical and Chemical tests to be done in NABL certified lab as per IS 383 for material Suitability for its approval prior start of work							
4.3.1	Testing	Moisture Content	Testing	A	Every 200 m3 Or As & When Required by Client	IS : 2386 P3 IS : 456 IS : 383 Tech. Specification	SR / TR	Accordingly water content in concrete shall be adjusted

4.3.1	Field Testing	Specific Gravity, Bulk Density, Voids & Water absorption	Testing	A	Once for each source and every change of source	IS : 2386 P3 IS : 456 IS : 383 Tech. Specification	SR / TR	Accordingly Mix design shall be reviewed
		Sieve Analysis	Testing	A	Every 200 m3 Or As & When Required by Client	IS : 2386 P1 IS : 456 IS : 383 Tech. Specification	SR / TR	
		Abrasion Value, Crushing Value, Impact value, EI/FI	Testing	A	Every 200 m3 Or As & When Required by Client	IS : 2386 P3 IS : 456 IS : 383 Tech. Specification	SR / TR	
		Deleterious Materials & Organic Impurities	Testing	A/B	Once for each source and every change of source	IS : 2386 P3 IS : 456 IS : 383 Tech. Specification	ELTR	In case of deviation, Experts opinion regarding suitability of the aggregates shall be obtained from specialist agency like NBCM, CSMRS / Corporate Engg / Consultant
		Soundness	Testing	A/B	Once for each source and every change of source	IS : 2386 P5 IS : 456 IS : 383 Tech. Specification	ELTR	In case of deviation, Experts opinion regarding suitability of the aggregates shall be obtained from specialist agency like NBCM, CSMRS // Corporate Engg / Consultant
		Alkali aggregate Reactivity	Testing	A/B	Once for each source and every change of source	IS : 2386 P7 IS : 456 IS : 383 Tech. Specification	ELTR	The aggregate type (deleterious innocuous results shall be supported by petrographic examination)

		Petro graphic Examination	Testing	A/B	Once for each source and every change of source	IS : 2386 P8 IS : 456 IS : 383 Tech. Specification	ELTR	Reporting of Petro graphic examination shall be done as per IS 2386 P8. Petrography report shall be supported by analysis and recommendation by specialize agency by TPCL like NBCM, CSMRS / / Corporate Engg / Consultant in case of deviation.
4.3.2	Field Inspection	Stacking Arrangements	Visual	B	100% covered storage	IS : 4082	SR / LB	PCC to be provided on surface at which aggregates to be stacked.
		Bin Partitions	Visual	B	100% Partition walls between each size agg	IS : 4082	SR / LB	Intermixing of CA and FA shall be not allowed.
		Watering of Aggregates in Case of Temp Control Concrete	Visual	B	100%	Specifications	-	
4.4	<u>FINE AGG (SAND):</u>							
	i) Unless otherwise, specified, it shall be either natural river sand or pit sand. Silt & clay content, bulking of sand, specific gravity, bulk density, voids, absorption, deleterious material, soundness are conducted per each source and complied with relevant standards for the design mix. Following tests shall be conducted before use at site. Crusher stone dust (i.e. retained on 300-micron sieve) may be used as replacement of certain quantum of sand aiming to improve the fineness modulus of fine aggregate. The quantum of replacement of sand shall be arrived at by suitable trial mixes and at the discretion of Client / Consultant. FM Shall be 2.30 – 3.30 for RCC							
	ii) Sand for Masonry Mortars shall be natural sand / crushed stone sand or crushed gravel and shall comply with IS 2116-1980. It shall not contain amount of clay, silt and fine dust more than 5% by weight.							
	iii) Sand for plastering mortars for internal wall, ceiling and external plastering shall conform to IS 1542. It shall not contain any harmful impurities such as iron pyrites, alkalis, salts, coal, mica and other organic matters % of dust and salt shall not be more than 5% by weight. Fineness modules of natural occurring sand shall not be less than 1.5.iv) Aggregates which are chemically reactive with alkalis of cement shall not be used.							
		Moisture Content, Bulk age	Testing	C	Every 200 m3 Or As & When Required by Client	IS : 2386 P3 IS : 456 IS : 383 Tech. Specification	SR / TR	Weight of water & volume of sand shall be adjusted as per MC & Bulk age.

4.4.1	Field Testing	Specific Gravity, Bulk Density, Voids & Water absorption	Testing	A	Once for each source and every change of source	IS : 2386 P3 IS : 456 IS : 383 Tech. Specification	SR / TR	Accordingly Mix design shall be reviewed.
		Sieve Analysis	Testing I	A/C Randomly	Every 200 m3 Or As & When Required by Client	IS : 2386 P1 IS : 456 IS : 383 Tech. Specification	SR / TR	Grading shall conform to Zone-III. Max. Size of particle shall be 4.75 mm and shall be graded down. Sand containing more than 10% of fine grains passing through 150 micron sieve or having the fineness modulus less than 2 shall not be used for concrete work. Grading of Fine Aggregate for mortar and grout shall be within the limits of Zone-III & IV.
		Silt Content	Testing	A/C Randomly	Daily before start of concrete	IS : 2386 P2 IS : 456 IS : 383 Tech. Specification	SR / TR	
		Soundness	Testing	A/B	Once for each source and every change of source	IS : 2386 P5 IS : 456 IS : 383 Tech. Specification	ELTR	In case of deviation, Experts opinion regarding suitability of the aggregates shall be obtained from specialist agency like NBCM, CSMRS
		Deleterious Materials & Organic Impurities	Testing	A/B	Once for each source and every change of source	IS : 2386 P3 IS : 456 IS : 383 Tech. Specification	ELTR	In case of deviation, Experts opinion regarding suitability of the aggregates shall be obtained from specialist agency like NBCM, CSMRS

		Alkali aggregate Reactivity	Testing	A/B	Once for each source and every change of source	IS : 2386 P7 IS : 456 IS : 383 Tech. Specification	ELTR	The aggregate type (deleterious innocuous results shall be supported by petro graphic examination)
		Petro graphic Examination	Testing	A/B	Once for each source and every change of source	IS : 2386 P8 IS : 456 IS : 383 Tech. Specification	ELTR	Reporting of Petro graphic examination shall be done as per IS 2386 P8. Petrography report shall be supported by analysis and recommendation by specialize agency by TPCL like NBCM, CSMRS / Corporate Engineering /etc in case of deviation.
4.4.2	Field Inspection	Stacking Arrangements	Visual	B	100% covered storage	IS : 4082	SR / LB	PCC to be provided on surface at which aggregates to be stacked.
		Bin Partitions	Visual	B	100% Partition walls between each size agg.	IS : 4082	SR / LB	Intermixing of CA and FA shall be not allowed.
4.5	LIME FOR MORTARS & CONCRETE: shall conform to IS 712-1984, if applicable as per drawing. The total of CaO and MgO content in quick lime shall not be less than 85% (MgO shall not exceed 5%). Quick lime, after slaking, shall leave a residue of not more than 5% by weight on IS sieve 85.							
4.7	WATER: Used for mixing concrete and mortar and for curing shall be clean and free from injurious amounts of oil, acid, alkali, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. Potable water is generally considered satisfactory for mixing concrete. Water shall be obtained from an approved source.							
4.7.1	Construction Water Testing	TDS, Carbonic Content, Sulphate, Chlorides & PH Value.	Testing	A	Half yearly or change of source	IS : 3025 P 22,23 for testing IS 456 for acceptance	SR/TR	100 ml of water should not require more than 5 ml 0.02N NAOH by using phenolphthalein indicator & 25 ml 0.02N sulphuric acid

		PH Value & Density	Field Testing	A	Monthly or as and When Required by Client	IS : 3025 P 2 for testing IS 456 for acceptance	SR/TR	
		Check for initial setting time & Strength by used water and distilled water	Testing	A	As and When Required by Client	IS : 456	SR/TR	Initial setting with used water should not be less than distilled water. This check is be carried out if Physical and Chemical tests are not acceptable
4.7.2	Construction Water Field Inspection	Cleaning of Water Tank	Visual	B	Monthly or as & when Required	IS : 456	SR	
		Water Tank Coverage	Visual	B	100% covered storage.	IS : 456	SR	
		Hard Barrication	Visual	B	100% Barrication	IS : 456	SR	Safety / Washing / Bathing Point of View Hard Barrication shall be provided.
4.8	CONCRETE ADMIXTURES:							
4.8.1	Material Requirements	Approved Material identification, Retention time,/ Setting Time, Air Content, Compressive Strength etc. Physical & Chemical properties as per relevant IS codes	A Review MTC	A	Each Batch	IS : 9103 IS:456 Tech. Specification	MTC	In absence of MTC testing shall be carried out at NABL Approved Lab.
4.8.2	Field Stacking Arrangements & Testing	P H value & Density	Field Testing	A	Each Lot	IS : 9103 IS:456 Tech. Specification	TR	
		Shed and Platform,	Visually	B	100%	IS : 9103 IS:456 Tech. Specification	IR	Shall be Protected from Direct Sunlight.

5.0	PCC / RCC CAST IN- SITU CONCRETE:							
5.1	Concrete Production, Placement and Compaction	Mix Design Proportion Test / Cube Compressive Strength	External Lab Test	A	Once for each source and each grade of concrete	IS : 10262 IS : 456 / SP: 23 IS : 516 Tech. Specification	MDR	Where use of admixture is envisaged, Separate mix design shall be done with admix and same will be reviewed annually or as decided by the OWNER'S engineer
		PCC / RCC Methodology	Approval	A	Before Start of Activity	Specifications	AM	
		Checking of Form work, Concrete arrangements, reinforcement, Embedded Parts	Physical / Visual	B	100%	Tech. spec / drg	IR / Protocol	For Critical Structures, it will be in CAT A
		Reduced level for PCC top	Measurement	B	100 % before start of concrete	Tech. spec / drg	IR / Protocol	
		Slump and Temp Test	Measurement	B	As per IS : 456	IS : 456 / Spec	IR / Site Record	
		Cube Crushing Test	Lab Test	A	IS : 456	IS : 456 / IS : 516 / TPCL Spec	Lab Record	Min. 6 cubes for each mix, 3 for 7 days & 3 for 28 days test. Sample to be taken at pouring point.
		Material Bin Partitions	Visually	B	100%	IS : 4082	IR	100% covered storage for cement and admixtures Required
		Temperature control of concrete for Critical Structures	Measurement	A / B	100%	Temp. Max 25*c	SR	Appropriate measure shall be taken to control the temperature like coverage of millers with jute

		Pour Sequence	Physical	B	100%	Review of Sequence Chart	SR	
		Check for Tools, Plants, Machines, Manpower, Material and Equipments	Physical	B	100%	Review of Status Chart	SR	List of Manpower, tools, machines, materials, Equipments to will be submitted for major conc.
		Batching Calibration	Measurement	A	Batching plant to be calibrate at starting & then quarterly and confirm IS 4925	Review of calibration Chart IS : 456 IS ; 457	Calibration Chart	Printout of each & every batch shall be protected / dispatched
		Batch & Mixing Time	Physical	B	IS : 457 IS: 4925	IS : 457 / Spec	Batch Prints	Mixing time shall be as per IS 457 or recommended by manufacturer
		Dispatch Time	Visual /Physical	B / C	100%	As per methodology / TPCL Spec	Dispatch Slips	Transit Mixers shall be covered to prevent loss of slump & temp.
		Pump line, Chutes, Lift Height etc	Visual /Physical	B / C	100%	As per methodology / TPCL Spec	SR	Lift Height shall be as per IS: 456
		Compaction with Vibrators, Compactors, Denseness	Physical	B	100%	As per IS 456	SR	If Bleeding occur the mix design shall be adjusted & bleed water should be removed by sponge.
		Construction Joint (Green Cutting, Key Formation)	Visual /Physical	B	100%	As per methodology / TPCL Spec	SR	
		Finishing Class	Visual /Physical	B	100%	IS : 456 / TPCL Spec.	SR	F1,F2
5.2	Post Concrete	De shuttering time with adequate precautions	Visual /Physical	B	IS 456 / as per specification	IS : 456	SR	
		Segregation / Honeycombing	Visual /Physical	B	100%	IS : 456 / TPCL Spec.	QCAR	Rectification shall be done by TPCL approved procedure

		Core Test / NDT	Field Test	A	IS : 456	IS : 456 / IS : 516 / IS : 13311 TPCL Spec	TR	The Test will be carried out if there are deviations like cube failure, honeycombing, cavities, poor quality work
		Curing for Concrete	Visual /Physical	B / C	100%	Curing Period shall be as per IS 456	SR	Exposed concrete surface shall be protected against heating & drying upto 72 hrs. after placements. Curing compound should be used if Required
		Providing anti corrosive treatment	Visual	B	When Required	Spec / Drgs	Site Log book/ IR	To be used if Required
		Providing water proofing Compound	MTC Review	A	When Required	Spec / Drgs	SR	To be used if Required
		Water tightness test on water retaining structures	Water Filling	A / B	100%	IS : 3370 & Tech Spec.	SR	
		Ultrasonic test on TG deck or other critical structures	Field Test	A / B	100%	IS : 13311	Test report	The grid shall be 200mm c/c or as required by the Engineer
		Load Test	Physical	A	As required by TPCL Engineer	IS : 456	SR / LB	Required in case of deviation in strength
		Checking of visual inspection of concrete surface and rectification unsatisfactory performance, if any.	Visual /Physical	B	IS 456 / as per specification	IS : 456	QCAR	Any structure having severity of honeycombing and cracks will be grouted and NDT will be done as per TPCL Procedure
6.0	REINFORCEMENT STEEL: Steel complying with the requirements of IS 1786, 432, 1566 shall be used for making plain and reinforced concrete,. Other types of steel may be used depending upon the requirements of certain jobs with the approval of the Client / Consultant. All Physical and Chemical tests to be done in NABL certified lab as per relevant IS codes for material Suitability for its approval prior start of work.							
6.1	Material Requirements	Raw material identification, Inspection & dimensions. Physical & Chemical properties as per relevant IS codes	Review MTC	A	Each Lot / Dia./ Source	IS : 1786 IS : 432 IS : 1566 Tech. Specification	MTC	Tested steel to be Procured by Vendor. In absence of MTC testing shall be carried out at every 50 T consignment

		Diameter & Unit weight at Field	Field Testing	B	Each Consignment	IS : 1786 IS : 432 IS : 1566 Tech. Specification	IR	
		Yield Strength / UTS	MTC Review / Lab test report	A	Each Lot	IS : 1786 IS : 432 IS : 1566 Tech. Specification	MTC/IR	in absence of MTC testing shall be done
		Elongation	MTC Review / Lab test report	A	Each Lot	IS : 1786 IS : 432 IS : 1566	MTC/IR	in absence of MTC testing shall be done
		Bend & Rebend	MTC Review / Lab test report	B	Each Lot	IS : 1786 IS : 432 IS : 1566	MTC/IR	in absence of MTC testing shall be done
		Cutting Tolerances at Field	Measurement	B	At Random	IS:2502	SR/LB	Tolerance as per spec.
		Freedom from cracks, Surface flaws, Lamination (Visual Examination)	Visual	B	At Random	IS:1852 IS:1786 IS:432	IR	To be checked at site
		Chemical Analysis	A	Physical	Every 100MT	IS : 1786, IS : 432 IS : 1566	ELTR	Each dia. / Each Brand
		External coating to reinforcement bars	Physical	B	Each Lot	IS:1786	IR	If applicable
6.2	Placement of Reinforcement & Embedded Parts	Check for bar bending schedule with necessary laps, spacers & chairs	Review of BBS	B	100%	As per Drg / Spec.	BBS	In Case of Critical Structures. This will be inspected by Cat - A
		Check for Cover, Spacing Tying, Splices & laps	Visual & Measurement	B	100%	IS:2502 As per Drg / Spec.	SR	
		Check for all joints & Crossings	Visual	B	100%	As per Drg / Spec.	SR	
		Position & level of Embedded Parts & Dowels	Dimensional	B	100%	As per Drg / Spec.	SR	

		Position , Depth & size of bolt hole	Dimensional	B	100%	As per Drg / Spec.	SR	Exposed surface of The embedded parts Other than holding down bolts to be painted with primer, rubber based zinc phosphate and for Critical Structures this will be inspected by Cat – A (where specified)	chlorinated,	
		Location Verticality of pipe sleeve/ opening of bolt hole	Dimensional	B	100%	As per Drg / Spec.	SR			
		Welding / Tying of embedded part to the reinforcement	Dimensional	B	100%	As per Drg / Spec.	SR			
		Storage Site	B	Visual	Randmly	As per IS 4082 / TPCL Spec.	SR			
7.0	FORMWORK / SHUTTERING:									
7.1	Material Requirements	Plywood for concrete shuttering work (moisture content, glue adhesion in dry state, water resistance test, modulus of elasticity as per mnfc)	Review MTC	B	100%	IS : 4990 IS : 1734	SR	Manufacturer MTC shall be reviewed with methodology		
		Soundness of shuttering, staging & scaffolding	Physical	B	100%	Manufacturers Spec IS 4990	Pour Card			
7.2	Placement and Field Inspection	Alignment, Forms seam work and water tightness	Physically	B	100%	Spec / Drgs	Pour Card	In Case of Critical Structures. This will be inspected by Cat - A		
		Connection between individual scaffolding units safe slenderness ratio. Two independent safeties	Physically	B	Fortnightly	As per national safety council & relevant IS code 14687 & 3696.	Pour Card			
		Hoisting for personnel & materials	Physically	B	Fortnightly	As per Mnfc Recommendation & safety codes	Pour Card			

		Checking of alignment, vertical dimension, levels, coordinates , joint filling,	Measurement	B	100%	Spec / Drgs	Pour Card	
		Removal time for shuttering	Physically	B	100%	IS:456	Pour Card	
8.0	DRAINAGE WORK WITH R.C.C. HUME PIPES / PVC PIPES:							
8.1	Material Requirements	Inspection / Identification Mark	Visual	B	Each Lot	IS: 458 IS:4984 & 4985 Specifications	MTC	In absence of MTC, test shall be done in approved external lab
8.2	Placement and Field Inspection	Laying of pipes as per levels after providing PCC	Measurement	B	100%	Spec / Drgs	IR	Field Inspection Checklist Shall be Prepared Scheme Wise & Same to be Submitted with Respective RA Bills
		Joining of pipes & plugging of collars	Physically	B	100%	Spec / Drgs	IR	
		Water Leakage Test	Field Test	B	100%	Spec / Drgs	IR	
		Slope Checking	Measurement	B	100%	Spec / Drgs	IR	
		Final System Checking	Physically	A	100%	Scheme	IR	
9.0	PRE – CAST CONCRETE STRUCTURES:							
9.1	Segment Requirements	Crushing Strength	Physical	A	One sample of 6 cubes per 50 cum or there after	IS : 516 IS : 456	SR / LB	Min. 3 specimens tested for 28 days
9.2	Field Inspection & Testing	Workmanship free from visual defects	Physical	B	100%	Specifications	SR	The precast shall be free from defects & all tests shall be done as per IS 456
		Dimension of finished structure	Measurement	B	100%	Spec / Drgs	Site Log book/ IR	
		Lifting & Shifting	Visually	B	100%	Spec / Drgs	IR	
		Load Test	Field Test	A	5% or as decided by Engineer	IS : 456 / Spec.	IR	

		Checking of alignment, vertical dimension, levels, coordinates , joint filling etc in line with construction drawing	Measurement	B	100%	Spec / Drgs	IR	
10.0	FOUNDATION BOLTS / ANCHORAGES / SLEEVES / PLATES :							
10.1	Material and Field Inspection	Raw material identification & sample selection	Visual	A / B	100%	IS: 5624 IS:1363 IS:2016 Tech Spec.	SR	1.If Procured from out of Approved Vendor List, First Vendor Evaluation shall be done 2.MTC shall be Correlated with Lab Report
		Chemical / Physical Properties	Lab Test	A			TR	
		Dimensions / Dia. / Visual	Measurement	B			SR / LB	
10.2	Field Inspection & Testing	Consignment	Review Inspection Report & MTC	A & B	100%	IS: 5624 IS:1363 IS:2016 Tech Spec.	IR / MTC	Field Inspection and Handing Over Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA Bills
		Storage at Site	Visual	B		As per IS 4082 / TPCL Spec.	-	
		Greasing & Protection of Threaded Portion	Visual	B		Spec / Drgs	-	
		Thickness, Size & Dia. Of Plates	Measurement	B			IR	
		Welding, Size & Thickness of Sleeves	Measurement	B			IR	
		Pre Fab-Template	Measurement	B	100%	Spec / Drgs	IR	
		Diagonals	Measurement	B			IR	

		C / C Spacing	Measurement	B			IR	
		Exposed Portion & it's Protection	Measurement	B			IR	
		Verticality, Top Level ,Fixing & Tying	Measurement	B			IR	
11.0	GROUTING:							
11.1	Material Requirements	Properties	A Review MTC	A	100%	Specifications	MTC	In absence of MTC, test shall be done in approved external lab
11.2	Field Inspection & Testing	Grouting pressure	Physical	B	Randomly	Tech Spec.	IR	If Required
		Grouting pressure gauge calibration	Measurement	A	Yearly or when required	NABL Std.	CR	In Case of Injection Grouting
		Grouting composition	Physical	B	each lot	Mnfr Spec	IR	Field Inspection Checklist Shall be Prepared Component Wise & Same to be Submitted with Respective RA Bills
		Grout Layer Thickness	Physical	B	100%	Spec / Drgs	IR	
		Compressive strength	Measurement	A	each lot	Mnfr Spec	TR	
		Density	Hydrometer	B	Daily at Grouting Point	Mnfr Spec	TR	
		Water Leakage Test	Visual	B	Each Component	Tech Spec.	TR	
		Curing	Visual	C	Each Component	Tech Spec.	-	
12.0	SPECIAL ITEMS:							
12.1	Vibration Isolation System	Installation / Erection (if required)	Visual / Physical	A	100%	As Per Manufacturers standard Practice	TR/TC/SR	The installation / erection shall be carried out by manufacturer of the spring and as per TPCL spec.
12.2	Bitumastic Flooring	Bitumen Grade	Visual / TC	B	100%	Spec / Drgs	TC	TC Review

12.3	Earth Mat	Weld size & length	Visual / TC	B	100%	Spec / Drgs		Low hydrogen electrode as per TPCL approved shall be used
		DP	Physical	A	100% at Random	Spec / Drgs	TR	
		Coating welded zone with bitumastic compound	Visual	B	100%	Drgs	SR	
		Earth Test	Measurement	A	100%	Relevant IS code	SR	Earthing required as per IS code
13.0	PILING WORK IN GENERAL:							
13.1	General	Submission of Detailed Methodology of Execution	Review of MS	B	100%	IS: 2911 , Tech. Spec. & MS for piling work	MS of piling work	
		Selection and Approval of Construction Materials for Piling Work and Concrete Design Mix Approval.	Review of MS	B	100%	IS: 2911 , Tech. Spec. & MS for piling work	MS of piling work	
		Calibration of all testing equipments	Review Calibrating Certificates	A	100% before test	As per Specifications	CC	
		Check for pile layout	Measurement	B	100%	As per approved Drawing	SR	
13..2	Pilot Bores	Standard Penetration Test (STP).	Field Test	A	at 1500 mm intervals form ground level downwards	As per approved Drawing / Tech. spec	TR	
13.3	Test Piles	Low Strain Pile Integrity Test	Field Test	A	Each Test Pile	ASTM: D 5882. As per approved Drawing / Tech. spec	TR	
		Initial Vertical load test on single vertical piles	Field Test	A	100% as per spec	IS: 2911 P4 As per approved Drawing / Tech. spec	TR	

		Initial cyclic load test on single vertical piles	Field Test	A	100% as per spec	IS: 2911P4 As per approved Drawing / Tech.	TR	
		Lateral load test on a pair of vertical piles at pile cut off level	Field Test	A	100% as per BOQ	IS: 2911 As per approved Drawing / Tech.	TR	
		Pull out test on piles after excavation around piles to cut off level	Field Test	A	100% as per spec	IS: 2911P4 As per approved Drawing / Tech.	TR	
13.4	Working Piles	Survey and Setting up	Measurement	B	100%	As per approved Drawing / Tech. spec	SR	
		Check on flushing the bore hole prior concrete filling	Flushing	B	100%	As per approved Drawing / Tech. spec	SR	
		Check on forming concrete shaft of the pile upto 700 mm above existing grade level to termination level of the bore	Physical	B	100%	As per approved Drawing / Tech. spec	SR	
		Low strain pile integrity test on all the working piles	Field Test	A	Each Pile	ASTM: D 5882. As per approved Drawing / Tech.	TR	
		Carry out routine working load test on single vertical piles	Field Test	A	2% of 100% as per spec	As per approved Drawing / Tech. spec	TR	
		High strain dynamic testing of piles	Field Test	A	5% of 100% as per spec	As per approved Drawing / Tech. spec	TR	
		Carry out horizontal load test on a pair of vertical working piles	Field Test	A	100% as per spec	IS: 2911 P4 As per approved Drawing / Tech. spec	TR	
		Chipping the exposed pile concrete upto the cut off level of the pile	Field Test	B	100% as per spec	As per approved Drawing / Tech.	IR	

		Pile Cap	Physical	B	100%	As per approved Drawing / Tech.	IR	
		Bentonite Material	Physical	B	Each Lot	IS : 2720	IR / TR	The bentonite has to be checked for liquid limit, sand content, and density of freshly prepared bentonite suspension, viscosity, differential free swelling & PH value.
		Density check on sample of bentonite mud collected from the pile bore bottom	Physical	B	Each pile	IS: 2911 As per spec / drgs	IR / TR	Testing shall be done before placing of Concrete. Sample to be collect from bore bottom
		Mild steel casing pipe	Material. Fabrication & Installation	B	100%	As per approved Drawing / Tech. spec	IR	
		Guarantee bond	Review Legal Document	A & B	As per Specifications	Specifications	Stamp Paper	If Required
14.0	ROLLING SHUTTERS:							
14.1	Material Requirements	Material & Accessories	Review MTC	A	Once per lot	IS:6248 Spec / Drgs	MTC	MTC shall be reviewed for the consignment received
14.2	Field Inspection	Check for dimensions	Physical	B	100%	Spec / Drgs	IR	
		Painting (Nos. of coats & type of Painting)	Physically	B	100%	Spec / Drgs	IR	
		Fixing and Workmanship	Visually	B	100%	Spec / Drgs	IR	

		Verticality & alignment	Physical	B	100% at Random	Spec / Drgs	IR	
		Performance of rolling shutter for smooth operation under all ambient working conditions	Physical	B	100% at Random	Spec / Drgs	IR	
15.0	DOOR WINDOWS AND GLAZING WORK :							
15.1	Materials	Flush door Approve Make and Properties	Review MTC	A	Each Lot	IS: 2202 Specifications	MTC	Samples shall be got approved before procurement
		Steel based fire proof door approved make and properties	Review MTC	A	Each Lot	IS: 3614P2 BS: 476 ISO:834 Specifications	MTC	
		Aluminum windows approved make and material properties	Review MTC	A	Each Lot	IS: 733 IS:1948 Specifications	MTC	
		Glazing approved make and material properties	Review MTC Transparent / Wired & Figured Glass	A	Each Lot	IS: 2835 IS: 5435 Specifications	MTC	
		Accessories like Fasteners, flanges, screws, clips etc	Physical	B	Each Consignment	Specifications Drawings	IR	
15.2	Field Inspection	Work Methodology	Approval	A	Once per Activity	Specifications	AM	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA Bills.
		Check for dimensions	Physical	B	100%	Spec / Drgs	IR	
		Coal Tar Coat on Embedded Part	Physical	B	100%	Spec / Drgs	IR	
		Thickness of paint / Polish	Physical	B	100%	Spec / Drgs	IR	

		Hold Fast, Fittings, Wire Gauges, Glass Panes	Physical	B	Randomly	Spec / Drgs	IR	
		Verticality, alignment & Sealing	Physical	B	100%	Spec / Drgs	IR	
		Performance of shutter for smooth operation under all ambient working conditions	Physical	B	100%	Spec / Drgs	IR	
16.0	FIRE PROOF DOORS:							
16.1	Material Requirements and Brand Approval	Check for material steel , insulation, fire retardant painting system and all other paints / brands	Review MTC	A	Each lot	As per spec / drgs IS:3614 ISO:834 BS:476	MTC	Material shall be Procured only after Approval of sample.
16.2	Field Inspection	installation and maintenance	Physically	B	100%	As per spec / drgs BS:8214 IS:3614	IR	
		Check for provisions of latches horizontal full with lever & operable on pressings door stoppers	Physical	B	100%	As per spec / drgs IS : 3614P1	IR	The bolts, laches, straps etc shall be as per IS: 3614P1
		Check for type testing for Fire rating of 2 hrs	Review of type testing documents	A	Once per lot	Approved Drgs / Spec	Type test certificate	Testing conducted by Central Building Research Institute (CBRI) Roorkee.
		Performance of the Door	Physically	B	100%	As per spec / drgs IS : 3614P1 BS EN : 1634-1	IR	
		Guarantee Certificate	Review	A	100%	As per spec / drgs IS:3614 ISO:834 BS:476	Legal Document	
17.0	GLASS & GLAZING WORKS:							

17.1	Material	Material & Accessories (Plain, Ground, frosted or rough cast wired glass)	Review MTC	A	Once per lot	IS:2835 IS: 14900 IS: 5437 IS:1081 Tech spec / drgs	MTC	MTC shall be reviewed for each consignment received.
17.2	Fixing and Workmanship	Width and Thickness Tolerances and Defects	Physically	B	Each Lot	IS:2835 Specifications	IR	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Fixing of glasses / glazing's / Accessories	Visual	B	Randomly	IS:1081 As per spec / drgs	IR	
		Workmanship, Beading, Sealing etc	Visual	B	100%	IS:1081 As per spec / drgs	IR	
18.0	WATER PROOFING: 1. WORK METHODOLOGY TO BE APPROVED BEFORE START FOR EACH TYPE OF WATERPROOFING. 2. GUARANTEE BOND SHALL BE PROVIDED FOR EACH TYPE OF WATER PROOFING.							
18.1	WITH BITUMEN FELT							
18.1.1 18.1.1	Materials Material Requirements (Type & Grade)	Self-finished felt, Glass Fibre base self-finished felt	Review MTC	A	Once per lot	IS: 1322 IS: 7193	MTC	
		Bitumen Primer	Review MTC	A	Once per lot	IS: 3384	MTC	
		Industrial Bitumen Bonding Material	Review MTC	A	Once per lot	IS: 702	MTC	
18.1..2	Field Inspection	Surface Preparation	Physical	B	Randomly	IS:3067 Specifications	IR	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Bitumen Primer	Rate of Application	B	100%	Tech spec / drgs	IR	
		Bitumen Binding Material	Rate of Application	B	100%	Tech spec / drgs	IR	

		Layers of Bitumen Felt	Physical	B	100%	IS:3067 Approved Drgs	IR	
		Lap Length, Lap Jointing & Staggeredness	Physical	B	100%	IS:3067 Approved Drgs	IR	
		Concave Filling at Junction of Roof and Vertical Face Massonary	Physical	B	100%	Specifications Approved Drgs	IR	
		Water Proofing over Gutters	Physical	B	100%	Specifications Approved Drgs	IR	
		Expansion Joint Treatment	Physical	B	100%	IS: 1346	IR	
		Water Leak Test	Field Test by Water Ponding	A	100%	Specifications	TR	
		Additional Surface Treatment	Physical	B	100%	Specifications	IR	
18.2	WITH BRICK BAT COBA							
18.2.1	Material Requirements	Brick Bat Coba (Burnt Clay Bricks), Coarse Aggregates	Physically	A	Once per Source	Relevant IS code Specifications	-	
		Lime Class	Physically	A	Once per Source	IS: 712	-	
18.2.2	Laying and Field Inspection	Surface Preparation	Physically	B	Once per Source	Specifications	IR	
		Mix Proportion	Physically	B	100%	Specifications	IR	
		Laying & Compaction	Physically	B	100%	Specifications	IR	
		Thickness & Slope	Physically	B	100%	Specifications	IR	

		Beating (Water Sprinkling)	Visually	C	Randmly	Specifications	IR	Beating shall be Minimum 7 Days.
		Water Leak Test	Field Test by Water Ponding	A	100%	Specifications	TR	
18.3	CHINA MOSAIC WATER PROOFING :							
18.3.1	Different Materials	Properties	Physically	A	Once per Source	Relevant IS Code Specifications	-	
18.3.2	Laying and Field Inspection	Cement Mortar Bed Preparation with Water proof Chemical	Physically	B	100%	Specifications	IR	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Application of Cement Slurry over Bed	Physically	B	100%	Specifications	IR	
		Size of Selected Pieces	Physically	B	100%	Specifications	IR	
		Wooden Mallet Pressing of Exposed Pieces	Physically	B	100%	Specifications	IR	
		Spreading of Neat Cement Slurry over Pressed Pieces	Physically	B	100%	Specifications	IR	
		Water Leak Testing	Field Test by Water Ponding	A	100%	Specifications	TR	
		Line. Level , Slope, Thickness, Cleaning and Curing	Visually	B	100%	Specifications	IR	
18.4	CEMENT BASED WATER PROOFING OF W.C, BATHS & ROOF TERRACES :							
18.4.1	Material Requirements	Water Proofing Compound	Review MTC	A	Each Batch	IS: 2645 Specifications	MTC	
18.4.2	Laying and Field Inspection	Surface Preparation	Physically	B	100%	Specifications	IR	Field Inspection Checklist Shall be Prepared Structure Wise

		Mix Proportion	Physically	B	100%	Mnfr Specifications	IR	& Same to be Submitted with Respective RA
		Application of Cement Slurry with Chemical	Physically	B	100%	Mnfr Specifications	IR	
		Laying of Mix	Physically	B	100%	Specifications	IR	
		Water Proof Thickness as per Activity	Physically	B	100%	Mnfr Specifications	IR	
		Slope & Curing	Visually	C	100%	Specifications	IR	
		Water Leak Testing	Field Test by Water Ponding	A	100%	Specifications	TR	
18.5	WITH ELASTOMERIC MEMBRANE :							
18.5.1	Material	Elastomeric membrane	Review MTC	A	Each lot	As per TPCL spec / drgs and relevant IS codes	MTC	
18.5.2	Field Inspection	Surface Preparation	Physical	B	Randomly	Approved Drgs	IR	All elastomeric membrane shall be fully dried to perform testing with water ponds created on min. 55 sqm (or as decided by OWNER's Engineer) of area of nominal size of 6mx6m for height of 25-30mm at
		Workmanship	Physical/ Visually	B	100%	Tech spec / drgs	IR	
		Thickness of Elastomeric membrane	Physical	B	Randomly	Approved Drgs	IR	

		Testing of dampness below elastomeric membrane	Physical	B	100%	Approved Drgs	TR	critical location for a period of 48 hrs
		Sealing of joints of panels of wearing course	Physical	B	100%	Approved Drgs	IR	
19.0	WATER SUPPLY, DRAINAGE & SANITATION:							
19.1	VITREOUS SANITARY ITEMS							
19.1.1	Material Requirements	Material & Accessories	Review MTC	A	Once per lot	Spec / Drgs IS: 2556	MTC	MTC shall be reviewed for the consignment received
19.1.2	Field Inspection	Surface finish, freedom from cracks & other defects	Visual	B	Each	Spec / Drgs IS: 2556P1	SR	Tolerance limits should be as per IS 2556
		Dimension & Construction	Physical	B	10% subject to min. 3 nos of each item	Spec / Drgs IS: 2556	SR	
19.2	FLUSHING SYSTEM							
19.2.1	Material Requirements	Materials, components including valves	Review MTC	A	Each	IS:2326 IS:774 Spec / Drgs	MTC	MTC shall be reviewed for the consignment received
19.2.2	Field Inspection	Surface finish, freedom from cracks & other defects	Visual	B	Each	Spec / Drgs IS: 2556P1	SR	
		Dimension & Construction	Physical	B	10% subject to min. 3 nos of each item	Spec / Drgs	SR	Tolerance limits should be as per IS code

19.3	MISC, SANITARY & BATHROOM							
19.3.1	Material Requirements	Material & Accessories	Review MTC	A	Each	Relevant IS codes Spec / Drgs	MTC	MTC shall be reviewed for the consignment received
19.3.2	Field Inspection	Surface finish, freedom from cracks & other defects	Visual	B	Each	Relevant IS codes Spec / Drgs	SR	
		Dimension & Construction	Physical	B	10% subject to min. 3 nos of each item	Spec / Drgs	SR	Tolerance limits should be as per IS code
19.4	GI, CI/AC, PVC, HDPE Pipes & FITTINGS							
19.4.1	Materials	G.I.Pipes	MTC Review	A	Each Lot	IS:1239 Specifications	MTC	In absence of MTC with Consignment , test shall be done in approved external lab
		C.I. & A C Pipes	MTC Review	A	Each Lot	IS:1230 / 1626P1 / 1536 / 1538 Specifications	MTC	
		HDPE Pipes	MTC Review	A	Each Lot	IS:8008Ps Specifications	MTC	
		PVC Pipes	MTC Review	A	Each Lot	IS: 4984 Specifications	MTC	
		Valves	MTC Review	A	Each Lot	IS: 778 Specifications	MTC	
19.4.2	Field Inspection, Workmanship & Testing	Surface finish, freedom from cracks & other defects	Visual	B	Each	Relevant IS codes Spec / Drgs	IR	Field Inspection Checklist Shall be Prepared Structure Wise

		Dimension & Construction	Physical	B	10% of Lot	AS per drgs	IR	& Same to be Submitted with Respective RA
		Coating & Insulation	Physical	B	Each Line	Spec / Drgs	IR	
		Water Leak Test	Physical	B	Each Joint	Spec / Drgs	TR	
		Final System Checking	Physically	A	100%	Spec / Drgs	IR	
19.5	CONCRETE / STONE WARE PIPES							
19.5.1	Material Requirements	Material & Accessories	Review MTC	A	Each Lot	IS:458 IS:651 Spec / Drgs	MTC	MTC shall be reviewed for the consignment received
19.5.2	Field Inspection & Test	Surface finish, freedom from cracks & other defects in pipes	Visual	B	Each	Relevant IS codes Spec / Drgs	IR	Tolerance limits should be as per IS:458, IS :651
		Dimension & Construction	Physical	B	5% each lot	IS:458 IS:651 Spec / Drgs	IR	
		Water Leak Test	Physical	B	Each Joint	Spec / Drgs	TR	
19.6	AFTER INSTALATION OF PIPES							
19.6.1	Water Pipe & Fittings	Hydraulic pressure test	Physical	A	Each stretch	IS:2065 Approved Drgs / Spec	TR	Tolerance limits should be as per IS:2065

19.6.2	Drain & sewer pipes above ground level	Smoke test	Physical	B	Each stretch	Relevant IS code Approved Drgs / Spec	TR	Tolerance limits should be as per IS code. Jointing should be ensured.
		Water Test	Physical	A	Each stretch	Relevant IS code Approved Drgs / Spec	TR	Tolerance limits should be as per IS code. Jointing should be ensured.
		Straightness Test	Physical	B	Each stretch	Relevant IS code Approved Drgs / Spec	TR	Tolerance limits should be as per IS code.
19.7	DRAIN & SEWER PIPES BELOW GROUND LEVEL	Water Leak Test	Physical	A	Each stretch	Relevant IS code Approved Drgs / Spec	TR	Tolerance limits should be as per IS code. Jointing should be ensured.
		Straightness Test	Physical	B	Each stretch	Relevant IS code Approved Drgs / Spec	TR	Tolerance limits should be as per IS code.
19.8	OVERHEAD TANK							
19.8.1	Material Requirements	Material & Accessories for HDPE tank	Review MTC	B	Each	IS:12701 Spec / Drgs	MTC	MTC shall be reviewed for the consignment received
		Material & Accessories for RCC tank	Physical	B	Each	IS:456 Spec / Drgs	IR	
19.8.2	Field Inspection & Test	Surface finish	Visual	B	Each	Relevant IS code Approved Drgs / Spec	IR	Tolerance limits should be as per IS code.
		Dimension & Construction	Visual	B	Each	AS per drgs	IR	Tolerance limits should be as per IS code.
		Water tightness hydro test	Physical	A	Each	Relevant IS code Approved Drgs / Spec	TR	Tolerance limits should be as per IS code.
20.0	JOINTS IN CONCRETE:							
20.1	Materials	Bitumen Mastic board	Review MTC	A	Once per lot	Spec / Drgs IS: 1838	MTC	MTC shall be reviewed for the consignment received

		PVC Water stopper	Review MTC	A	Once per lot	Spec / Drgs IS: 12200	MTC	MTC shall be reviewed for the consignment received
		Bitumen sealing compound	Review MTC	A	Once per lot	Spec / Drgs IS: 1834	MTC	Grade of bitumen sealing compound shall be as per technical spec.
		Expanded polystyrene sealant	Review MTC	A	Once per lot	Spec / Drgs IS: 11433	MTC	
20.2	Field Inspection & Workmanship	Installation & fixing	Visual	B	Randomly	Spec / Drgs or Mnfc. recommendations	IR	
		Width & Thickness of Filler	Measurement	B	100%	Spec / Drgs	IR	
		Workmanship	Physically	B	100%	Spec / Drgs	IR	
21.0	INSULATION: (over false ceiling panels/ under deck insulation)							
21.1	Materials	Mineral wool	Review MTC	A	Once per lot	Spec / Drgs IS: 8183	MTC	MTC shall be reviewed for the consignment received
		Polysocyanuarite / Rigid pheniloc foam slabs	Review MTC	A	Once per lot	Spec / Drgs IS: 12436 IS:13204	MTC	
21.2	Field Inspection & Workmanship	Installation ,fixing and Workmanship	Visual	B	100%	Spec / Drgs or Mnfc. recommendations	IR	
		Overall Clearance	Physical	A	100%	Spec / Drgs or Mnfc. recommendations	IR	
22.0	MASONRY WORKS: * WORK METHODOLOGY TO BE APPROVED BEFORE STSRIT OF EACH TYPE OF MASSONARY * FIELD INSPECTION CHECKLIST SHALL BE PREPARED & TO BE SUBMITTED WITH RA A BILLS							
22.1	CLAY BRICK MASSONARY							

22.1.1	Tests on Bricks	Dimensions, colors, Compressive strength, water absorption & warpage efflorescence	Measurement & physical tests	A	As per IS code one sample for 3000nos bricks	IS:1077 & IS:3495P1 (CS) IS:3495P2 (WA) IS:3495P3 (Efflorescence) IS3495P4 (warpage)	IR	
	Test on Mortar & Workmanship	Compressive strength, consistency & water retentivity for each portion of wall and ceiling plaster	Test	A	Randomly	IS:2250	IR	Cement used for plastering should conform relevant IS code and sand should conform IS 2116
		Massonary construction, workmanship, verticality & alignment	Visual / Physically	B	100%	IS:2212 IS:1905 Tech spec	SR	
22.1.2	Field Inspection	Wetness of Bricks	Visual	B	100%	IS:2212 Specifications	IR	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Hacking of RCC surface	Visual	B	100%	IS:2212	IR	
		Bond / Coursing	Visual	B	Randomly	SP:20 Specifications	IR	
		Mortar Mix Proportion	Physical	B	100%	IS:2250 Specifications	IR	
		Lift Height & Pointing	Physical	B	Randomly	IS:2212	IR	
		Joint Thickness, line, level & Curing	Physical	B	100%	SP:20 Specifications	IR	
22.2	FLY ASH BRICK MASSONARY							

22.2.1	Tests on Bricks	Dimensions, colors, Compressive strength, water absorption & warpage efflorescence	Measurement & physical tests	A	As per IS code one sample for 3000nos bricks	IS:12894 IS:1077 & IS:3495P1 (CS) IS:3495P2 (WA) IS:3495P3 (Efflorescence) IS3495P4 (warpage)	IR	
22.2.2	Test on Mortar, Lime & Workmanship	Compressive strength, consistency & water retentionvity foe each portion of wall and ceiling plaster	Test	A	Randomly	IS:2250	IR	Cement used for plastering should conform relevant IS code and sand should conform IS 2116
		Massonary construction, workmanship, verticality & alignment	Visual / Physically	B	100%	IS:2212 IS:1905 Tech spec	SR	
		Class C of Hydrated Lime	Physically	B	Randomly	IS:712	IR	
22.2.3	Field Inspection	Soaking of Bricks	Visual	B	100%	IS:2212 Specifications	IR	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Hacking of RCC surface	Visual	B	100%	IS:2212	IR	
		Bond / Coursing	Visual	B	Randomly	SP:20 IS:2212 Specifications	IR	
		Mortar Mix Proportion	Physical	B	100%	IS:2250 Specifications	IR	
		Lift Height & Pointing	Physical	B	Randomly	IS:2212 SP:20	IR	
		Joint Thickness, line, level & Curing	Physical	B	100%	SP:20 Specifications	IR	
22.3	ACID RESISTANT BRICK / FIRE RESISTANT BRICKS / CHEMICAL RESISTAN MORTAR:							

22.3.1	Tests on Bricks	ARB -Dimensions, Warpage, Compressive Strength, Flexural strength, water absorption FRB - Apparent Porosity, Cold Crushing Strength, Dimensions, Alumina, & Silica	Review MTC& Field Tests	A	Each Lot	IS:4860 IS:4457	MTC / TR	Samples Shall be got approved Before Procurement
22.3.2	Bitumen Primer	Properties	Review MTC	A	Each Lot	IS:1530	MTC	
22.3.3	Chemical Resistant Mortar	Compressive Strength, Flexural Strength, Bond Strength, Working Time etc	Review MTC& Field Tests	A	Each Lot	IS:4832		
22.3.4	Field Inspection	Class and Size of Bricks	Measurement	B	Randmly	Specifications	IR	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Surface Preparation	Visually	B	100%	SP:20 Spec / Drgs	IR	
		Mortar Proportion	Physically	B	100%	Spec / Drgs	IR	
		Joint Thickness, Line, Level & alignment	Physically	B	100%	IS:2212 SP:20 Spec / Drgs	IR	
		Lift Height & Curing of Joints	Visual	B	Randmly	IS:2212 Specifications	IR	
		Guarantee Bond	Review	A	100%	Specifications	Stamp Paper	
22.4	CONCRETE BLOCK MASSONRY:							
22.4.1	Material Requirements (Hollow, Solid & ACC Blocks)	Dimensions, Compressive strength, water absorption & Density	Field tests	A	IS:2185	IS:2185 Parts	TR	
22.4.2	Field Inspection	Dryness of Blocks	Visual	B	100%	Specifications	IR	Field Inspection Checklist Shall be Prepared Structure Wise

		Hacking of RCC surface	Visual	B	100%	Specifications	IR	& Same to be Submitted with Respective RA
		Workmanship	Visual	B	Randomly	IS:2572 IS:6042 IS:6041	IR	
		Mortar Mix Proportion	Physical	B	100%	IS:2250 Specifications	IR	
		Lift Height & Pointing	Physical	B	Randomly	SP:20 IS:2572 Specifications	IR	
		Joint Thickness, line, level & Curing	Physical	B	100%	SP:20 IS:2572 Specifications	IR	
23.0	ROOF SHEETING AND SIDE WALL CLADDING WORK							
23.1	Material Requirements	Approve Make Sheets and Properties	Review MTC	A	Each Lot	IS: 14246 IS: 277 Specifications	MTC	
		Structural Steel	Review MTC	A	Each Lot	IS: 2062 IS: 1239	MTC	
		Accessories like Fasteners, J / L Hooks, Sealers, closure plates, Washers etc	Physical	B	Each Consignment	Specifications Drawings	IR	
23.2	Field Inspection & Testing	Storage at site	Visual	B	100%	As per standard practice	IR	
		Type and spacing of hooks- J/ L or self tapping screws	Physically	B	100%	Tech spec mnfc specifications	IR	
		Layout & level of truss/ purling	Measurement	B	100%	Drawings	IR	
		Lapping	Physically	B	100%	Spec / Drawings	IR	
		Wind ties	Physically	B	Randmly	Spec / Drawings	IR	

		Installation, lap, alignment & workmanship	Physical	B	100%	Specifications Drawings	IR	No gas cutting of sheeting is acceptable. FIFO system is applicable.
		Proper installation of flashing, Bolting & Welding	Physical	B	100%	Specifications Drawings	IR	
		Surface Preparatrion & No. of coats of red oxide and enamel paints on steel Members	Physical	B	100%	Specifications Drawings	IR	Joint Inspection Protocol to be Prepared and submitted with RA bills.
		Water Leak Test	Water Spraying	A	100%	Specifications Drawings	IR	
24.0	FINISHING ITEMS: * WORK METHODOLOGY TO BE APPROVED BEFORE STSRRT OF EACH TYPE OF PLASTERING * FIELD INSPECTION CHECKLIST SHALL BE PREPARED & TO BE SUBMITTED WITH RA A BILLS							
24.1	Cement Plastering for Walls & Ceilings and Sand Face / Rough Cast Plasters :							
24.2	Materials	Sand For Plastering	Gradation	A	Once per 50 cum	Spec / Drgs IS: 1542	SR/TR	Table -1 of IS:2116
		Chicken Mesh / PP Fibre	Review MTC	B	Once per lot	Spec / Drgs IS: 1566 Relevant IS Code	MTC	Work shall be allowed only after completion of Electrical Work
	Field Inspection	Work Methodology	Approval	A	Once per Activity	Specifications	AM	
		Completion of Conduiting / Electrical Work	Visual	B	100%	Specifications / Drawings	IR	
		Hacking of RCC surface	Visual	B	100%	IS:1661 As per standard practice	IR	
		Fixing of Chicken mesh	Visual	B	100%	IS:1661 As per standard practice	IR	
		Mix Proportion	Physical	B	100%	Spec / Drgs	IR	

		Application of Slurry coat	Physical	B	100%	IS:1661 Spec / Drgs	IR	
		Ensure the thickness of plaster for brick massonary walls and Ceiling be as per Specifications.	Thickness Measurement	B	100%	Spec / Drgs IS:1661	IR	
		Ensure that the thickness of plaster for concrete ceiling should be Specifications	Thickness Measurement	B	100%	Spec / Drgs IS:1661	IR	
		Grooves, opening etc.	Visual	B	100%	Spec / Drgs IS:1661	IR	
		Check for defects and remedial measure for bond filler , blistering, crazing, efflorescence & irregularity of surface texture	Visual / Measurement	B	100%	Spec / Drgs IS:1661	IR	
		Compressive Strength on Mortar Cubes	Field Test	A	100%	IS:2250	TR	
24.2	FLOORING WORK: *WORK METHODOLOGY TO BE APPROVED BEFORE STSRT OF EACH TYPE OF PLASTERING * FIELD INSPECTION CHECKLIST SHALL BE PREPARED & TO BE SUBMITTED WITH RA A BILLS IRONITE (OR HARDONATE) FLOORING							
24.2.1	Material Requirements	Check for Ironite / Hardonate material	Physically	A	100%	Spec / Drgs	IR	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Aggregates,Water,Chemicals	Physically, MTC Review	A	100%	Spec / Drgs	IR	
24.2.2	Field Inspection	Work Methodology	Approval	A	Once per Activity	Specifications	AM	

		Cement Concrete Under Layer (Thickness, Mix Proportion & Green Cutting)	Physically	B	100%	Spec / Drgs	IR	
		Metalic Concrete Hardener Topping (Layer Thickness, Mixing of Cement : Hardener and W / C	Physically	B	100%	Spec / Drgs	IR	
		Laying, Compaction, Line, , Level & Slope	Physically	B	100%	Spec / Drgs	IR	
		Curing	Visually	B	100%	Spec / Drgs	IR	
24.3	CEMENT CONCRETE FLOORING (IPS) :							
24.3.1	Approved Cement, Sand, Aggregate and Water	Material Quality	Physically	B	Randmly	IS : 456 Specifications / Drawing	SR	The maximum size of coarse aggregate shall be 10mm
	Approved Aluminium or Glass Strips	Material Requirements	Review MTC	A	Each Lot	As per Relevant IS code	MTC	
24.3.2	Site Inspection, Workmanship & Testing	Work Methodology	Approval	A	Once per Activity	Specifications	AM	
		Preparation of Bed (Chipping or Hacking)	Physical	B	100%	Specifications / Drawing	SR	
		Fixing of Aluminium / Glass Strips	Measurement	B	100%	IS: 2571 Specifications / Drawing	SR	Dimension of Panel Shall not be Exceed by 2mtr
		Application of Cement Slurry Before Laying	Physical	B	100%	IS: 2571 Specifications / Drawing	SR	Application Rate Shall be Minimum 2.75 kg/ sqm.
		Mix Proportion	Physical	B	Randmly	Specifications / Drawing	SR	Shall be 1:2:4 Having W / C = 0.40
		Alternate Casting of Panels	Visual	B	100%	IS: 2571 Specifications / Drawing	-	Pattern Shall be Approved

		Laying, Compaction, Line, , Levels and Slope	Visual	B	100%	IS: 2571 Specifications / Drawing		
		Thickness of IPS	Measurement	B	100%	IS: 2571 Specifications / Drawing	SR	The depth of dividing strips shall be the thickness
		Finishing	Visual	B	100%	IS: 2571 Specifications / Drawing	-	
		Curing	Visual	B	100%	Specifications / Drawing	-	Shall be Minimum 7 Days
24.4	VITRIFIED / CERAMIC TILE FLOORING (DADO / SKIRTING / FACIA.):							
24.4.1	Materials	Approved Cement, Sand, Aggregate and Water	Physically	B	Randmly	IS : 456 Specifications / Drawing	IR	Material shall be Procured only after Approval of sample
		Pigments, Marble Powder, Grouting Material, Cleaning Agents				IS: 2114 IS: 460 Spec / Drg	MTC	
		Approved Brand of Tiles	Review MTC	A	Each Lot	IS: 15622 IS: 13712 Spec / Drg	MTC	
24.4.2	Site Inspection, Workmanship & Testing	Work Methodology	Approval	A	Once per Activity	Specifications	AM	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Surface Preparation (Subgrade)	Physically	B	100%	Specifications / Drawing	IR	
		Mortar and Bedding (Thickness & Proportion)	Physically	B	100%	Specifications / Drawing	IR	
		Fixing of Tiles (Pattern, Joint Width, Straightness, line & Level	Physically	B	100%	Specifications / Drawing	IR	
		Pointing and Grouiting	Physically	B	100%	Specifications / Drawing	IR	
		Finishing & Curing	Physically	B	100%	Specifications / Drawing	IR	

		Slope Checking	Water Flooding	A	100%	Specifications / Drawing	IR	
		Soundness Test	Tapping With Wooden Mallet	A	100%	Specifications / Drawing	IR	
		Cleaning and Protection	POP or Guard Sheet	B	100%	Specifications / Drawing	IR	
24.5	PVC SHEETS / TILES FLOORING:							
24.5.1	Materials	Approved Brand (PVC Sheet / Tiles)	Review MTC	A	Each Lot	IS : 3462 Specifications / Drawing	MTC	In Absence of MTC, Tests shall be done in Approved Lab.
		Bitumen Paints (Concrete Painting)	Review MTC	A	Each Lot	IS : 1580 Specifications / Drawing	MTC	
		Bitumen Felt	Review MTC	A	Each Lot	IS : 1322 Specifications / Drawing	MTC	
		Adhesives for Fixing	Review MTC	A	Each Lot	Spec / Drg	MTC	
24.5.2	Site Inspection, Workmanship	Work Methodology	Approval	A	Once per Activity	Specifications	AM	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Preparation of Sub Surface	Physically	B	100%	Spec / Drg	IR	
		Laying & Fixing (Pattern, Dryness of Surface, Temperature during laying,)	Physically	B	100%	Spec / Drg	IR	
		Application of Adhesives	Physically	B	100%	Spec / Drg	IR	
		Period for Bond Development	Visually	B	100%	Spec / Drg	IR	
		Line, Level, Evenness & Cleaning	Visually	B	100%	Spec / Drg	IR	

24.6	ACID RESISTANT TILES							
24.6.1	Material Requirements	Ensure that tiles are ceramic & homogeneous	Visual	C	100%	IS-4457 Spec / Drgs	SR	In absence of MTC, test shall be done in approved external lab
		Check for material	Review for MTC	A	100%	IS-4457 Spec / Drgs	MTC	
		Check for workmanship	Visual	B	100%	IS-4457 Spec / Drgs	SR	
		Water Absorption	Review for MTC	A	100%	Spec. ASTM C 373 IS-4457	MTC	
		Scratch resistance	Review for MTC	A	100%	Spec. ASTM C 373 IS-4457	MTC	
		Chemical resistance	Review MTC	A	100%	Spec. ASTM C 650 IS-4457	MTC	
		Abrasion resistance (hardness)	Review MTC	A	100%	Spec. ASTM C 501 IS-4457	MTC	
		Breaking strength	Review MTC	A	100%	Spec. ASTM C 648 IS-4457	MTC	
		Density	Review MTC	A	100%	Spec. IS-4457	MTC	
24.6.2	Field Inspection	Survey & Settings	Measurement	B	100%	Drawings	SR	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Fixing, alignment and tightness of formwork	Physical	B	100%	Spec / Drawings	SR	
		Insulation work	Physical	B	100%	Spec / Drawings	SR	
		Fixing of anchor / stiffeners	Physical	B	100%	Spec / Drawings	SR	
		Primer application	Physical	B	100%	Spec / Drawings	SR	

		Workmanship & Curing	Physical	C	100%	Spec / Drawings	SR	
25.0	MS GATES:							
25.1	Material	Posts- RCC/ M S Steel	Review MTC	B	100%	IS-2062 IS: 456 Spec.	MTC	MTC to be correlated to the consignment.
25.2	Field Inspection	Fabrication, Erection Accessories and smooth operation of gates	Physical	B	100%	Specifications Drawings	IR	Joint Inspection Protocol shall be Submitted with RA Bills.
		Surface Preparation and Application of red oxide and enamel paint on steel	Physical	B	100%	Specifications Drawings	IR	
		No. of coats of red oxide and enamel paints on steel	Physical	B	100%	Specifications Drawings	IR	
		DFT	Testing	A	Randomly	Specifications Drawings	IR	
26.0	FALSE CEILING:							
26.1.1	GLASS REINFORCED GYPSUM (GRG) BOARD FALSE CEILING:							
26.1.2	Material & Inspection	Approve Make GRG and Properties	Review MTC	A	Each Lot	IS: 2095 Specifications	MTC	
		G I Channels	Review MTC	A	Each Lot	IS: 2486P2 Specifications	MTC	
		Accessories like Fasteners, flanges, screws, clips etc	Physical	B	Each Consignment	Specifications Drawings	IR	
26.1.3	In Process Installation and erection	Size and Thickness	Physical	B	100%	Specifications Drawings	IR	Field stage Inspection Checklist Shall be Prepared Structure Wise

		Pattern / Marking on ceiling / wall	Physical	B	Each Component	Specifications Drawings	IR	& Same to be Submitted with Respective RA Bills
		Fixing of hold fasts	Physical	B	Each Component	Specifications Drawings	IR	
		Cut outs for electrical points and conduits	Physical	B	Each Component	Specifications Drawings	IR	
		Erection of board	Physical	B	Each Component	Specifications Drawings	IR	
		Fixing of electrical switch boxes	Physical	B	Each Component	Specifications Drawings	IR	
		Check for plumb, line, level, alignment and deformations	Physical	B	Each Component	Specifications Drawings	IR	
		Filling of hold fast and finishing of joints	Physical	B	Each Component	Specifications Drawings	IR	
26.2	GYPSUM PLASTER BOARD FALSE CEILING							
26.2.1	Material & Inspection	Material	Review MTC	A	Each Lot	Specifications	MTC	
26.2.2		Fixing & Erection	Visual	B	Randomly	Spec./ Drg Mnfr Guidelines	SR	
27.0	ROAD SYSTEMS:							
27.1	GENERAL	ACTIVITY WISE WORK METHODOLOGY TO BE APPROVED BEFORE START OF ACTIVITY AND FIELD INSPECTION CHECKLISTS SHALL BE PREPARED						

27.1.1	Site Preparation	Layout, Alignment, Centre line, Initial Ground level, Finish Grade level & elevation at Crown	Measurement	B	100%	Spec / Drgs	Level Sheet	The Measurement shall be Total Station , Auto level
27.2	EARTH WORK							
27.2.1	Physical and Chemical Suitability of Earth	Specific Gravity of Soil	Lab Test	A	Once per Source or as Required	IS: 2720 P3	TR	Test for Soil & Sand
		Grain Size Analysis	Lab Test	A	Once in 2000 cum for each Source	IS: 2720 P4	TR	
		Liquid & Plastic limits	Lab Test	A	Once in 2000 cum for each Source	IS: 2720 P5	TR	
		Shrinkage Limit	Lab Test	A	Once in 2000 cum for each Source	IS: 2720 P6	TR	
		Free Swell Index	Lab Test	A	Once in 2000 cum for each Source	IS: 2720 P XI	TR	
		Organic Matters	Lab Test	A	Once per Source or as Required	IS: 2720 P XXII	TR	
		Calcium carbonate	Lab Test	A	Once per Source or as Required	IS: 2720 P XXIII	TR	
27.2.2	Field Testing & Compaction Control	Standard Proctor Test for OMC / MDD	Lab Test	A	Once per 2000 cum / Source or as Required	IS: 2720 P 7	TR	All Test Records shall be Submitted with RA bills
		Moisture Content of Fill before Compaction	Field Test	B	Once per 300 cum / Source or as Required	IS: 2720 P 7	TR	
		Degree of Compaction by Core Cutter or Sand Replacement Method	Field Test	B	Once per 1000 sqm/ Source or as Required	IS: 2720 P XXIX & XXVIII	TR	

		Layer Thickness & Permeability Test	Field Test	A	Randmly	IS: 2720 P 17 & 36	TR	
		CBR	Lab / Field Test	A	Once per KM or 3000 cum,	Specifications	TR	If Required
27.3	GRANULAR SUB-BASE							
37.3.1	Material Requirements & Testing	Grain Size Analysis	Lab / Field Test	A	Once per 200cum	MORTH Table 400-1 & 2	TR	All Test Reports shall be Comply with Respective RA Bills.
		Atterberg Limits	Lab Test	A	Once per 200cum	MORTH Sec 400	TR	
		CBR	Lab Test	A	Once per 200cum	MORTH Table 400-1 & 2	TR	
		10% Fine Value	Lab Test	A	Once per 200cum	MORTH Sec 400	TR	
		Water Absorption	Lab Test	A	Once per 200cum	MORTH Sec 400	TR	
		OMC / MDD	Lab Test	A	Once per Source	MORTH Sec 400	TR	
		Degree of Compaction by Core Cutter or Sand Replacement Method	Field Test	B	Once per 500 sqm	MORTH Sec 400	TR	
27.3.2	Field Inspection	Survey (Grade, Alignment, Level & Camber)	Survey Inst.	B	100%	MORTH Sec 400	IR	Field Inspection Checklist Shall be Prepared Chainage Wise & Same to be Submitted with Respective RA Bills
		Uniform Blending of Mix	Visual	B	100%	MORTH Sec 400	IR	

		Layer Thickness	Field Test	B	Once per 200cum	MORTH Sec 400	IR	
		Compaction of Edges	Physical	B	100%	MORTH Sec 400	IR	
		Checking of under layer drainage / Electrical line	Scheme Review	B	100%	Specifications	IR	
		Type, Capacity & Speed of roller	Visual	B	100%	MORTH Sec 400	IR	
27.4	WET MIX MACADAM							
27.4.1	Material Requirements & Testing	Grain Size Analysis	Lab Test	A	Once per 200cum	MORTH Table 400 - 11	TR	All Test Reports shall be Comply with Respective RA Bills.
		Atterberg Limits	Lab Test	A	Once per 200cum	MORTH Sec 400	TR	
		Water Absorption	Lab Test	A	Once per 200cum	MORTH Sec 400	TR	
		OMC / MDD	Lab Test	A	Once per 200cum	MORTH Sec 400	TR	
		Degree of Compaction by Core Cutter or Sand Replacement Method	Field Test	B	Once per 500 sqm	MORTH Sec 400	TR	
		Abrasion Value	Lab Test	A	Once per 200cum	MORTH Table 400 - 10	TR	
		Impact Value	Lab Test	A	Once per 200cum	MORTH Table 400 - 10	TR	
		Elongy / Flacky Index	Lab Test	A	Once per 200cum	MORTH Table 400 - 10	TR	
27.4.2	Field Inspection & Test	WMM Mix Design	Review	A	Once per Source	MORTH Sec 400 Technical Specifications	MDR	Field Inspection Checklist Shall be Prepared Chainage Wise & Same to be Submitted

		WMM Plant Calibration	Measurement	A	Firstly before start of work & thereafter Quarterly or Devi.	MORTH Sec 400 Technical Specifications	CR	with Respective RA Bills
		Survey (Grade, Alignment, Level & Camber)	Survey Inst.	B	100%	MORTH Sec 400 Technical Specifications	IR	
		Uniform Laying & Blending of Mix	Visual	B	100%	MORTH Sec 400 Technical Specifications	IR	
		Compaction of Edges	Physical	B	100%	MORTH Sec 400 Technical Specifications	IR	
		Checking of under layer drainage / Electrical line	Scheme Review	B	100%	MORTH Sec 400 Technical Specifications	IR	
27.5	TACK / PRIME COAT							
27.5.1	Document Reviews & Field Inspection	Quality of Binder	MTC Review	A	Once per Source or as Required	IS:73 IS:217 IS:8887	TR	In absence of MTC, test shall be done in approved external lab
		Protection of Kerb stones / side walls	Visual	B	100%	Technical Specifications	-	
		Rate of Spray	Field Test	A	2 Test per Shift	MORTH Table 500 - 2	TR	
		Curing (Lag Time)	Visual	B	100%	Technical Specifications	IR	
27.6	DENSE BITUMINOUS MACADAM / BITUMINOUS CONCRETE							

27.6.1	Material Requirements & Document Reviews	Quality of Binder	MTC Review	A	Once per Source or as Required	IS:73 IS:217 IS:8887	MTC	In absence of MTC, test shall be done in approved external lab
		Mix Design	Lab Test	A	Once per Source or as Required	MORTH Table 500 - 10 , 11 , 12,17 , 18 & 19 which is applicable	MDR	Mix Design approval to be get before start of activity
		Grain Size Analysis	Lab Test	A	Once per 100cum	MORTH Table 500 - 10 , 11 , 12,17 , 18 & 19 which is applicable	TR	All Test Reports shall be Comply with Respective RA Bills
		Abrasion & Impact Value	Lab Test	A	Once per 200cum	MORTH Table 500 - 10 , 11 , 12,17 , 18 & 19 which is applicable	TR	All Test Reports shall be Comply with Respective RA Bills
		Water Absorption	Lab Test	A	Once per 200cum	MORTH Table 500 - 10 , 11 , 12,17 , 18 & 19 which is applicable	TR	
		Polished stone value	Lab Test	A	Once per Source or as Required	MORTH Table 500 - 10 , 11 , 12,17 , 18 & 19 which is applicable	TR	
		Soundness	Lab Test	A	Once per Source or as Required	MORTH Table 500 - 10 , 11 , 12,17 , 18 & 19 which is applicable	TR	
27.6.2	Field Inspection & Test / Workmanship	Hot Mix Plant Calibration	Measurement	A	Firstly before start of work & thereafter Quarterly or Devi.	MORTH Sec 500 / Tech Spec	SR	
		Survey (Grade, Alignment, Level & Camber)	Survey Inst.	A	Once per Source or as Required	MORTH Sec 500 / Tech Spec	SR	
		Old and New Joints	Physically	B	100%	MORTH Sec 500 / Tech Spec	-	

		Uniform Laying / Rolling of Mix	Visually	A	100%	MORTH Sec 500 / Tech Spec	SR	Speed of Roller shall not be more than 5 km / hr
		Mix Temp	Temp Meter	B	100% at Placing and Rolling Point	MORTH Sec 500 / Tech Spec	SR	If Temp not complying the requirements the load shall not be accepted.
		Filler Material Gradation	Lab Test	A	Once per 100cum	MORTH Sec 500 / Tech Spec	TR	
		Thickness & Density	Field Test	B	Once per 250 cum	MORTH Sec 500 / Tech Spec	TR	
		Binder Content	Field Test	A	Twice in a Shift	MORTH Sec 500 / Tech Spec	TR	Binder content shall be check at dispatch & Laying point
		Marshal Stability	Testing	A	1 Sample / 400cum	MORTH Sec 500 / Tech Spec	TR	
		Control of grade, Camber, thickness, Alignment ,Dimensions, surface finish, horizontal & vertical tolerance limits etc.	Visually	B	100%	MORTH Sec 500 Spec / Drgs	SR	
27.7	EDGE BLOCK / KERB STONE							
27.7.1	Document Reviews & Field Testing	Mix Proportion,	Physical	B	100%	Spec / Drgs	SR	
		Compressive Streng th	Lab Test	A	IS: 456	Spec / Drgs	TR	
27.7.2	Workmanship	Control of grade, Camber, thickness, Alignment ,Dimensions etc.	Visually	B	100%	Spec / Drgs	SR	

27.8	ROAD PAINTS AND MARKINGS							
27.8.1	Material / Document Reviews & Field Inspection	Thermoplastic paints	MTC Review	A	Each lot	IS:164	MTC	In absence of MTC with Consignment, testing is required
27.8.2	Field Inspection	Centre Line Marking for 2, 3 & 4 Lane	Measurement	B	100%	IRC: 2, 35 & 67	SR	Joint Inspection Protocol shall be Submitted with Respective RA Bills.
		Carriageway Markings	Measurement	B	100%	IRC: 2, 35 & 67	SR	
		Object Markings	Measurement	B	100%	IRC: 2, 35 & 67	SR	
		No Overtaking / Passing Zone Lines	Measurement	B	100%	IRC: 2, 35 & 67	SR	
		Pavement Edge Lines	Measurement	B	100%	IRC: 2, 35 & 67	SR	
		Bus & Bicycle Lane Markings	Measurement	B	100%	IRC: 2, 35 & 67	SR	
		Transverse & Parking Markings	Measurement	B	100%	IRC: 2, 35 & 67	SR	
		Standard Letters & Numerals	Measurement	B	100%	IRC: 30	SR	
27.9	CULVERTS & DRAINS							
27.9.1	Material Requirements & Document Reviews	Coarse & Fine Agg	Lab Test	A	Once per Culvert	IS : 383 / 2386	TR	In absence of MTC testing is required
		Cement	Review of MTC	A	Once per Culvert	Relevant IS code	MTC	
		Reinforcement	Review of MTC	A	Once per Culvert	IS : 1786	MTC	
27.9.2	Field Inspection & Test	Location & Level	Measurement	B	100%	Spec / Drgs	SR	Date of Casting shall be Displayed

		Dimensions of Excavated Pit , Bed Level & Slopes	Measurement	B	100%	Spec / Drgs	SR	
		Placement, Compaction & Curing, Line & Level of Concrete	Physical	B	Randmly	IS: 456	SR	
		Thickness of Drain Walls & Bed	Physical	B	Randmly	IS: 456	SR	
		Laying of Pipes as per Levels after PCC	Measurement	B	100%	Spec / Drgs	SR	
		Joining of Pipes & Plugging of Collars	Physical	B	100%	Spec / Drgs	SR	
		Backfilling & Compaction	Physical	B	100%	Spec / Drgs	SR	
		Sampling & Testing of Concrete Specimens	Lab Test	A	IS : 456	IS: 456	TR	
28.0	PAINTING SYSTEM: * BEFORE START OF WORK ACTIVITY WISE WORK METHODOLOGY TO BE APPROVED *FIELD INSPECTION CHECKLIST SHALL BE PREPARED & TO BE SUBMITTED WITH RA A BILLS							
28.1	WHITE WASHING WITH LIME AND COLOR WASHING:							
28.1.1	Material	White lime “Katani” or Equivalent	Physically	B	Each Consignment	IS:712 Mnfr Specifications	-	
		Pigments	Physically	B	Each Consignment	IS: 3574	MTC	
28.1.2	Applications & Field Testing	Surface Preparation	Visually	B	100%	IS:6278 Specifications	IR	1. Surface shall be brushed for New Work 2. Loose Pieces, Scales to be Scrapped & holes / Patches to be filled for old work
		Preparation of Lime Wash Mix	Physically	B	100%	IS:6278 Specifications	IR	Will be 5 litres of water to one kg of lime.

		Doze of Pigments	Physically	B	100%	Mnfr Specifications	IR	
		Method of Application & No. of Coats	Physically	B	100%	IS:6278 Specifications	IR	By Brush or Spray
		Rubbed Test	Physically	B	100%	Specifications	IR	Shall not Readily come off on the hand when Rubbed.
28.2	WALL CARE PUTTY:							
28.2.1	Material	Approved Brand	Physically	A	Each Consignment	HDB-Singapore Standards or Specifications	IR	
28.2.2	Applications & Field Inspection	Surface Preparation (Unevenness, Brushing, Cleaning & Surface Pre Wetting)	Physically	B	100%	Specifications	IR	
		Mixing (Proportion & Time for Use)	Physically	B	100%	Mnfr Specifications	IR	
		Applications (Rate of Application, No. of Coats, Coat Thickness)	Physically	B	100%	Mnfr Specifications	IR	
		Evenness and Lag Time	Physically	B	100%	Mnfr Specifications	IR	
28.3	WATER PROOFING CEMENT BASED PAINT:							
28.3.1	Material	Approved Brand & Quality	Review MTC	A	Each Batch	IS: 5410 Specifications	MTC	
28.3.2	Applications, Inspection & Workmanship	Surface Preparation (Brushing, Wetting, Cleaning etc)	Physically	B	100%	IS:2395P1 Specifications / Drawings	IR	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted

		Stages of Mixing with Water	Physically	B	100%	Specifications / Drawings	IR	with Respective RA
		Applications (Rate of Application, No. of Coats, Coat Thickness)	Physically	B	100%	IS:2395P1 Mnfr Specifications	IR	
		Time Lag Between Coats	Physically	B	100%	Mnfr Specifications	IR	
		DFT	Field Test	A	100%	Specifications / Drawings	IR	
		Uniform Appearance	Visually	B	100	IS:2395P1 Specifications / Drawings	IR	
		Guarantee Bond	Review	A	Each Structure	Specifications	Stamp Paper	
28.4	PAINTING WITH SYNTHETIC ENAMEL/SEMI GLOSSY PAINT ON NEW WORK ::							
28.4.1	Material	Approved Brand & Quality	Review MTC	A	Each Batch	IS: 1932 Specifications	MTC	
28.4.2	Applications & Field Inspection	Checks for Surface Preparation (Cleaning, Unevenness, Holes, Indentations, Smoothness & Dryness)	Physically	B	100%	IS:2395P1 Mnfr Specifications	IR	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Under Coat (Shade, Uniformity & Dryness)	Physically	B	100%	Mnfr Specifications	IR	
		Top Coat (Finishing, Desired Color & Shade, Uniformity)	Physically	B	100%	IS:2395P1 Mnfr Specifications	IR	

		Final Checking	Physically	A	100%	Specifications	IR	
28.5	PAINTING WITH ACRYLIC EMULSION/PLASTIC EMULSION PAINT:							
28.5.1	Material	Approved Brand & Quality of Paint With Shade	Review MTC	A	Each Batch	IS: 5411 Specifications	MTC	
		Approved Brand & Quality of Primer & Putty	Physically / Review MTC	B	Each Consignment	Mnfr Recommendations	MTC / IR	
28.5.2	Applications & Field Inspection	Checks for Surface Preparation (Cleaning, Unevenness, Holes, Indentations, Smoothness & Dryness)	Physically	B	100%	IS:2395P1 Mnfr Specifications	IR	Field Inspection Checklist Shall be Prepared Structure Wise & Same to be Submitted with Respective RA
		Checks for Putty (Uneven Surface, Filling of Cracks / Holes, Preparation of Putty Mix etc)	Physically	B	100%	Mnfr Specifications	IR	
		Finishing Coats (Application Method, No. of Coats, Time Lag between coats, Finishing, Desired Color & Shade, Uniformity etc)	Physically	B	100%	IS:2395P1 Mnfr Specifications	IR	
		DFT	Field Test	A	100%	Specifications	TR	
		Final Checking (Evenness, Brush Marks, Cleaning etc)	Physically	A	100%	IS:2395 Specifications	IR	
		Guarantee Bond	Review	A	Each Structure	Specifications	Stamp Paper	

28.6	PAINTING OF FERROUS METALS IN BUILDINGS:							
28.6.1	Materials	Material & accessories	Review of MTC	A	Once per Lot	IS: 1477 Specifications	MTC	MTC shall be reviewed for the consignment received
28.6.2	Applications	Ensure that Surface are blast Cleaned to near white metal surface	Visually	B	Randmly	IS: 1477 Specifications	Protocol	
		Painting with inorganic Zinc silicate primer	Visually / Measurement	B	100%	IS: 1477 Specifications	SR / LB	
		1st coat of epoxy based finish polyamide cured painting	Visually / Measurement	B	100%	IS: 1477 Specifications	SR / LB	
		2nd coat of epoxy based finish polyamide cured painting	Visually / Measurement	B	Randmly	IS: 1477 Specifications	SR / LB	
		Polyurethane finish paint	Visually / Measurement	B	Visually / Measurement	IS: 1477 Specifications	SR / LB	
		DFT Check	Field Test	B	Randmly	IS:1477 Specifications	SR / LB	
		Colour coding	Visual inspection	B	100%	Specification/Drawi ng	IR	
28.7	PAINTING (CHLORINATED RUBBER PAINT)							
28.7.2	Material and Site Inspection	Chlorinated rubber paint primer	MTC Review	A	Each Lot	IS: 13467 Specifications	MTC	MTC shall be reviewed for the consignment received
		Final Paint	MTC Review	A	Each Lot	IS: 13467 Specifications	MTC	
		Surface Preparation	Visually	B	100%	IS: 13467 Specifications	SR	
		DFT Check	Field Test	B	Randmly	IS: 13467 Specifications	SR / LB	If Required

24.8	PAINTING OF CONCRETE SURFACES / PLASTERED MASONRY							
24.8.1	Material	Oil Bound Distemper, Cement Paint, Acrylic / Plastic Emulsion. etc	MTC Review	A	Each Lot	IS:428 IS:5410 IS:5411	MTC	MTC shall be reviewed for the consignment received
24.8.2	Workmanship	Under ground structures, super structurer (RCCworks)	Visual	B	100%	IS:2395P1 Tech Spec./ Drg	SR	
28.9	PAINTING & POLISHING OF WOOD WORK							
28.9.1	Material	Primer, Filler, Varnish, French Polish, Synthetic Paint	MTC Review	A	Each Lot	IS:3536 / 104 IS:110 IS:337 IS:348 IS:2932	MTC	MTC shall be reviewed for the consignment received
28.9.2	Workmanship	Surface Preparation, No. of Coats & Finishing	Visual	B	100%	IS:2338P1 Tech Spec./ Drg	SR	
28.10	PAINTING OF STEEL WORK							
28.10.1	Material	Anodic Film, Dip Zinc Coating, Bitumen Felt	MTC Review	A	Each Lot	IS: 12594 IS:1868 IS:1322 Tech Spec./ Drg	MTC	MTC shall be reviewed for the consignment received
28.10.2	Workmanship	Ensure that Surface are blast Cleaned to near white metal surface	Visually	B	Randmly	IS: 1477 Specifications	Protocol	
28.10.3		No. of Coats & Finishing	Visual	B	100%	Tech Spec./ Drg	SR	

28.10.4		DFT Check	Field Test	B	Randmly	Specifications	SR / LB	
28.10.5		Colour coding	Visual inspection	B	100%	Specification/Drawi ng	IR	
28.11	UNDERGROUND PROTECTION OF CONCRETE SURFACES							
28.11.1	Material	Bitumen of grade 80/100	MTC Review	A	Each Lot	IS:3384 IS: 73	MTC	
		Bitumen grade 30/40	MTC Review	A	Each Lot	IS:702 IS; 73	MTC	
28.11.2	In Process Application and Inspections	Surface Preparation (Cutting of tie rods, Capping of tie rod holes, Repairing of honeycombing and cleaning)	Physical	B	100% before application	Specifications Drawings	IR	
		Mixing of Bitumen with anti stripping, adhesion agent & kerosene oil.	Physical	B	100%	Specifications Drawings	IR	
		Rate of Application of Primer coat	Physical	B	100%	Specifications Drawings	IR	
		No. of Coats	Physical	B	100%	Specifications Drawings	IR	
		Uniformity	Physical	B	100%	Specifications Drawings	IR	
29.0	STRUCTURAL STEEL WORK							
29.1	Source Approval	Approved Manufacturer	Vendor Assessment	A	Once per Source	Spec / Drgs	VER	In Case of Out of Approved Vendor List

29.2	Material Requirements	Hot Rolled Sections and Plates.	MTC Review	A	Each Lot	IS:2062	MTC	MTC shall be verified. In case of non submission of MTC, sample shall be selected and tested for physical and metallurgical properties
		Tubular Sections	MTC Review	A	Each Lot	IS:1161	MTC	
		Hollow Sections (rectangular or square)	MTC Review	A	Each Lot	IS:4923	MTC	
		MS Black / High Strength Bolts and Nuts and washers	MTC Review	A	Each Lot	IS:800 / 1363 /1367	MTC	
29.3	Fit - Up	Marking and Cutting	Visual/ Measurement	B	100%	Approved drawing	SR	Proper identification marks to be put. If laminations are found during cutting of the material it shall not be used
		Ensure proper fit up before welding	Measuring Tape	B	100%	Drawing and Tech. Spec.	SR	
		Check that the gap is minimum for all fillet welds	Measuring Tape	B	100%	Drawing and Tech. Spec.	SR	
		Ensure that the butt weld joints are properly aligned and the offset does not exceed 10% of the thickness of the thinner part of the joint maximum permitted value is 3.2 mm	Measuring Tape	B	100%	Drawing and Tech. Spec.	SR	
29.4	Visual Examination on all welds	Presence of undercuts	Visual	B	100%	Tech. Spec. / approved drawing	SR	
		Surface cracks in both welds and base metals	Visual	B	100%	Tech. Spec. / approved drawing	SR	
		Unfilled craters	Visual	B	100%	Tech. Spec. / approved drawing	SR	

		Improper weld profile and size	Visual	B	100%	Tech. Spec. / approved drawing	SR	
		Excessive reinforcement in weld	Visual	B	100%	Tech. Spec. / approved drawing	SR	
		Surface porosity	Visual	B	100%	Tech. Spec. / approved drawing	SR	
29.5	Fillet welds and groove welds	Dye Penetration Test (DFT)	Testing	A	As per Spec	ASTME 165.	TR	
29.6	Groove welds, heat affected zone, butt welds	UT	Testing	A	As per Spec	ANSI/AWS D1-92	TR	
		RT	Testing	A	As per Spec		TR	
30.0	PRECAST RCC JALLI:							
30.1	Material Requirements	Manufacturing Properties	MTC Review	A	Each Lot	MTC	MTC	RCC shall Comply IS: 456
30.2	Fixing	Pattern	Review	B	100%	Spec / Drgs	SR	Minimum 7 Days curing is Required
		Cement Mortar 1:2	Physically	B	100%	Spec / Drgs	SR	
		Opening True to Line, Level & Plumb	Measurement	B	100%	Spec / Drgs	SR	
		Curing of Joints	Visual	C	100%	Spec / Drgs	SR	
31.0	WELDING:							

31.1	Material Requirements	Welding Consumables	MTC Review	A	Each Lot	IS:814, 1395, 1278,7280,3613,6419 ,6560	MTC	
31.2	Field Inspection & Testing	Section Thickness	Type & Size of Electrode	B	100%	IS:816 Specifications	IR	
		Position of Welding	Visual	B	100%	IS:816 Specifications	IR	
		Arc length, Rate of Travel, Current and Polarity	Measurement	B	100%	IS:816 Specifications	IR	
		Minimum Leg Length of a Fillet Weld	Measurement	B	100%	IS:816 Specifications	IR	
		Angle between Fusion Faces	Measurement	B	100%	IS:816 Specifications	IR	
		Crack, Porosity or Cavities	Physicallyt	B	100%	IS:816 Specifications	IR	
		Testing of Welded Joints	Testing	A	100%	IS 3600, 3613, 4260, 7205, 7215, 7307, 7310, and 7318.	TR	
32.0	STONE MASSONARY:							
32.1	Material Requirements	Stone Properties (Crushing Strength, WA)	Stone Sample Approval	A	Once Per Source	IS:1597 / IS:1124	TR	The rubble shall be of the best quality trap/granite/ballast stones
32.2	Field Inspection	Bed Preparation	Visually	B	100%	Specifications / Drawing	SR	Joint Inspection Protocol shall be prepared and submitted with respective RA bills.
		Size of Stone	Measurement	B	100%	Specifications / Drawing	SR	
		Approved Pattern	Review	B	100%	Drawing	SR	

		Mortar Mix Proportion	Physically	B	Randmly	Spec / Drgs	SR	
		Filling of Inner faces	Physically	B	Randmly	Spec / Drgs	SR	
		Line, Level, Alignment & Plumb	Measurement	B	100%	Spec / Drgs	SR	
		Thickness & Curing of Joints	Visual	C	100%	Spec / Drgs	SR	
33.0	HARD CORE / SOLING UNDER FLOORS / FOUNDATIONS:							
33.1	Material	Soling Material (W A ,Crushing Strength etc)	Stone Sample Approval	A	Once Per Source	IS:1597 / IS:1124	TR	The Material shall be of the best quality trap/granite/ballast stones
33.2	Site Inspection & Test	Bed Preparation	Visually	B	100%	Specifications / Drawing	SR	
		Size of Stone	Measurement	B	100%	Specifications / Drawing	SR	
		Gap Filling with approved Murrum	Physically	B	100%	Specifications / Drawing	SR	
		Watering & Compaction	Testing	B	100%	Specifications / Drawing	TR	
34.0	DAMP PROOF COURSE (DPC):							
34.1	Approved Cement, Sand, Aggregate and Water	Material Quality	Physically	B	Randmly	IS : 456 Specifications / Drawing	SR	
	Approved Water Proofing Compound	Properties	MTC Review	A	Each Lot	Mnfr. Specifications	MTC	
	Bitumen felts for water proofing and damp proofing	Properties	MTC Review	A	Each Lot	IS:1322	MTC	

34.2	Site Inspection, Workmanship & Testing	Mix Proportion	Physical	B	Randomly	Specifications / Drawing	SR	
		Doze of Water Proofing Compound in Mix	Physical	B	100%	Specifications / Drawing	SR	
		Form Work	Measurement	B	100%	Specifications / Drawing	SR	
		Straightness, Evenness and truly Verticality	Measurement	B	100%	Specifications / Drawing	SR	
		Next Activity on DPC & Curing	Visual	B	100%	IS: 456	-	Next Activity Shall be start on DPC, after 48 hrs Curing Minimum
35.0	ALUMINIUM WINDOWS, VENTILATORS, COMPOSITE UNIT ETC:							
35.1	Material	Aluminium Alloys	MTC Review	A	Each Lot	IS DSGN. HEA-WP OF IS:733	MTC	
		Extruded / Hollow Sections	MTC Review	A	Each Lot	IS designation HE9-WP & HV9-WP	MTC	
		Glazing	MTC Review	A	Each Lot	IS:2835	MTC	
35.2	Site Inspection, Workmanship & Testing	Fabrication	Physically	B	Randomly	Specifications / Drawing	IR	
		Anodizing (Film Thickness, Evenness)	Physically / TC Review	A	100% Each Lot	BS:1616 Specifications / Drawing	TC	
		Lacquer or Cellulose Based Layer on Finished Sections	Visually	B	Each Lot	Specifications / Drawing	-	
		Hardware & Accessories Samples	Physically	B	Each Lot	Specifications / Drawing	IR	Approved samples of Hardware shall be kept in the custody of Engineer-in-charge.
		Fixing of Windows / Glazing	Physically	B	100%	IS:1081 / 3548	IR	

		Testing for water tightness	Field Test	B	100%	IS: 3548	TR	Any leakage found during testing shall be rectified by the contractor without extra charge
36.0	M.S. GRILLS/RAILING:							
36.1	Material Requirements	Structural Steel Sections	MTC Review	A	Each Lot	IS:226 & IS:2062 IS:1239	MTC	Samples of grill and railings shall be Approved before use
		Paint& Polish	MTC Review	A	Each Lot	IS:104	MTC	
36.2	Site Inspection, Workmanship	Fabrication (Welding, Joints, Rivets, Fastenings & Devices)	Physically	B	Randmly	Specifications / Drawing	IR	
		Installation (Position, line, Level, Verticality)	Physically	B	100%	Specifications / Drawing	IR	
		Painting (Type of Paint, Shade, No. of Coats & Finishing)	Physically	B	100%	Specifications / Drawing	IR	
37.0	FALSE CEILING WITH GYPBOARD AND G.I. FRAMEWORK							
37.1	Material Requirements	G.I.Frames	MTC Review	A	Each Lot	Specifications / Drawing	MTC	
		Gypsum Board	MTC Review	A	Each Lot	IS: 2095	MTC	
		Compounds, Papers tapes & Paints	MTC Review	A	Each Lot	Mnfr Specifications	MTC	
37.2	Site Inspection, Workmanship	Insulation & Fixing	Physically	B	100%	Specifications / Drawing	IR	Joint Inspection Protocol shall be

		Priming & Painting	Physically	B	100%	Specifications / Drawing	IR	prepared and submitted with respective RA bills.
		Line, Level, Spacing of framework , Spotting, Jointing etc	Physically	B	100%	Specifications / Drawing	IR	
38.0	RUBBER / PVC WATER STOPS:							
38.1	Material Requirements	Approved Brand & Properties of Water Stop	Review MTC	A	Each Lot	IS:12200 & 15058	MTC	A sample of Rubber / PVC water stops shall be got approved
38.2	In Process installation Inspections	Placing in Position at centre and tying	Physical	B	100% before concreting	IS:12200 / Mnfr Specifications	IR	
		Overlap, Welding & Jointing at junctions	Physical	B	100% before concreting	IS:12200 / Mnfr Specifications	IR	
		Exposed Projected Portion on Concrete	Physical	B	100%	IS:12200 / Mnfr Specifications	IR	
		Water Leak Test at joints	Physical	A	100%	IS:12200 / Mnfr Specifications	IR	
		Cleaning of projected portion	Visual	B	100% before next concrete	IS:12200 / Mnfr Specifications	IR	
39.0	FENCING WORKS WITH BARBED WIRE, CHAIN LINK ETC. *FIELD INSPECTION CHECKLIST SHALL BE PREPARED & TO BE SUBMITTED WITH RA A BILLS							
39.1	Material Requirements	Barbed Wire (M.S. or G.I).	MTC Review	A	Each Lot	IS: 278	MTC	
		Approve Make Chain Links and Properties	Review MTC	A	Each Batch	Mnfr Specifications	MTC	
		MS post / RCC post	MTC Review	A	Each Lot	Specifications	MTC	
		Structural Steel	Review MTC	A	Each Lot	IS: 2062 IS: 1161	MTC	

39.2	Site Inspection, Workmanship	Pit Size	Physical	B	100%	Specifications Drawings	IR	
		Grade of Concrete for fixing of RCC posts	Physical	B	100%	IS: 456 Specifications Drawings	IR	
		C / C Distance between posts, alignment, verticality and top level	Measurement	B	100%	Specifications Drawings	IR	
		Fixing & straightening of Chain link & keeping it tight erect.	Physical	B	100%	Specifications Drawings	IR	
		Embedment of bottom first row of chain links in the ground / concrete	Physical	B	100%	Specifications Drawings	IR	
		Priming & Painting of posts	Coats	B	100%	Specifications	IR	
40.0	MANGALORE PATTERN TILE ROOFING :							
40.1	Material Requirements	Basel Mission or Equivalent	Review MTC	A	Each Lot	IS:654	MTC	The sample of tiles shall be got approved before procuring
		Chemical Used for Mortar Bedding	Review MTC	A	Each Lot	IS:654	MTC	
40.2	Site Inspection, Workmanship & Testing	Thickness of Mortar Bedding 1: :2 over R.C.C. Slab	Physically	B	Randmly	Specifications / Drawing	IR	
		Soaking of Tiles in Water	Physically	B	Randmly	Specifications / Drawing	IR	Shall be soaked for four hours before taking up for lying.
		Mortar Proportion & it's Thickness	Physically	B	Randmly	Specifications / Drawing	IR	The tiles shall be laid from the eves towards ridge
		Laying of tiles (Position, Line, Level, Straightness, Joint Thickness)	Visually	B	Randmly	Specifications / Drawing	IR	
		Pointing of Joints	Visually	B	100%	Specifications / Drawing	IR	

		Intermediate lines Straightness, Pearliness & Horizontality	Visually	B	Randmly	Specifications / Drawing	IR	
		Water Tightness of Joints	Field Test	B	100%	Specifications / Drawing	TR	
		Coloring of Joints	Visually	B	100%	Specifications / Drawing	IR	Color of Tiles & Joints Shall be Match
		Curing	Visually	C	Randmly	Specifications / Drawing	IR	Shall be Minimum 7 Days
41.0	ASBESTOS CEMENT CORRUGATED / TRAFFORD SHEET ROOFING :							
41.1	Material Requirements	A.C. sheets, Big Six / Trafford and Accessories	Review MTC	A	Each Lot	IS:2096	MTC	-
41.2	Site Inspection, Workmanship & Testing	Top Bearing Surfaces of all Purlins and of other Roof Members	Level Measurement	B	100%	IS:12093 Specifications / Drawing	SR	
		Lap Width	Measurement	B	Randmly	IS:12093 Specifications / Drawing	SR	
		Snug (Close) Fit up (where four sheets meet at a lap)	Physically	B	Randmly	IS:12093 Specifications / Drawing	IR	
		Fixing of J & L Hooks	Physically	B	Randmly	IS:12093 Specifications / Drawing	IR	
		Wind Ties	Physically	B	100%	IS:12093 Specifications / Drawing	IR	
		Leak Proof Test	Field Test	B	100%	Specifications / Drawing	TR	
42.0	VINERATEX OR VITROBRITE DECORATIVE TEXTURE COAT :							

42.1	Material	Aggregate and Special Bonding Media / Synthetic Resin	Review MTC	A	Each Lot	Mnfr Specifications	MTC	-
42.2	Applications	Surface Preparation	Physically	B	100%	Mnfr Specifications	SR	
		Rate of Application of Solution & Thickness	Physically	B	Randmly	Mnfr Specifications	SR	
		Protection of Vineratex or Vitrobrite	Visually	B	Randmly	Mnfr Specifications	SR	
43.0	PRECAST INTERLOCKING PAVER BLOCKS WORK:							
43.1	Material	Size, Thickness, Strength and Physical Properties	Review MTC	A	Each Lot	IS: 15658 Tech Specifications	MTC	The sample shall be got approved before procuring
43.2	Laying and Inspection	Surface Preparation	Visually	B	100%	Tech Specifications / Drawings	IR	Joint Inspection Protocol to be prepared and submitted with RA Bills.
		Approved Pattern	Review	B	Once per Brand	Tech Specifications / Drawings	IR	
		Color Combination	Physically	B	100%	Tech Specifications / Drawings	IR	
		Laying (Position, Line, Level, Undulations, Joint Straightness, Slope)	Physically	B	100%	Tech Specifications / Drawings	IR	
		Joint Filling	Visually	B	100%	Tech Specifications / Drawings	IR	
		Compaction	Physically	B	100%	Tech Specifications / Drawings	IR	

The Tata Power Company Ltd



OPEN TENDER NOTIFICATION

Tender Reference: CC25NP022

Document Date: 10th July 2024

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.

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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.

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- 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 foot (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.

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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:

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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 Permit-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 Barricade:

- 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.

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- 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.

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- 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.

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- 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. In case ground water is 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

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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.

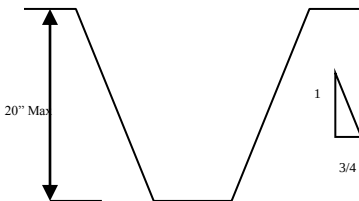
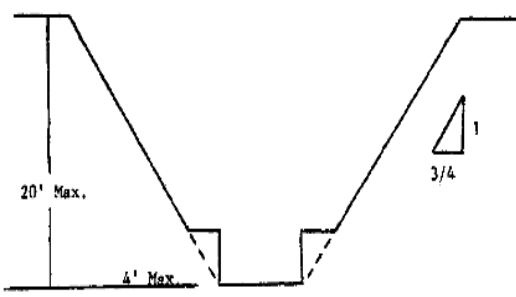
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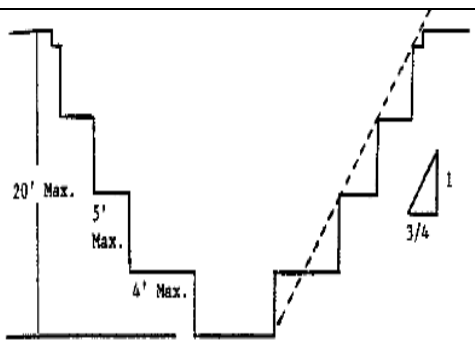
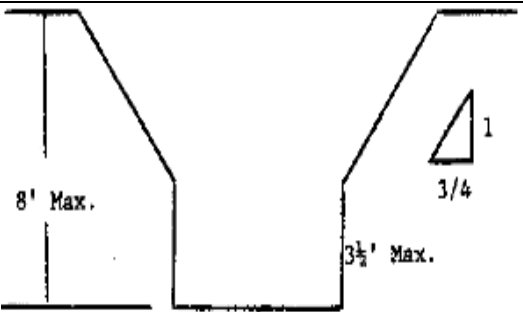
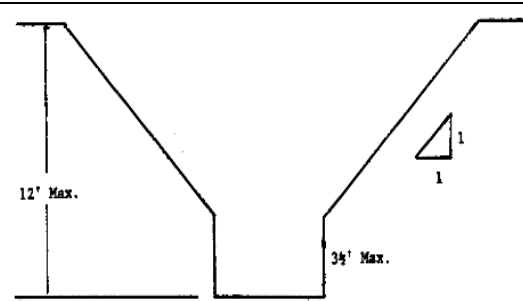
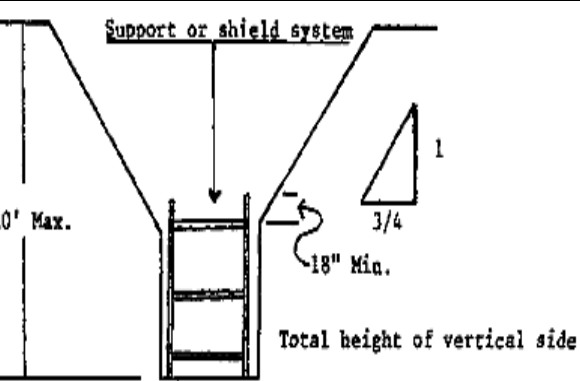
6.3.10 Sloping: For sloping of sides/angle of repose refer Table no1

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

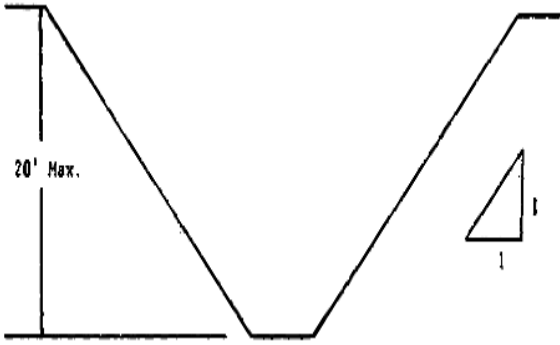
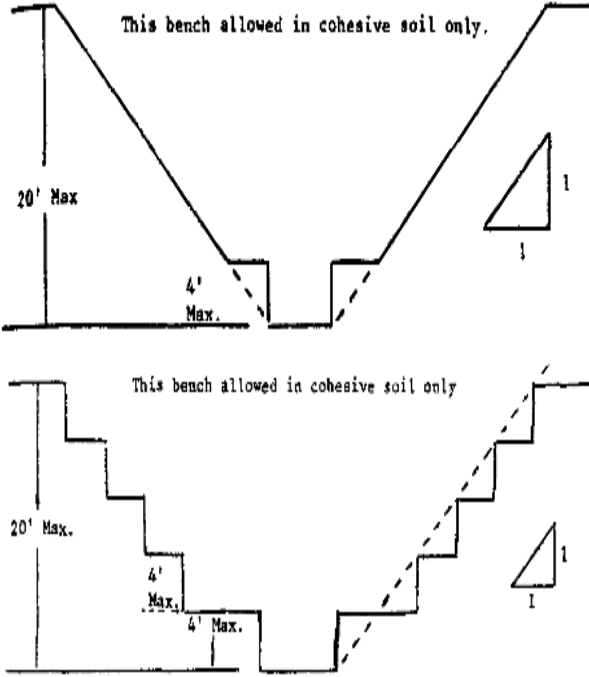
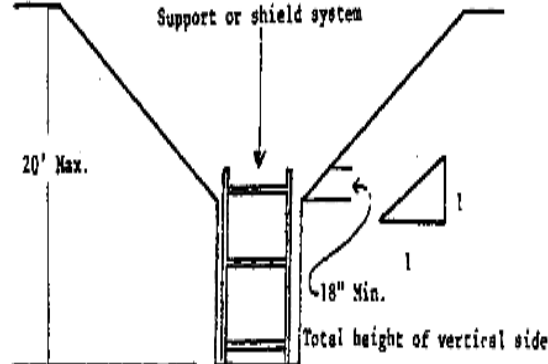
Excavations made in type A Soil

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.	

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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.		

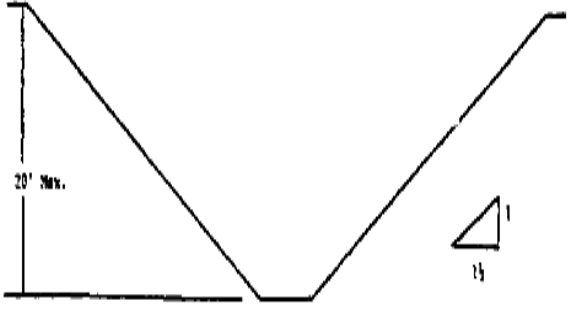
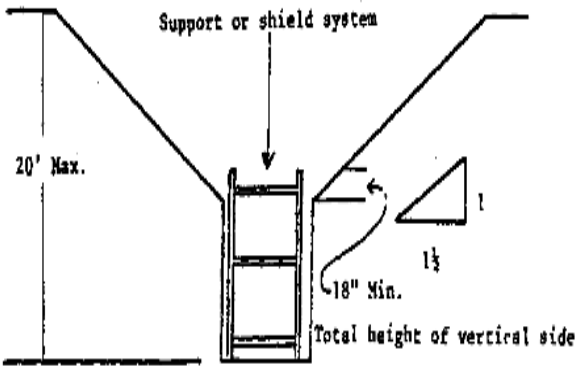
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Excavations Made in Type B Soil

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.	

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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

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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

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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			

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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	☐
Barricade 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 :

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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
						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

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>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:

- Trench jacks may be used in lieu, or in combination with, cross braces.
- Shoring is not required in solid rock, hard shale or hard slag.
- Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.

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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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-	Annexure - 1 Sample format for full body Harness and Lanyard Inspection Check List (TPSMS/CSP/WAH/004/FORM/001)	14
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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.

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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.

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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.

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- 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)

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- 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

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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.

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- 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.

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- 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 its 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.

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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:
- The tank/vessel inspection, inspection documentation is reviewed and is current.
 - The tank/vessel must be capable of supporting the intended load (personnel, tools, etc.) particularly Acid and Caustic storage tanks and corrosive tanks & vessels.

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- 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

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8. TRAINING & COMMUNICATION

8.1. It is mandatory that all 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)

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Annexure- 1

TPSMS/CSP/WAH/004/FORM/001

<u>Inspection checklist – Full body Harness</u>				
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	Inspection checklist to be filled for each Harness by Authorized person			
2	Checking to be done every three month, Records shall be maintained for last 1 year			
3	Tick in appropriate column, mark NA for checks not applicable			
4	Provide appropriate inspection tag / Stickers			

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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	Inspection checklist to be filled for each Harness by Authorized person			
2	Checking to be done every three month, Records shall be maintained for last 1 year			
3	Tick in appropriate column, mark NA for checks not applicable			
4	Provide appropriate inspection tag / Stickers			

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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:** _____

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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 heavy 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%.

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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.

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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.

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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.

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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.

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- 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.

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- 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:

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- 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.

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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.

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- 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.

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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.

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- 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.

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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-

- Operator
- 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)

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- 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)

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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.

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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.

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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	*		

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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*		

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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.

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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				- <i>For Magnetic Control</i>		
- 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		

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Annexure-4

OVERHEAD CRANE PERIODIC INSPECTION REPORT - FORMAT

Contd.

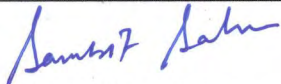
ITEM	OK	CODE		ITEM	OK	CODE
Controls (continued)				Resistors		
- Trolley Overhead Relays				- M.H. Resistors		
- Bridge Overhead Relays				- A.H. Resistors		
- M.H. Limit Switch Contacts				- Trolley Resistors		
- A.H. Limit Switch Contacts				- Bridge Resistors		
For Manual Drum Control				Mainline		
- 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.

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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)

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- 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.

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- 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%.

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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.

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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.

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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 from 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.

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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

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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.

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- 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.

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- 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 signperson 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.

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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:

- The share of the load which is to be carried by each crane;
- How the load sharing is to be proportioned; and
- 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:

- Mass of the load;
- Position of the center of gravity;
- Mass of the lifting gear;
- Safe working capacity of the lifting gear; and

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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.

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- 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

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- 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

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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:			

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Annexure - 2

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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 (P_{MAX}) for Asphalt/dry sand/clay = 20 tonnes per m²

area = $0.65 \times (CM + L) / P_{MAX}$

area = $0.65 \times (32 \text{ tonnes} + 21.65 \text{ tonnes}) / 20 \text{ tonnes per m}^2$

area = 22.75 tonnes / 20 tonnes per m²

area = 1.74 m²

Dimensions of outrigger timbers: $\sqrt{1.74 \text{ m}^2} = 1.32 \text{ m}$

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 (P_{MAX}) for Asphalt/dry sand/clay = 20 tonnes per m²

area = $0.65 \times (CM + L) / P_{MAX}$

area = $0.65 \times (29 \text{ tonnes} + 15 \text{ tonnes}) / 20 \text{ tonnes per m}^2$

area = 22.75 tonnes / 20 tonnes per m²

area = 1.43 m²

Dimensions of outrigger timbers: $\sqrt{1.43 \text{ m}^2} = 1.2 \text{ m}$

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

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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 (P_{MAX}) for Asphalt/dry sand/clay = 20 tonnes per m²

area = $0.65 \times (CM + L) / P_{MAX}$

area = $0.65 \times (86 \text{ tonnes} + 68 \text{ tonnes}) / 20 \text{ tonnes per m}^2$

area = 100 tonnes / 20 tonnes per m²

area = 5.00 m²

Dimensions of outrigger timbers: $\sqrt{5.00 \text{ m}^2} = 2.23 \text{ m}$

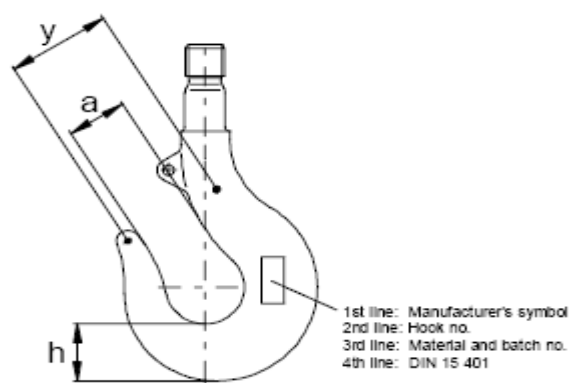
Therefore, length x width of timbers required = 2230 mm x 2230 mm.

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

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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 $\diamond$ 6
Lah 100 ...	RSN 8	80	95	125	Rd 56 $\diamond$ 6
Lah 125 ...	RFN 10	90	106	175	Rd 64 $\diamond$ 8
Lah 160 ...	RFN 12	100	118	200	Rd 72 $\diamond$ 8
Lah 200 ...	RFN 16	112	132	220	Rd 80 $\diamond$ 10
Lah 250 ...	RFN 20	125	150	240	Rd 90 $\diamond$ 10
Lah 320 ...	RFN 25	140	170	250	Rd 100 $\diamond$ 12
Lah 400 ...	RFN 32	160	190	320	Rd 110 $\diamond$ 12
Lah 500 ...	RFN 40	180	212	350	Rd 125 $\diamond$ 14
Lah 630 ...	RFN 50	200	236	400	Rd 140 $\diamond$ 16
Lah 800 ...	RFN 80	224	265	400	Rd 160 $\diamond$ 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

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Checks and Maintenance: Crane ropes, rope pulleys, load hooks and rope end fittings

Figure 1

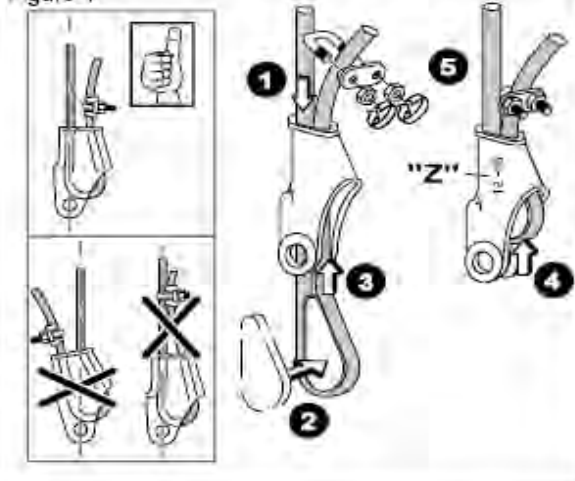
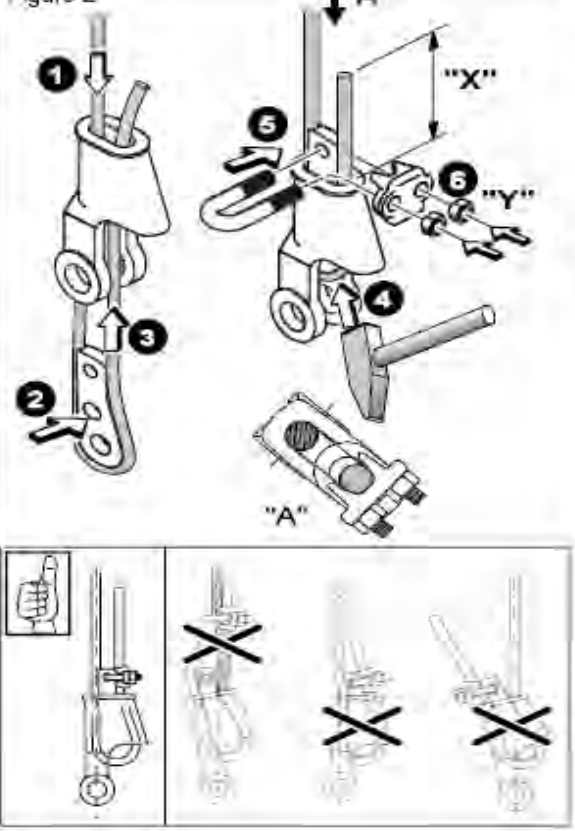


Figure 2

**Installation, inspection and maintenance of wedge sockets !**

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**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% !

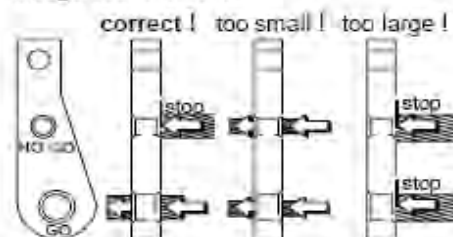
Damage must not be repaired by welding.
Inspect permanent connections once a year, or more often in severe operating conditions.**Installation:**

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:



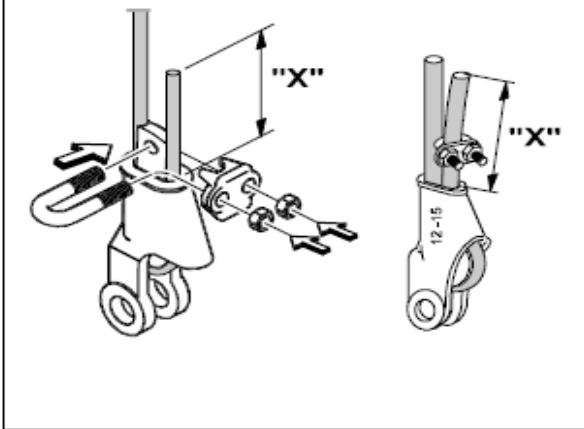
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Annexure - 3

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Checks and Maintenance: Crane ropes, rope pulleys, load hooks and rope end fittings

Figure 3



Installation, inspection and maintenance of wedge sockets !

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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.

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Annexure – 4

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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 m². 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.

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- **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.

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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.

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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

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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.

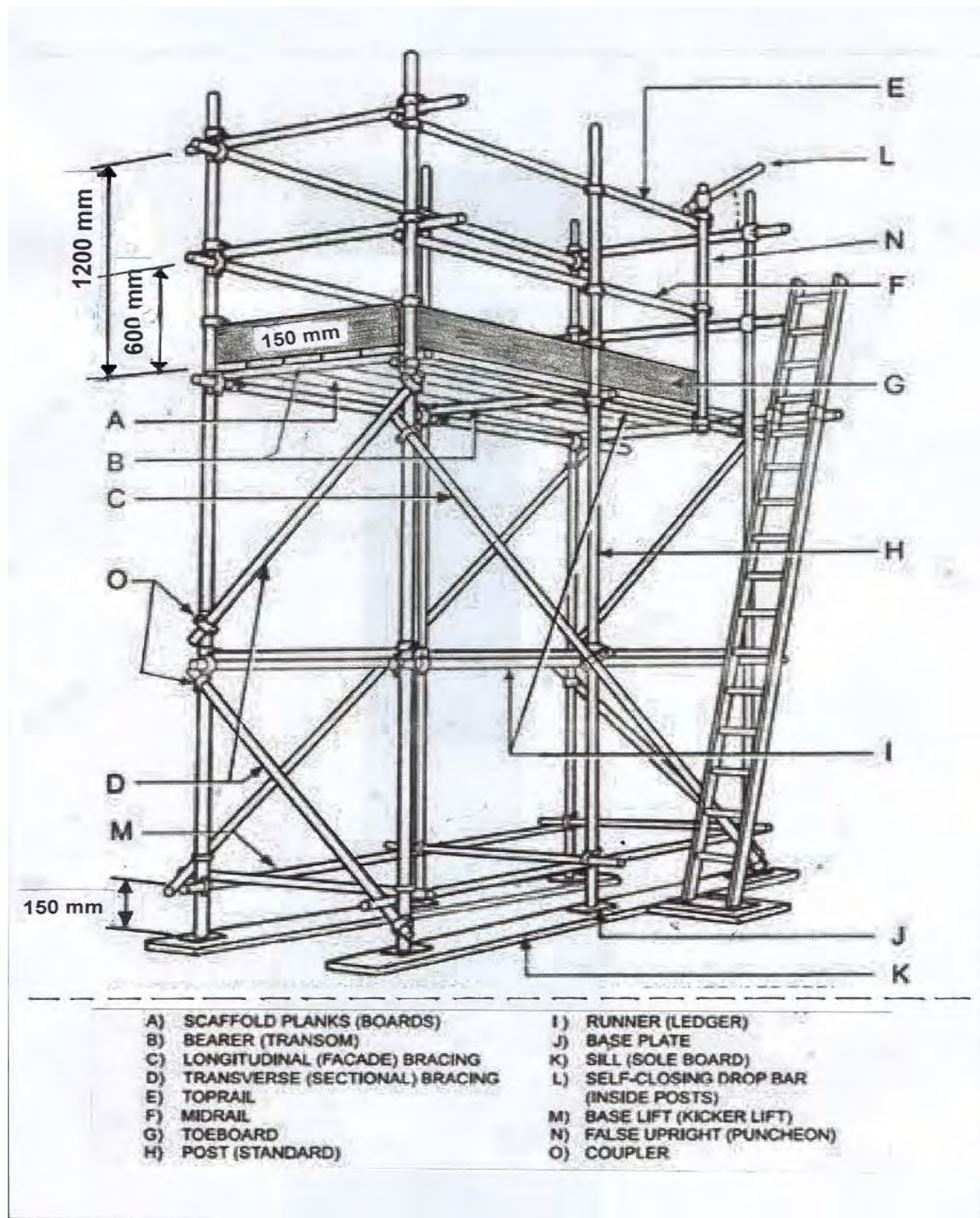
Tube-and-coupler scaffold: A supported or suspended scaffold consisting of a platform(s) supported by tubing, erected with coupling devices connecting uprights, braces, bearers, and runners (also known as tube-and-clamp scaffold).

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

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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/Coupler 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 ininMeter	2.7	2.2	1.8	1.4	1.0	0.8

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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.

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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 scaffolders.

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.

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- 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.

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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.

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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-

- Competent Person,
- Scaffolding Supervisor,
- 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

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Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

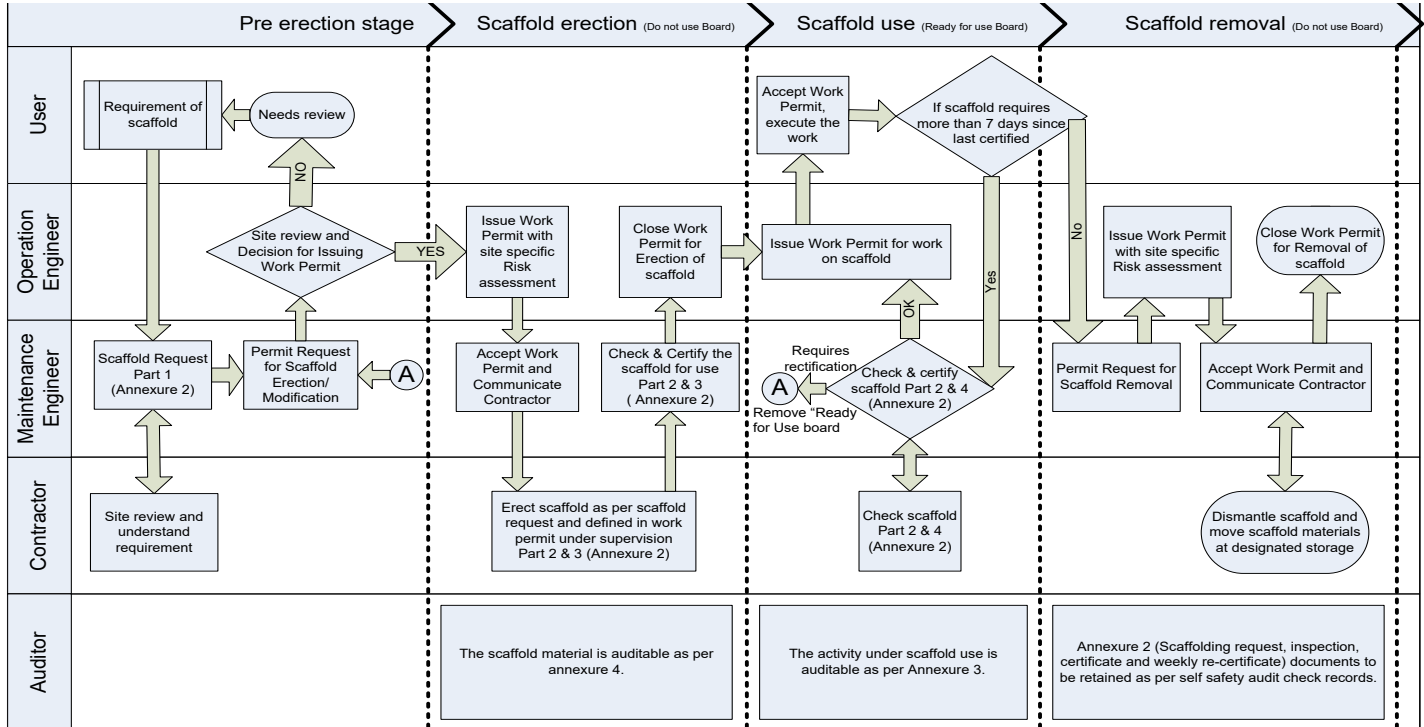
13. ATTACHMENTS/APPENDIX :

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



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Annexure - 2

(Part: 1 of 4)

TPSMS/CSP/SCAF/007/FORM/001

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 _____
(Scaffolding Contractor)

Date:

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Annexure - 2

(Part: 2 of 4)

TPSMS/CSP/SCAF/007/FORM/001

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?		

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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):

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Annexure - 2

(Part: 3 of 4)

TPSMS/CSP/SCAF/007/FORM/001

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.....)

Date: _____

Name and signature of
Scaffolding Supervisor

M/s _____
(Scaffolding Contractor)

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Annexure - 2

(Part: 4 of 4)

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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
2 nd week					
3 rd week					
4 th week					
5 th week					
6 th week					
7 th week					
8 th week					
9 th week					
10 th week					

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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 Inspector:

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Annexure – 4

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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?		

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Annexure – 4

TPSMS/CSP/SCAF/007/FORM/002

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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) :

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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: _____

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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”.

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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.

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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					✓	

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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

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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 as 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.

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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.

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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 list of the activities and types of work that are to be controlled through the Permit to Work system.
- A specification of the permits to be issued for various types of work.
- A process for deciding which hazardous work requires additional control measures.
- A list of the persons who are authorized to issue permits, accept permits and to specify additional controls.
- A process for ensuring the competence of permit signatories (issuer and acceptor) and others playing an active role in the Permit to Work system.
- 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:

- Permit with JSA.
- Permit with a HIRA.
- Permit plus a JSA/HIRA and supporting procedures.

6.4. Procedures include the following:

- Hot Work
- Work at Height
- Confined Space
- Gas Test (toxic gases, oxygen)
- 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.

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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).

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- 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.

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- 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).

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- 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.

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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.

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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.

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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

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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)

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- 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

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- 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

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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.

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- 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.

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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

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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

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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

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	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

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	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

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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.

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- 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.

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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

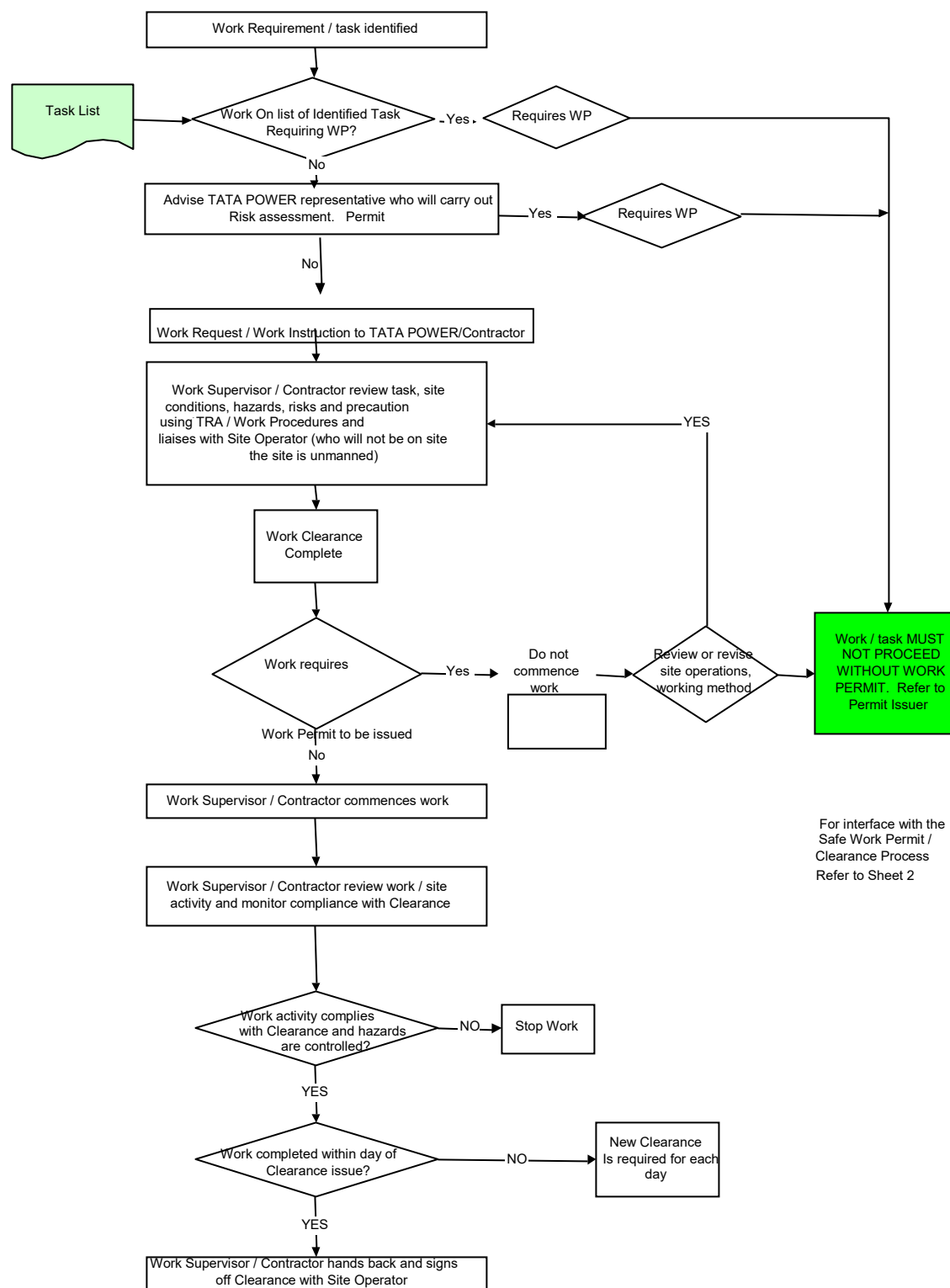
**HAZARDOUS AREAS HAVE NO HEIGHT
LIMITATIONS FOR PERMIT CONDITION
PURPOSES**

SMOKING IS NOT PERMITTED ON SITE

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Annexure- 3

Sheet 1 - Work Clearance Process Flow Diagram



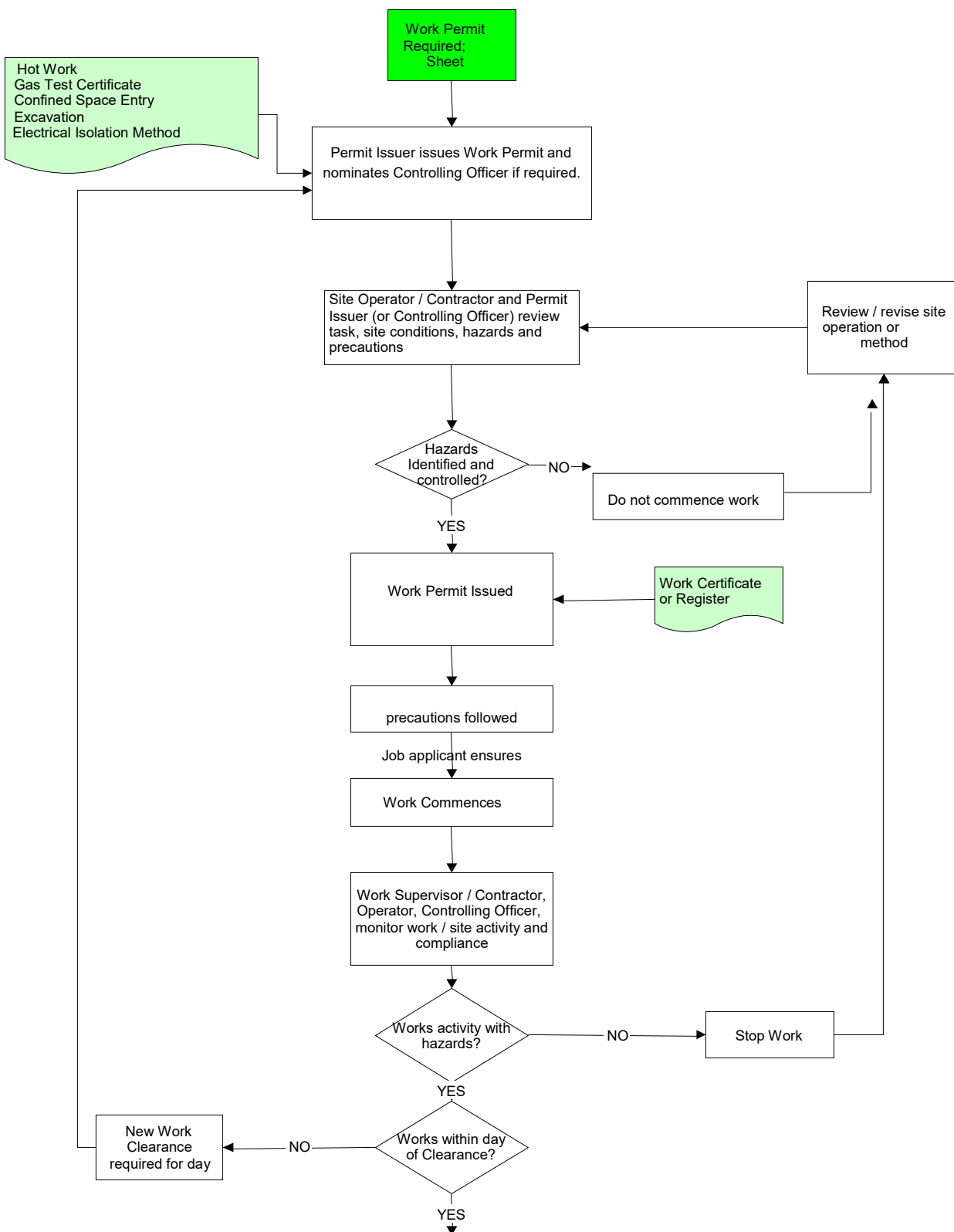
For interface with the
Safe Work Permit /
Clearance Process
Refer to Sheet 2

PERMIT PROCESS OPERATONAL FACILITIES SHEET 1

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Annexure-3

Sheet 2 – Work Permit Process Flow Diagram



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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

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times mechanical isolation / blanking may have to be performed if the isolation valves are passing.

- 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.

- 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.
- 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.
- 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.
- 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.
- 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.

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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 of 15m 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.

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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.

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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.

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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.

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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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-	Annexure – 1: Sample Format for Job Safety Analysis (JSA) - TPSMS/CSP/JSA/009/FORM/001	7

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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

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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.

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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.

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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)

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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 burning 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

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- 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

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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:

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- 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. assess 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.

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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

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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.

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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.

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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 :

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 - 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.

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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

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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.

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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.

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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

The Tata Power Company Ltd		<i>OPEN TENDER NOTIFICATION</i>
<i>Tender Reference: CC25NP022</i>		<i>Document Date: 10th July 2024</i>

Section E.1: Special Conditions of Contract

Civil work- Micro tunnelling for EHV cable laying below railway track at Byculla Location, Mumbai Ref. No. CC25NP022	THE TATA POWER COMPANY LIMITED	
	E.1 SPECIAL CONDITIONS OF CONTRACT	SHEET 1 OF 4

Sr. No.	TOPIC	PRINCIPLES OF TERMS & CONDITIONS
1	GENERAL	The following Special Conditions of Contract (SCC) shall supplement the General Conditions of Contract (GCC). 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 contract price shall be the Lump sum price for the Scope of works under the Contract.
3	CONTRACT PRICE VARIATION	The Lumpsum Contract Price and rates shall be FIRM till completion of Work.
4	CONTRACT PERFORMANCE BANK GUARANTEE	Contractor shall submit a Contract performance bank Guarantee @10% of the Contract Value valid till completion of the Defect liability Period. CPBG shall be submitted within 15 days from the date of award of work as per approved format. This CPBG cum PBG shall be valid till warranty period with additional claim period of 6 months.
5	TERMS OF PAYMENT	Payment terms are as below: i) Payment of the lumpsum Contract value shall be based on completion of milestones as listed below, a) Submission of Proposal to Railways: 2.5% of contract value b) Approval of Proposal from Railways: 2.5% of contract value c) Mobilization at Site with all plant and Machinery: 7.5% of contract value d) Completion of jacking pit and retrieval pit and starting boring operation: 20% of contract value e) Completion of Micro tunneling operation including providing 1400mm dia. casing pipes jointing etc. complete: 50% of contract value

Civil work- Micro tunnelling for EHV cable laying below railway track at Byculla Location, Mumbai Ref. No. CC25NP022	THE TATA POWER COMPANY LIMITED	
	E.1 SPECIAL CONDITIONS OF CONTRACT	SHEET 2 OF 4

		f) Completion of Fixing Frames, HDPE Pipes and grouting of annular space: 15% of contract value g) Demobilization and Handing over of Site including cleaning and removing of all construction debris etc. complete: 2.5% of contract value. ii) Payment shall be released within 60 days from the date of receipt of error free invoice. For MSME, Credit Period is 45 days. iii) Safety retention shall be as per safety T&C.(Attached as Annex to GCC) iv) 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. V). 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	CONTRACTOR'S OBLIGATION FOR PROVISIONAL TAKE OVER & FINAL TAKE OVER	The key obligations of the Contractor for (all other obligations listed in GCC also shall be met) a) Provisional Take over are , i) Completion of the Works and successful completion of all tests to the satisfaction of Owner/Project Manager in accordance the scope, technical specifications and Contract documents. ii) Rectification of all punch list items other than those which are minor in nature and would not affect intended operation/use of the Works. b) Final Take over are, (all other obligations listed in GCC also shall be met). i) Successful completion of Provisional Take Over of the Works ii) Submission of all As-Built Drawings.

Civil work- Micro tunnelling for EHV cable laying below railway track at Byculia Location, Mumbai Ref. No. CC25NP022	THE TATA POWER COMPANY LIMITED	
	E.1 SPECIAL CONDITIONS OF CONTRACT	SHEET 3 OF 4

		iii) Rectification of Punch list items and certification of the same by Owner/Project Manager.
7	WORK COMPLETION PERIOD	Entire scope of works (obtaining NOC from Railways and execution of work) shall be completed within 12.5 months from the date of order placement. Execution of Micro-tunneling work shall be completed within 5.5 months from receipt of NOC from Railways.
8	LIQUIDATED DAMAGES FOR DELAYS , NON – PERFORMANCE & OVER ALL	In the event of delay, LD shall be levied at 1% of Contract Value per week of delay subject to maximum of 10% of Contract Value. Scope included obtaining NOC from Railways and then executing Micro-tunneling work, LD will be applicable if work is not completed within 5.5 months from date of obtaining NOC from Railways.
9	DEFECT LIABILITY PERIOD	Contractor is responsible for defects in the Works for a period of 12 (Twelve) months from the date of Issuance of the Completion certificate issued by the Owner/Project Manager to the Contractor for the Works.
10	INSURANCES	As per General conditions of Contract and technical specifications
11	WATER & POWER FOR CONSTRUCTION	Construction water & power will be arranged by Contractor at its own expense.
12	QUANTITIES	Not applicable being a contract on Lump Sum EPC basis.
13	SERVICES AND FACILITIES BY THE OWNER/PROJECT MANAGER	The following facilities and services will be provided by the OWNER/PROJECT MANAGER to the Contractor: Only a base line and one permanent benchmark, if available, would be furnished to the Contractor near the site. Surveying and laying out of all works shall be in Contractor's scope. Contractor shall maintain without disturbance during the course of execution of the work the reference line and the workbench mark.

Civil work- Micro tunnelling for EHV cable laying below railway track at Byculia Location, Mumbai Ref. No. CC25NP022	THE TATA POWER COMPANY LIMITED	
	E.1 SPECIAL CONDITIONS OF CONTRACT	SHEET 4 OF 4

14	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 enroll his and subcontractors work force to the respective safety/skills / crafts training (Levels L1/L2/L3) offered by TPSDI.
15	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.
16	Reverse Auction	Tata Power reserves the right to go for Reverse Auction (RA) for price negotiation and discover the most competitive price on Tata Power's e-Tender system. 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.
17	Special note for Statutory requirements related to contract workmen	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.
18	Free Issue Items	NA

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Section E.2: Price bid format

E.2 Price bid: Micro Tunnelling work for EHV Cable laying at Byculla location

Sr no.	Description	Qty	Unit	Rate
1	Engineering, taking permissions from Railway Authority, laying of 1400 mm diameter ID MS pipe by microtunneling, Laying of HDPE pipes with STB encasing, facilitating cable laying through these pipes and all other associated works as per tender enquiry and subsequent clarifications issued till date.	1	lumpsum	
Total Basic Rate				0
GST-18%				0
Total All Inclusive				0

Note: Above description shall be read in conjunction with the Scope of Works and Technical specifications.

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Section E.3: General Condition of Contracts

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Appendix I -

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Appendix II - Safety T & C, Tata Power policies and TATA Code of Conduct.

1. DEFINITION OF TERMS AND PRELIMINARY CONDITION OF CONTRACT

1.1 Definitions: In the Contract (as defined below), unless the context requires otherwise the words and expressions defined below shall have the meaning hereinafter assigned to them.

1.1.1 “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

1.1.2 “Annexure” means all appendices, annexure 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.

1.1.3 Not Used

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 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 Defects liability 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 Works on the Site, performance of Work, 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.

1.1.6 “Bid” means the offer of the Contractor to the Owner/Project Manager in response to the Tender Document as set forth in the Final Proposal.

1.1.7 “Business Day” means a day other than a Sunday or public holiday on which banks are open for domestic business in the city/area where project site is located.

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.

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- 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 or
 - d) If appropriate, an adjustment in one or more of the (i) Contract Prices, (ii) 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 proposal issued and signed by Owner/Project Manager requesting a change, submitted to Contractor by Owner/Project Manager.
- 1.1.12** "Change Order Request" means a written notice to Owner/Project Manager issued by Contractor indicating that a 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 Contract Agreement in relation to the Works between the Parties as may be amended, supplemented or modified from time to time by agreement in Writing between the Parties.
- 1.1.15** "Control" (including, with its correlative meanings, the term "under common Control with" or "Controlled by"), as used with respect to any person, means possession, directly or indirectly, of the power to direct or cause the direction of management or policies of any Person, whether through the ownership of voting securities, or partnership or other ownership interests, or by

contract or otherwise; it being clarified that the ownership of 26% of the voting securities of a Person, or the ability to appoint a majority of the members of the board of directors or other governing body of such Person, shall be deemed to be "Control" over such Person.

- 1.1.16** "Contract Period" or "Period of Contract" or "Contract duration" means the period from the Effective date up to and including the last day of the Defect Liability Period.
- 1.1.17** "Contract Price" or "Contract Value" or "Contract Sum" means the lump sum fixed price or unit rates of items as stated in the Contract or such price as may be modified and as payable by the Owner/Project Manager to the Contractor in consideration of it performing the Works or supply of Goods including all obligations of the Contractor under and in accordance with the provisions of the Contract.
- 1.1.18** "Contractor's Works" shall mean the places which are used by the Contractor or any of its sub-vendor / Sub-Contractor for the manufacture of equipment or fabrication of materials for the performance of Work.
- 1.1.19** "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 Works.
- 1.1.20** "Contractor" means the Person whose Bid has been accepted by the Owner/Project Manager and is awarded the Works under this Contract, and the legal successors in title to such person who satisfies the qualification criteria set forth in the Tender Documents.
- 1.1.21** "Contractor Permits" means all Permits, required by the Contractor from any Government Instrumentality for the performance of his obligations.
- 1.1.22** "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.
- 1.1.23** "Completion of Works" shall mean successful completion of all Works including Performance Tests and of 'Tests Before Taking Over' and issuance of Final Taking Over Certificate/completion certificate by the Owner/Project Manager.
- 1.1.24** Not Used.
- 1.1.25** "Consultant" shall mean Consulting Engineers appointed by the Owner/Project Manager for the Project and shall include, their duly authorised representatives.

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- 1.1.26** “Day” means a calendar Day of 24 (twenty four) hours and “Year” means 365 (three hundred and sixty five) days.
- 1.1.27** “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.
- 1.1.28** “Drawings” shall mean all:
- a) Drawings 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” or “Effective Date of Contract” or “Date of award” means the date on which the Contract comes into force and effect, i.e. the date of issue by the Owner/Project Manager of the Letter of Intent or Notice to Proceed or as defined in the Contract Agreement.
- 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 Take over” means the acceptance by the Owner/Project Manager of the Works as a whole in accordance with Contract.
- 1.1.32** “Final Payment Certificate” means the payment certificate issued by the Owner/Project Manager or his Representative thereof to the Contractor.
- 1.1.33** “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

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/or operation of the Plant; or funds for refinancing part or whole or take-out of any such financing.

- 1.1.34** “Force Majeure Event” shall have the meaning set forth in clause no. 13.0 of these Conditions of the Contract.
- 1.1.35** “Foreign Currency” means a freely convertible currency, specified in the Schedule of Prices mentioned elsewhere in Contract in which part of the Contract Price is payable, but not Indian Rupees.
- 1.1.36** “General Conditions of Contract” means these ‘Terms and General Conditions of Contract’ as mutually agreed as part of Contract.
- 1.1.37** “Goods” means all of the materials, equipments, 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.
- 1.1.38** “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 Construction and electric utility industry, taking into account conditions in India, in connection with the works of the same or similar size and type as the Relevant Package, (ii) are commonly used in prudent engineering, construction, project management and operations, and (iii) would be expected to result in performance of the Services and completion of Works in a manner consistent with Applicable Laws, Applicable permits, reliability and safety.
- 1.1.39** “Government Instrumentality” or “Government” 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.
- 1.1.40** “Guaranteed Completion Date” or “Guaranteed Completion Dates” means, individually or collectively, the Completion Date of the Works.
- 1.1.41** “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,

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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.

- 1.1.42** "Inspector" shall mean the authorised representatives appointed by the Owner or Project Manager or the Consultant or Owner's/Project Manager's Third Party Inspection Agency for purpose of the inspection of materials / Equipment / works / Services.
- 1.1.43** "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."
- 1.1.44** "Interim Payment Certificate" means any payment certificate other than Final Payment Certificate, issued by the Owner/Project Manager.
- 1.1.45** "Latent Defect" shall be the defects inherently lying within the goods or Works which do not manifest during normal inspections carried out by the Owner/Project Manager during Defect liability Period.
- 1.1.46** "Liquidated Damages" means the appropriate measures of the damages for such delays or such shortfalls in performance by the Contractor 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 relevant clause hereof.
- 1.1.47** "Manuals" means all the various instruction manuals to be provided as per the Contract by the Contractor and shall include Manuals described in Specifications or General Conditions of Contract.
- 1.1.48** "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 / work.
- 1.1.49** "Materials" means Goods and other things of all kinds to be provided and incorporated, to be used in the permanent Works / Plant/ Works 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.
- 1.1.50** "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.

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- 1.1.51** “Month” shall mean calendar month or a period of 30 (thirty) days as relevant to the context.
- 1.1.52** “Monthly Progress Report” or “Progress Report” means a progress report of the Works meeting the requirements set forth in Specification hereto or as instructed by the Owner/Project Manager.
- 1.1.53** “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.
- 1.1.54** “Other Contractor” shall mean Contractors engaged by Owner/Project Manager for carrying out other related works and other allied infrastructure facilities required for the Works.
- 1.1.55** “Owner” shall mean the Tata Power Company Limited in its capacity as Owner of the Facility and the Works and shall include its successors and assigns, as well as authorised officers. ‘Project Manager’ shall mean The TATA Power Company Limited or duly authorised representatives. “Engineer” shall mean the duly authorised representative of the Owner.
- 1.1.56** Owner’s/Project Manager’s Representative” or “Engineer” 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.
- 1.1.57** “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.
- 1.1.58** “Owner/Project Manager Permits” means the permits, authorisations, consents and approvals required by the Owner/Project Manager to own, possess, operate and maintain the Works and to operate it for intended purpose.
- 1.1.59** “Party” means Owner/Project Manager or Contractor individually and “Parties” means Owner/Project Manager and Contractor collectively.
- 1.1.60** “Permanent Works” means the Permanent Works, equipment and Materials including all Civil and 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.
- 1.1.61** “Performance Guarantees” or “Warranty” shall have the meaning set forth in Technical Specifications of Contract.
- 1.1.62** “Performance Test” means, the test to be carried out in accordance with the provisions of Technical Specifications of Contract to prove and establish the Performance Guarantees as per Technical Specifications of Contract.

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- 1.1.63** “Permit” means any valid permit, authorisation, license, registration, approval, consent, waiver, and 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.
- 1.1.64** “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.
- 1.1.65** “Preliminary Operation” means all activities undertaken as part of Commissioning after Civil and Mechanical Completion up to 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.
- 1.1.66** “Project” means the works to be performed under the scope of this Contract in accordance with the Contract documents.
- 1.1.67** “Project Documents” mean collectively this Contract, the State Implementation and Support Agreement, the Land Lease 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.
- 1.1.68** “Provisional Acceptance” or “Take Over” means the provisional acceptance by the Owner/Project Manager of the Works, pursuant to the provisions of hereof.
- 1.1.69** “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 equipments 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.
- 1.1.70** “Punch List” means the list prepared by Owner/Project Manager at the time of Provisional take over 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 take over, 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 Works fully complies with all of the standards and requirements set forth in the Contract.

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- 1.1.71** “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 Facility 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.
- 1.1.72** Not Used
- 1.1.73** “Schedule” shall have the meaning set forth in relevant clause hereof.
- 1.1.74** “Site” or “Project Site” means all those parcels of land owned by Owner/Project Manager on which the Works will be located, as more particularly identified on the site plan and described in Drawings forming part of Contract hereto.
- 1.1.75** “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 and the legal successors in title to such Person, but not any assignee of such Person.
- 1.1.76** “Take Over” or “Taking Over” shall mean Taking-over of the Works for the purpose envisaged under the Contract upon completion of the Performance Tests and fulfilling the conditions as mentioned in relevant clause hereof.
- 1.1.77** “Take over Certificate” or “Completion certificate” means the certificate issued under relevant clause hereof.
- 1.1.78** “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.
- 1.1.79** “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.
- 1.1.80** “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.
- 1.1.81** “Tests before Take Over” means the tests prescribed in the Technical Specifications mentioned elsewhere in the Contract and any other such tests as may be agreed between the Owner/Project Manager and Contractor or instructed as a Change Order, which has to be carried out by the Contractor before the Taking Over of the Works.
- 1.1.82** “Trial Operation” shall have the same meaning as per Technical Specification of Contract.
- 1.1.83** “Technical Specifications” or “Specification” means all the specifications, drawings, datasheets, BOQ, scope etc which are part of Contract and which form part of technical, performance, workmanship, warranty, scope and all other requirement of the Works as stated therein.

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1.1.84 “Warranty Period” for the Works shall mean the period as mentioned in Technical Specifications or Special conditions of Contract beginning from the date of issuance of completion certificate of Works. During this Warranty Period, the Contractor will be liable to rectify defects in the Works if any arisen.

1.1.85 “Works” or “Contract Works” or “Relevant Package” or “Project” means all the work and obligations of the Contractor under the Contract including without limitation, the Work and services described in Specifications including permanent works and temporary works as appropriate under the Contract.

1.1.86 “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 Law, Language and Measurements

1.2.1 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 , where the project is located and of the Republic of India.

1.2.2 All correspondence and documentation pertaining to this Contract shall be in the English language only. 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.

1.2.3 All measurements shall be in metric system

1.3 Stamp Duty and Similar Charges

The costs of stamp duties and similar charges imposed by law on the Contract or Agreement or any part thereof shall be borne by the Contractor.

1.4 Effective Date of Contract

The Contract shall be deemed to have come into force and effect from the date of issue by the Owner/Project Manager of the Letter of Intent or the Notice to proceed to the Contractor or as defined in the Contract Agreement.

1.5 Priority of Documents

In case of any discrepancy/conflict and/or differences in the documents constituting the work order, the order of precedence of the documents shall be as follows:

1. Work Order/Agreement
2. Letter of Intent (LOI)
3. Price Schedule (Bill of Quantity & Unit Rates)

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4. Contract Specification

- i) Scope of works
- ii) Special conditions of Contract
- iii) General conditions of Contract
- iv) Technical Requirement
- v) Drawings
- vi) Instruction to bidders

The Contractor is deemed to have full knowledge and understanding of the contents of all the foregoing documents whether contained in or incorporated by reference thereto, and accepted all the terms and conditions contained therein. In the event of any ambiguity or conflict between any of the foregoing Contract Documents, the Contractor shall, prior to commencement of the Contract work, be deemed to have clarified from the Owner/Project Manager all such ambiguities or conflicts. The order of precedence of the foregoing documents shall be the same as listed herein above.

1.6 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 and the Documents referred /mentioned in sub-clause 1.5 duly authenticated by the Owner's Representative. These Documents shall be either true copies or original documents, the same being verified as true copies by OWNER's Representative. The OWNER/PROJECT MANAGER, the Owner'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.

1.7 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 Representative, (in as many copies required) and all notices or communication, to be given to the OWNER/PROJECT MANAGER or to the Owner'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 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 representative and would need to provide the documentary evidence (correspondences received from OWNER/PROJECT MANAGER / OWNER's Representative) if required by the OWNER/PROJECT MANAGER.

1.8 Contractor's Use of Owner/Project Manager's Documents

- 1.8.1** Copyright in the Owner/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. The design, engineering, Drawings and Works layout shall be with the OWNER/PROJECT MANAGER. Contractor may, at

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its Cost, copy, use and communicate any such documents for the purposes of the Contract. They shall not, without the Owner/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

- 1.8.2** 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.

1.9 Confidential Details

- 1.9.1** 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 prior consent in writing of the OWNER/PROJECT MANAGER at the Owner/Project Manager's sole discretion.

- 1.9.2** 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 intended under the Contract.

1.10 Contract Co-ordination and Interface

- 1.10.1** From fiscal and execution considerations, the Owner/Project Manager may enter into independent stand-alone contracts with one or more Other Contractors for the other packages at the same premises.
- 1.10.2** The Contractor, shall be responsible for effective coordination and interfacing of all his contracting activities and obligations under the Contract with the activities and obligations of the Other Contractors and Related Works 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.
- 1.10.3** It is the responsibility of the Contractor to interface, coordinate and cooperate with Other Contractors. Contractor shall share all information & details about the Works which are reasonably required by Other Contractors to perform works under their respective Contracts or to integrate the Works with other Contractors' works if so required.

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1.11 Assignment

1.11.1 The whole of the works included in the Contract shall be executed by the Contractor and the Contractor shall not directly or indirectly transfer, assign, sub-contract or sublet the Contract or any part, share or interest therein nor shall he take a new partner without the written consent of the Owner/Project Manager. Without prejudice to the above, it is agreed that sub-contracting of all or part of its obligations under this Contract shall not relieve the Contractor from the full and entire responsibility of the Contract (including such obligations thereunder that have been sub-contracted) or from active superintendence of the works during their progress. There shall not be any change in Control of the Contractor without the prior written consent of the Owner / Project Manager.

1.11.2 If the Contractor shall cause any part of the work to be performed by the approved Sub-Contractor, the provisions of this Contract shall apply to such Sub- Contractor and his or its officers, agents or employees in all respects as if they were employees of the Contractor, and the Contractor shall not in any manner thereby, be discharged from his obligations and liability hereunder, but shall be liable hereunder for all acts and negligence of his Sub- Contractor, Sub-contractor's officers, agents and employees, as if they were employees of the Contractor. No sub-contract shall be made by the Contractor, without the written approval of the OWNER/PROJECT MANAGER, of both the sub-contract and the Sub- Contractor, but no such approval of the OWNER/PROJECT MANAGER, of both the sub-contract and the Sub- Contractor, shall affect the provisions hereof or serve to relieve the Contractor of any of the responsibilities and liabilities as described above. Copies of all such sub-contracts shall be furnished to the OWNER/PROJECT MANAGER immediately upon the execution thereof. The OWNER / PROJECT MANAGER may request the Contractor at any time to terminate any sub-contracting arrangement if the OWNER / PROJECT MANAGER is not satisfied with the performance of such Sub-contractor and immediately upon receipt of such request, the Contractor shall terminate such sub-contracting arrangements. The Contractor shall ensure that all sub-contracting arrangements entered into by the Contractor allow it to terminate such sub-contracting arrangements in accordance with the instructions of the OWNER / PROJECT MANAGER, as set out above.

1.12 Relationship between Parties

This Contract is on a principal-to-principal basis only and the Contractor shall act as an independent contractor in the performance of this Contract. The Contract shall not be construed as a partnership or an association of parties. 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. OWNER / PROJECT 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/Project Manager's property rights within reasonable time after the Letter of Intent 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, duly authorised Sub-contractors and workmen, shall be allowed to do Work on the Site, except by the special permission, in writing by the OWNER's representative.

2.2 Permits Licences & Approvals

2.2.1 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, in time as per the Schedule agreed in the Contract. The OWNER/PROJECT MANAGER may, at the request and cost of the Contractor assist the Contractor 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/ PROJECT MANAGER. In any case, the obligations of the Contractor as set out herein shall continue, 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 solely borne by and be the sole liability of the Contractor, without any recourse to the OWNER/PROJECT MANAGER.

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 Other Contracts and as appropriate, make information available to Contractor.
- b) 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 The Owner's representative's Duties and Authority

The OWNER may appoint separate consultant/s to provide project management consultancy services for the Project. Such consultant/s shall act as an OWNER's Representative to exercise the 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. The OWNER shall keep the Contractor informed in writing of the persons designated as the Owner's Representative in accordance with the above provisions.

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 (such as have been identified in writing by the OWNER) in accordance with the Contract. The Contractor shall not be authorised to receive instructions from any other Person without the prior written consent of the Owner and the Contractor shall be solely and entirely liable for any acts or omissions carried out under instructions from any Person other than the OWNER or a duly authorised OWNER's Representative.

3. SCOPE OF CONTRACT

3.1 General

3.1.1 The Contractor shall carry out and complete the works in every respect in accordance with this Contract and in accordance with the directions and to the satisfaction of the OWNER/PROJECT MANAGER. The OWNER/PROJECT MANAGER may at his absolute discretion from time to time issue further drawings and/or written instructions, details, directions and explanations which are hereafter collectively referred to as " OWNER/PROJECT MANAGER 'S Instructions" in regard to:

a) The variation or modification of the design, quality or quantity of works or the omission or substitution of any work.

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- b) Any discrepancy in the drawings or between the Schedule of Quantities and/or drawings and/or specification.
- c) The removal from the site of any materials brought thereon by the Contractor and the substitution of any other materials thereof.
- d) The removal and/or re-execution of any works executed by the Contractor.
- e) The dismissal from the works of any persons employed thereupon.
- f) The opening up for inspection of any work covered up.

3.1.2 The Contractor shall forthwith comply with and duly execute any work comprised in such OWNER/PROJECT MANAGER's Instructions provided always that verbal instructions, directions and explanations given to the Contractor or his Superintendent upon the works by the OWNER/PROJECT MANAGER shall, if involving a variation, be confirmed in writing by the Contractor within seven days and the OWNER/PROJECT MANAGER's written approval obtained. Rates of items not mentioned in the Schedule of Quantities and Rates shall be dealt with as extra items.

3.1.3 If compliance with the OWNER/PROJECT MANAGER's Instructions as aforesaid involves work beyond that contemplated by the Contract, then unless the same were issued owing to some breach of this Contract by the Contractor, the OWNER/PROJECT MANAGER shall pay to the Contractor the prices of the said work as an extra to be valued as hereinafter provided.

3.1.4 Free Issue Materials / Equipment (FIM) (as applicable) to the Contractor by the Owner/Project Manager:

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 :

- (a) Not used
- (b) The Contractor shall inspect the free issue materials / equipment at the time of taking delivery thereof and satisfy itself 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 shall be taken delivery of, transported, held, 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 Indigenous Material(s) shall constitute a breach by the Contractor.

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- (d) The Contractor shall transport the Free issue materials / equipment only by such transportation as is suitable and shall hold and store the Free issue materials / equipment 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. The Contractor shall exercise the at least the same level of care and diligence in respect of the use, storage, transportation or safety of the free issue materials / equipment that it exercises in respect of its own materials / equipment.
- (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.
- (g) CONTRACTOR shall ensure quarterly physical assessment of the stock of material issued to him by the OWNER/PROJECT MANAGER and submit the same in the form of Reconciliation.
- (h) The free issue materials will be supplied by the OWNER in bags, sizes and lengths or in coils as available. The cost of all wastage, due to rolling tolerance, cutting, conversion, straightening and/or fabricating shall be borne by the CONTRACTOR, at the recovery rates given in item No (i) below, as long as wastage margin does not exceed following limits:
- 1) Cement 2% - Reconciliation of cement shall be done as per standard practice as per relevant IS code and any wastage above 2% shall be recovered from the Contractor at the rate mentioned in item No (i) of clause 3.1.4 stated below.
 - 2) Structural steel at 3% of the theoretical requirements – 2.5 % is considered as visible wastage and 0.5 % as invisible wastage like gas cutting etc. Rolling tolerance if any shall be recorded separately and due credit or consideration shall be given during reconciliation. All scraps shall be the property of OWNER. The scraps shall be properly accounted for and no scrap or cut pieces shall be removed from site or disposed off without prior inspection and written permission by the ENGINEER. All scraps are deemed to be included within the above allowances. The following dimensions shall be considered for reconciliation purposes

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Structural sections less than 75 mm in any dimension - 1.2 meters and above

Structural sections exceeding 75 mm in any dimension-2.0 meters and above

Plates-Up to 12mm thickness - 200mm x 200mm and above

14mm to 25 mm thickness-300mm x 300 mm and above

25mm thickness – 400mm x 400mm and above

Provided further, if the ENGINEER so desires, the CONTRACTOR shall have to return to the OWNER cut pieces or scrap even below the dimension stated above. Due credit will be given for such return at rates to be fixed by the ENGINEER.

3) Reinforcement steel at 3% of the theoretical requirements – 2.5 % is considered as visible wastage and 0.5% as invisible wastage like cutting etc. Rolling tolerance if any shall be recorded separately and due credit or consideration shall be given during reconciliation. All scraps shall be the property of OWNER. The scraps shall be properly accounted for and no scrap or cut pieces shall be removed from site or disposed off without prior inspection and written permission by the ENGINEER. All scraps are deemed to be included within the above allowances. The following dimensions shall be considered for reconciliation purposes:

Reinforcement Steel Up to 16mm dia – 2 meters and above

Reinforcement Steel above 16mm dia – 3 meters and above

Provided further, if the ENGINEER so desires, the CONTRACTOR shall have to return to the OWNER cut pieces or scrap even below the dimension stated above. Due credit will be given for such return at rates to be fixed by the ENGINEER.

- (i) Recovery for unaccountable wastages, i.e. in excess of limits stated as above or for the material that is not reconciled, shall be made from the CONTRACTOR at prevailing market rate plus 25 %. The OWNER shall decide the quantities of materials for which such value is to be recovered and decision of the OWNER/ENGINEER shall be final and binding.

3.2 Labour and Personnel

3.2.1 The Contractor shall make his own arrangements for the engagement of all staff and labour, local or otherwise, and for their payment, housing, food 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 civil, mechanical, electrical, instrumentation and control, costing,

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scheduling, procurement, construction, start-up and training supervisors, all of whom shall follow Good Engineering Practices and shall have had extensive experience in projects of similar nature and magnitude and shall be proficient in the English language and have knowledge of standard industry 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 the construction, erection and execution of the Works and to directing the preparation of all documents required for the same. 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 & Safety personnel, all of whom shall report directly to Contractor's designated home office managers and not to the Project personnel located at the Site.
- e) CONTRACTOR shall give first preference for suitable skilled/unskilled local labours who have been affected due to implementation of this project.

The Contractor shall employ (or cause to be employed) only persons who are careful and appropriately qualified, skilled and experienced in their respective trades or occupations. Upon OWNER's/ PROJECT MANAGER's request, Contractor shall provide OWNER/ PROJECT MANAGER with the resumes of, and arrange for the interview by OWNER/ PROJECT MANAGER of, any or all personnel described in clauses (a), (b), (c) & (d) of this Section 3.2.1. In addition, OWNER/ PROJECT MANAGER will have the right to approve those individuals who will hold the positions described in clauses (a), (b), (c) and (d) of this Section 3.2.1 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) and (d) , of this Section 3.2.1 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.

3.2.2 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

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- e) Other good and sufficient reasons.

3.2.3 Rates of Wages and Conditions of Labour

Contractor shall ensure that he pays all his personnel and shall ensure and procure 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. No labourer below the age of eighteen years shall be employed in the work

No price adjustment shall be made on account of Minimum wages during contract period including extension period if any.

3.2.4 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.

3.2.5 Labour Laws

- 3.2.5.1** Any personnel engaged by the Contractor in accordance with and in pursuance of this Agreement shall be the employees / sub-contractors of the Contractor and the Contractor shall be solely liable for and responsible to such personnel. The Owner shall have no responsibility towards any such personnel and such personnel shall, in no event, be deemed to be the employees or sub-contractors of the Owner. 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 and shall at all times use its best efforts to maintain harmony among the personnel employed in connection with the Work 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

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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.

3.2.5.2 The Contractor shall be fully responsible for the due compliance by him and his sub-contractors with all statutory requirements and with all applicable labour laws including Contract Labour Abolition and Regulation Act, Workmen's Compensation Act, P.F./E.S.I., Labour welfare fund, Act, etc. as may be applicable to the Contractor, the sub-contractors and their employees. The locations where Allied Manpower Management System (On-line system) has been implemented, the Contractor shall ensure necessary declarations and documents are provided in the system, as per the role of the Contractor envisaged in the system.

The Contractor should get in touch with the local HR/IR/ES&A teams for completion of Statutory compliances before start of the work. The contractor should also ensure that he provides correct and complete PF compliance data for a wage month in the format provided by the HR/IR/ES&A teams on or before 15th of the subsequent month, failing which penalty of 1% of the value of the Invoice, per day of delay would be deducted from the Invoice raised. Further, the management will also have a right to suspend the work in case of delay in submitting the PF data.

All other compliances required by HR/IR/ES&A teams should also be provided as per timelines.

The Contractor shall fully indemnify and save harmless the Owner from and against all claims, demands, expenses, losses, liabilities, charges, actions, suits and proceedings whatsoever including claims under aforesaid Acts and laws which may be brought or made against the Owner, its Officers or servants by reason or in consequence of any matter or thing done or omitted or delaying the submission of data by the Contractor and/ or its sub-contractors and all costs, charges and expenses which may become payable by the Owner in respect thereof."

3.2.6 Working Hours

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.

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- 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 in respect thereof.

3.2.7 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/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 Project Site. Contractor shall make his own arrangements to procure and construct adequate labour housing outside the PROJECT Site and colony battery limits. No areas inside the OWNER's land and Project 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 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 land area before the start of their respective duty time.

3.2.8 Health and Safety Precautions

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. The Contractor shall pay particular attention to ensure safety of his staff and workmen and others persons in the vicinity of the Site and shall be responsible for any loss of life or injury to person due to negligence or any other causes whatsoever except natural causes. He shall provide all necessary

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fencing and lights required to prevent accidents and shall be bound to bear the expenses of defence of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with consent of the Contractor be paid to compromise any claim of any such person. Contractor shall comply with the Owner's/Project Manager's Safety Terms & Conditions, Health Safety & Environment Manual with sustainability document which is annexed to the GCC.

Without prejudice to the other provisions contained herein, the Contractor agrees to reinstate all damage of every sort mentioned in this clause so as to deliver the whole of the Contract work complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property of third parties.

The Contractor shall take all precautions necessary and shall be responsible for the safety of the work and shall maintain all lights, guards, sign boards, temporary passages, or other protection necessary for the purpose. All work shall be done at the Contractor's risk, and if any loss or damage shall result for fire or from other cause, the Contractor shall promptly repair or replace such loss or damage free from all expenses to the OWNER/PROJECT MANAGER. The Contractor shall be responsible for any loss or damage to material, tools or other articles used or held for use in connection with the work. The work shall be carried on to completion without damage to any work or property of the OWNER/PROJECT MANAGER or of others and without interference with the operation of existing machinery or equipment.

The use of explosives in a manner, which might disturb or endanger the stability, safety, or quality of the works, will not be allowed. Explosives shall be stored, handled and used as prescribed by the law and regulation of the Indian Union, the State in which the work is performed and sub-divisions thereof. Special attention must be given to immediate disposal of paper wrappings from explosives, which are poisonous to livestock.

Technical and safety evaluation of Contractor's sub-contractor shall be done jointly by Owner/Project Manager.

3.2.9 Contractor's Superintendence

The Contractor shall provide all necessary superintendence during the 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.

3.3 Permitting

3.3.1 Contractor and Construction Permits

Contractor shall obtain and maintain, all necessary permits required for the performance of its obligations hereunder, including those required for construction related activities and shall at all times, comply with all the terms and conditions as may be specified in such 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 fully indemnify and hold harmless OWNER/PROJECT MANAGER and all OWNER/PROJECT MANAGER and their respective shareholders, directors, employees and officials from any losses damages arising from and out of the Contractor's failure to secure such permits or comply with any terms and conditions stated therein.

3.3.2 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;

3.4 Co-operation

3.4.1 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 personnel of the OWNER/PROJECT MANAGER, and
- c) The personnel 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.

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3.4.2 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/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.

3.4.3 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, or damage to the works of Owner/Project Manager and/or other contractors 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 or omission of another 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, provided that the Contractor had notified the OWNER / PROJECT MANAGER of such acts or omissions of the other Contractor immediately upon the occurrence thereof.

The OWNER's Representative shall be notified promptly by the Contractor of any defects or delays 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.

The Contractor shall deploy all necessary effective manpower for coordination, expediting and construction supervision required for completion of the works to meet the stipulated quality standards & Project Schedule., In case of 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 Contractor, whether by set off against amounts payable to the Contractor under the Contract or directly, to be decided at the sole discretion of the Owner.

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Should the works be suspended by reason of strike/riots by CONTRACTOR's own employees or any other cause whatsoever which relates solely to the Contractor or the Contractor's sub-contractors and/or their respective employees and personnel CONTRACTOR shall take all precautions necessary for the protection of work and make good, at his expense, any damage arising from any of these causes and shall indemnify the OWNER for any delays arising on account thereof.

3.5 Construction Facilities, Construction Power, Construction Water Facilities, Sanitary Facilities, Telecommunication Facilities, Mail Service, Catering, Start-up Spares and Consumables

3.5.1 During the Contract Period, the Contractor shall arrange and pay for construction fuel necessary for the performance of the Work. 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 Works.

3.5.2 Construction Power Supplies

The Contractor shall be responsible for procuring power required for construction activities. However construction power may be made available at OWNER/PROJECT MANAGER's discretion at the Project Site at one point, on chargeable basis, by the OWNER and the Contractor shall make his own arrangements for further distribution of such power and shall be responsible for the maintenance of his power distribution system. The Contractor shall be responsible for payment of Energy Bills of such Construction Power till issue of Completion Certificate. The Construction Power system by its design and nature shall be a temporary system and not part of the permanent power supply.

Contractor shall be responsible for making its own assessment of the quantum of Construction Power required and shall be furnished. The Contractor acknowledges that electricity sourced from a distributing Licensee in that area through the Tata Power Company Limited 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 standby power source for all the activities/process, which requires uninterrupted power.

3.5.3 Construction and Drinking Water Facilities

The Contractor shall be responsible for procuring water required for construction and other performance of its obligations under the Contract. However, construction water may be provided by Owner/Project Manager at its discretion on chargeable basis at one point in the Project Site. Further distribution to various consumption points will be the responsibility of the Contractor. Any construction water provided by the Owner / Project Manager will be supplied on chargeable basis.

Drinking water shall be provided by Contractor for his Employees/Workmen.

3.5.4 Sanitary Facilities

Adequate sanitary facilities 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

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.

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 Owner/Project Managers and any employee of Contractors or his Sub-contractors found violating this provision shall be liable to immediate dismissal.

3.5.5 Canteen Facilities

The Contractor shall arrange for catering services for their staff and workers deployed on the project Site. Costs of catering services towards OWNER/PROJECT MANAGER / OWNER's Representative's Site staff would be borne by OWNER/PROJECT MANAGER / OWNER's Representative if services are availed.

3.5.6 Mail Service

A central mailing office shall be established and manned by the Contractor on the site where personal and business mail may be collected and delivered.

3.6 Access: Office Accommodations

Contractor shall provide OWNER/PROJECT MANAGER and its Engineers (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, 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 representatives 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.

Contractor shall provide to OWNER/PROJECT MANAGER/ OWNER's representatives as and when required appropriate office facility at the home office of Contractor.

3.7 Clean-Up and Waste Disposal

3.7.1 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.

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.

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 garbage 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.

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.

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.

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.

3.7.2 All soil, filth or other matter of an offensive nature taken out of any excavation, trench, sewer, drain, cesspool etc shall not be deposited on the surface, but shall at once be carted away by the Contractor to some pit or place suitably arranged by him away from the site of work and approved by local authorities.

3.7.3 As a part of the work included in this Contract, the Contractor shall completely remove and satisfactorily dispose of all temporary works to the extent directed. He shall tear down and dispose off all temporary buildings, shall remove or grade, to the extent directed, all embankments or coffer dams made for construction purposes shall remove all plant and equipment, shall satisfactorily dispose of all rubbish resulting from the operations under this Contract and shall do all work necessary to restore the territory embraced within the site of his operations to at least as good order and conditions as at the beginning of the work under this Contract.

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- 3.7.4** With regards to solid waste management, **Contractor** shall comply with Notification dated 29-March-2016 (Published in Gazette of India, Part II, Section 3, Subsection (ii)) by Ministry of Environment, Forest & climate change, Govt of India.

3.8 Reporting Requirements

- 3.8.1** Prior to commencement of the Contract Agreement, Contractor shall deliver to OWNER/PROJECT MANAGER/ OWNER's Representative a computer-based network Schedule in hard copy as well as a soft copy (licensed software in one computer of the Owner) in accordance with the Contract.

- 3.8.2** 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.

Contractor to have / arrange Video Conferencing facility at his HO & manufacturing plants and project site for project status reviews / discussions.

Contractor and his sub contractors will comply & follow the online document management systems requirements of the Owner / Project Manager.

3.8.3 Daily Diary and Progress Reports

A daily diary register will be kept in the OWNER/PROJECT MANAGER'S office. The Contractor will supply all detailed information every day at 9.00 hours for the day preceding and the diary will be jointly signed by the OWNER/PROJECT MANAGER/ OWNER'S Representative and the Contractor's representatives, every day in token of its correctness. A works instruction book, serially numbered will also be kept in the OWNER/PROJECT MANAGER'S office and all day-to-day instructions will be given in that book. The Contractor's representative shall report everyday to see these instructions and sign them at the bottom in token of his having seen them.

The CONTRACTOR shall supply all information regarding procurement of materials and progress of construction work, as is required by the ENGINEER for compiling the weekly progress reports. This information shall be supplied by 9.00 hours on every Monday, for the preceding week.

The CONTRACTOR shall furnish the ENGINEER with two levels of report (Weekly & Monthly) as per the format as approved by OWNER/PROJECT MANAGER.

Apart from this the CONTRACTOR is required to submit a daily report of the skilled labour and plant, equipment and other resources deployed by him at the project site. This shall include the resources of the sub-CONTRACTOR if any.

3.9 Schedule

- 3.9.1** Time is the essence of this contract. The CONTRACTOR shall, within one week of receipt of the Letter of Intent has to submit to the OWNER for his approval, a detailed work schedule adhering to the timeline as stated in Special Conditions of Contract, before starting the Work to achieve completion schedule both interim and ultimate. After the OWNER has agreed with the schedule, the CONTRACTOR shall prepare detailed program of each work front/activity breaking it down giving daily quantifiable/measure of progress. The schedules are to be reviewed periodically with the OWNER to ensure that the completion date will be met or to institute corrective steps (at no extra cost to the OWNER) to adhere to the completion dates. The OWNER reserves the right to revise the schedule at his discretion in order ensure completion within the completion date and to suit the Project requirement and such alterations shall not entitle the CONTRACTOR to any extra payment. The Contractor shall provide to the OWNER/ PROJECT MANAGER for approval within the time stated in clause 3.8.1 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 and (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, which as and when approved shall form the Schedule.
- 3.9.2** 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, including a critical path schedule.
- 3.9.3** Not Used.
- 3.9.4** 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 review 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.
- 3.9.5** CONTRACTOR shall arrange for the mobilisation of all equipment, material, personnel and all other resources to progress the work at the site to suit the completion dates of the Works. No financial, time extension or other claims for idling or under-utilisation of CONTRACTOR's resources will be entertained or paid by OWNER unless certified by OWNER's ENGINEER.
- 3.9.6** CONTRACTOR shall identify suitable quarries for uninterrupted supply of coarse and fine aggregates and sources of all other construction materials and make necessary arrangements for transportation of the same at its own cost. If quarries and sources of other materials are located faraway, CONTRACTOR shall at all times have reserve storage of all the construction materials so as not to affect the required rate of progress.

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3.10 Taxes**3.10.1 Taxes to the Contractor's Account**

- i) The price quoted by the Contractor in the Schedule of Quantities mentioned elsewhere in the Contract are inclusive of applicable taxes including CGST, SGST IGST , custom duty, royalties and/or any other duty/tax levied by Central, State Governments, local bodies or other Public bodies. The tax component (CGST, SGST & IGST) shall be shown separately in price breakup.

The agreed rates and price shall be deemed to include all materials, labour, plant & equipment and everything necessary to satisfactorily the agreed contract works, rates shall also include for everything in the Technical specifications & all activities/things required to complete the particular item. The rates shall be firm till the tenancy of Contract and shall not be subject to escalation on any ground whatsoever. The Contractor when called for by the OWNER/PROJECT MANAGER shall furnish detailed analysis in support of the rates quoted by him against each item of the Contract. The OWNER/PROJECT MANAGER reserves the right to utilise the analysis thus supplied in settling any deviations or claims arising out of this Contract.

- ii) 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 Works.
- iii) The Contractor, hereby agrees to indemnify and keep indemnified and saved harmless at all times the OWNER / PROJECT MANAGER 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.
- iv) 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.
- v) Further the OWNER/PROJECT MANAGER shall recover from the Contractor and / or adjust from the Contract Price, simple interest at the rate of Short term Prime lending 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.

3.10.2 Variation in Tax or Applicable Taxes or Introduction of New Taxes

- i) Any statutory variation in rate of applicable Indian taxes, duties, levies etc., 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 2 (two) 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 "Schedule of Quantity and Rates" as given elsewhere in the Contract, including any taxes 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.

3.10.3 The tax invoices shall contain the details to comply with the GST Law. The Contractor shall,

- i) Furnish (electronically) and communicate to the Owner, the details of Goods or Services supplied by the 10th of the month succeeding the said tax period,
- ii) Upon discovery of any discrepancy, rectify it and shall pay the tax and interest thereof,
- iii) Furnish the returns (electronically), for the inward and outward supplies of Goods and/or Services, before the specified dates as per the GST Law,
- iv) Communicate the tax paid, credits etc. as and when credited.
- v) The Invoice should clearly state the description of the goods, quantity, sale price, tax %, and tax amount;
- vi) The Invoice should be signed by an Authorized Signatory.

Bills/Invoices in the name of The Tata Power Company Ltd. with packing lists in triplicate shall be forwarded along with the equipment.

Contractor to furnish GST Registration number in all invoices as well as Owner's GST number.

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- 3.10.4** 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 contractor shall undertake to appoint a representative in India. The contractor shall pay the required amount of GST to this representative who in turn shall effect the payment of the tax to appropriate authority. Owner/Project Manager will not take any responsibility to pay GST.

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 GST return.

The agreed rates against items in schedule of quantities and shall be deemed to be inclusive of GST. The Owner/Project Manager will not pay any extra cost towards GST.

3.10.5 Withholding taxes

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 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.

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.

3.10.6 Benefit of credit for tax

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. 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

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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.

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.

3.11 Security & Safety Rules Of Owner

- 3.11.1** The site is a protected place and entry to the site is restricted. No person shall be employed or allowed on the site without the prior permission in writing from the OWNER. All persons employed or allowed at the site shall at all times conform to all regulations laid down by the OWNER.
- 3.11.2** The Contractor shall strictly follow Project Security Instructions and maintain proper control on movement of his men/materials. He shall implement the procedures for entry token/passes at his cost as required. He will record entry of all incoming materials, as no materials, which are returnable, will be permitted to be removed if not recorded at the time of entry. CONTRACTOR shall strictly abide by the rules and regulations of security and safety enforced by the OWNER. CONTRACTOR shall provide proper identity cards, badges, etc., to its personnel and to its sub-contractors and their personnel whenever directed by the OWNER. CONTRACTOR shall be solely responsible for the safety and security of its personnel and equipment.
- 3.11.3** 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. 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, Contractor at his cost shall rebuild, restore or replace such damaged

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or destroyed physical property to full satisfaction of OWNER/PROJECT MANAGER and shall fully indemnify the Owner / Project Manager for any loss or damage suffered by the Owner / Project Manager as a result of any damage thereto from the performance of the Work, whether directly or indirectly.

- 3.11.4** Contractor shall provide, and shall ensure that its Sub-contractors provide, proper and ample protection from damage or loss to the Works/other packages, the Site, equipment and construction equipment during its performance of the Work.
- 3.11.5** In the event that any of the Works are damaged or destroyed for any reason prior to acceptance of such work, Contractor shall rebuild, restore or replace the works or such items, subject to and in accordance with the Contract including Specifications. All costs irrespective of reimbursement of claims from Insurance shall be to Contractor's account.
- 3.11.6** CONTRACTOR shall adopt all safety measures/provide necessary protection to already constructed foundation/structures irrespective of the sequence of construction

3.12 Royalties and License Fees

- 3.12.1** 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 Works. Contractor should possess the valid license for the technology used in India by such Contractor from their principals/ technology providers. Contractor shall also arrange backup guarantees from their principals/ technology providers as required by the Owner/Project Manager, to demonstrate the Contractor's legal rights to use such intellectual property.

3.13 Standard for Supplies and Performance

- 3.13.1** Without limiting any other provision of Contract including Specifications, Contractor shall perform the Work and cause his Sub-contractors to perform their Work hereunder in accordance with Good Construction Practices and standards of professional care, skill, diligence and competence generally accepted in the construction industry applicable to construction & Project management practices for Structures of similar size and type as the Works.

3.14 Fire Protection

- 3.14.1** The Work procedures that have to be used during the construction / 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

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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.

- 3.14.2** 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.

- 3.14.3** 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.

- 3.14.4** 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.

- 3.14.5** Not Used

- 3.14.6** 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.

3.15 Contractor's Equipment and Owner/Project Manager's rights thereof

- 3.15.1** All equipment provided by the contractor & his Sub-contractors shall be certified, tested & valid by the competent Person. The Contractor shall provide all Contractor's 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.

- 3.15.2** 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.

3.16 Access Route to & at site

The Contractor shall be deemed to have satisfied himself as to the suitability and availability of the access routes to the Site that 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.

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.

3.17 Insurance

Contractor shall obtain and maintain all insurance required to be obtained by Contractor as per the Contract and as per statutory requirements including clause no. 4.0 hereof.

3.18 Maintenance of Schedule and Milestone Schedule

If Contractor is not performing the Work at a rate which will maintain the Schedule or the Milestone Schedule, Contractor shall at its own expense shall 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).

3.19 Work and Safety Regulations

3.19.1 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.

3.19.2 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 but not the obligation 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.

3.19.3 The OWNER's Representative shall have the right but not obligation at his sole discretion to inspect any such container or such construction plant/equipment for which Material in the

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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.

- 3.19.4** Wherever 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. Notwithstanding anything contained herein, the Contractor shall not store any petroleum products or petroleum mixtures or any other explosive material in the Site for a period in excess of 7 days, without the prior written consent of the Owner's Representative.
- 3.19.5** 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.
- 3.19.6** Periodical Examinations and all Tests 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.
- 3.19.7** 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.
- 3.19.8** 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.

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- 3.19.9** The Contractor shall provide safe working conditions to all workmen and employees at the Site including safe means of access, railings, stairs, ladders, scaffoldings, etc. The scaffoldings shall be erected under the control and supervision of an experienced and competent Person. For erection, good and standard quality of material only shall be used by the Contractor.
- 3.19.10** 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.
- 3.19.11** 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:
- Satisfy the OWNER's Representative that the appliance is in good working condition
 - Inform the OWNER's Representative of the maximum current rating, voltage and phases of the appliances
 - Obtain permission of the OWNER's Representative detailing the sockets to which the appliance may be connected.
- 3.19.12** The OWNER's Representative will not grant permission to connect until he is satisfied that:
- The appliance is in good condition and fitted with a suitable plug.
 - The appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores.
- 3.19.13** 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.
- 3.19.14** 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/equipments 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.
- 3.19.15** The Contractor shall employ necessary number of qualified, full time Electricians/Electrical Supervisors to maintain his temporary electrical installations.
- 3.19.16** 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-

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contractor's workmen/employees will also be considered as the Contractor's workmen/employees for above purpose.

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.

3.19.17 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.

3.19.18 The OWNER's Representative shall have the right at his sole discretion to stop the Work, if in his opinion the Work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and/or property, and/or equipment. In such cases, the Contractor shall be informed in Writing about the nature of hazards and possible injury/accident and he shall comply with the instructions of the OWNER's Representative including removal of shortcomings promptly. The Contractor after stopping the specific Work, can, if felt necessary, appeal against the order of stoppage of Work within 3 (three) Days of such stoppage of Work and OWNER/PROJECT MANAGER's decision in this respect shall be conclusive and binding on the Contractor.

3.19.19 The Contractor shall not be entitled for any damages/compensation for stoppage of Work due to safety reasons as provided in clause 3.19.18 above and the period of such stoppage of Work will not be taken as an extension of time for completion of Work and will not be the ground for waiver of levy of Liquidated Damages.

3.19.20 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, Works and equipment as may be prescribed from time to time without any demur, protest or contest or reservation.

3.19.21 Contractor shall engage Tata Power Skill Development Institute (TPSDI) certified labour force at the site for execution of the job. Requirement & fees for TPSDI certification shall be as per Company Policy.

3.20 Employee Identification, Project Site Security and Protection of Project Site

3.20.1 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.

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- 3.20.2** Contractor's employees shall wear identification badges provided by the Owner's Representative while on Work at Site.
- 3.20.3** Contractor shall be responsible for the security of the Works 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 take over and issuance of completion certificate
 - b)** The transfer of care, custody and control of the Works as a whole to Owner /Project Manager with the concurrence of the Owner/Project Manager, or
 - c)** Termination of the Contract.
- 3.20.4** 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 condition 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.
- 3.20.5** 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.
- 3.20.6** In the event that any of the Relevant Package or Works are damaged or destroyed for any reason prior to acceptance and Final takeover of such Relevant Package or Works, Contractor shall rebuild, restore or replace the Relevant Package/Works 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.
- 3.21 Safety Programme and Policy**
- 3.21.1** All requirements in the Safety Terms & Conditions enclosed with the Contract 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:

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- 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 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.

3.22 Affirmative Action:

3.22.1 The Owner recognizes that diversity in the workplace positively impacts business. The Owner commits itself in helping people from SC/ST background either by helping them to become entrepreneurs or by engaging workforce from SC/ST community under the contracts agreed herein. To encourage engaging SC/ST community, the owner may agree to incentivize the Contractor by paying additional 1% of the contract value, if the number of SC/ST workforce engaged in the contract exceeds 30% of the total deployed strength and 2%, if the strength goes beyond 50%. While the Contractor will assist the workforce so engaged to become self-reliant in meeting the work

expectation, the Owner will also volunteer its training resources to the extent possible to improve their employability.

The Contractor shall maintain the proper documentation of such category of the workforce engaged and the owner shall pay the incentive after its verification.

4. INSURANCE

4.1 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 shall 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.

4.2 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 including, without limitation, unemployment Insurance.

4.3 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 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.

4.4 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 Work.

4.5 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. Contractor shall also maintain Contractor's All Risk (CAR) insurance.

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.

4.6 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.

4.7 Remedy on Failure to Insure

If Contractor fails to effect and keep in force the Insurance for which it is responsible under the Contract, 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 thereof 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.

4.8 Descriptions not Limitations

The Insurance coverage referred to in this clause no. 4.0 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.

4.9 Fire Insurance

Unless otherwise instructed by the OWNER/PROJECT MANAGER, the Contractor shall on signing the Contract insure the works and keep them insured until the completion of the Contract against loss or damage by fire with a company to be approved by the OWNER/PROJECT MANAGER, in the joint names of the OWNER/PROJECT MANAGER and the Contractor for such amount and for any further sum if called upon to do so by the OWNER/PROJECT MANAGER, the premium of such further sum being allowed to the Contractor as an authorised extra. 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 shall deposit the policy and receipts for the premiums with the OWNER/PROJECT MANAGER within twenty-one days from the date of signing the Contract unless otherwise instructed by the OWNER/PROJECT MANAGER. In default of the Contractor not insuring as provided above, the OWNER/PROJECT MANAGER /OWNER'S Representative on his behalf may so insure and may deduct the premiums paid from any money due, or which may become due to the Contractor. The Contractor shall, as soon as the claim under the policy is settled, or the work reinstated by the Insurance Office should they elect to do so, proceed with all due diligence with the completion of the works in the same manner as though the fire had not occurred and in all respects under the same conditions of Contract. The Contractor, in case of rebuilding or reinstatement after fire, shall be entitled to such extension of time for completion, as the OWNER/PROJECT MANAGER may deem fit.

Notwithstanding the above, the Contractor shall provide adequate portable fire extinguishers in his work area and take all adequate precautions against fire hazard and train regularly his supervisors/workmen in fire fighting techniques.

In the event of occurrence of any fire being attributable in the opinion of the OWNER/PROJECT MANAGER /OWNER'S Representative to the Contractor's negligence, no extension of time will be granted.

4.10 Damages to Persons & Property Insurance in Respect of

- 4.10.1** The CONTRACTOR shall be responsible for all injury to persons, animals or things, and for all damage to the structural and/or decorative part of property which may arise from the operations or neglect of himself or of any of his approved SUB-CONTRACTOR or of any of his or his approved SUB-CONTRACTOR's employees, whether such injury or damage arises from carelessness, accident or any other cause whatever in any way connected with the carrying out of this Contract. The CONTRACTOR shall indemnify the OWNER/PROJECT MANAGER and hold him harmless in respect of all and any losses arising from any such injury or damage to person or property as aforesaid and also in respect of injury or damage under any applicable laws and also in respect of any award of compensation or damages consequent upon a claim in relation to such injury by a third party.

The Contractor shall have to cover personal third party insurance as per labour law/statutory requirements/applicable laws of state Government per person per incident. Third party

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insurance for damage to surrounding property shall be maintained by the Contractor per labour law/statutory requirements/applicable laws of state Government

4.10.2 The CONTRACTOR shall reinstate at his cost all damages of every sort mentioned in this clause, so as to deliver the whole of the Contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property of third parties.

4.10.3 The CONTRACTOR shall indemnify the OWNER/PROJECT MANAGER against all claims which may be made against the OWNER/PROJECT MANAGER by any member of the public, or other third party in respect of anything which may arise in respect of the works or in consequence thereof and shall at his own expense arrange to effect and maintain, until the completion of the Contract with an approved nationalised insurance company, a Policy of Insurance in the joint names of the OWNER/PROJECT MANAGER and the CONTRACTOR against such risks and deposit such policy or policies with the ENGINEER from time to time during the currency of this Contract. The CONTRACTOR shall also indemnify the OWNER/PROJECT MANAGER against all claims which may be made upon the OWNER/PROJECT MANAGER, whether under the Workmen's Compensation Act or any other Statute in force during the currency of this Contract or at common law in respect of any employee of the CONTRACTOR or any of his approved SUB-CONTRACTOR and shall at his own expense effect and maintain, until the completion of the Contract, with an approved nationalised insurance company, a Policy of Insurance in the joint names of the OWNER/PROJECT MANAGER and the CONTRACTOR against such risks and deposit such Policy or Policies with the ENGINEER from time to time during the currency of this Contract.

The CONTRACTOR shall be responsible and liable to the Owner for all losses, which may be excluded from the Insurance Policies above referred to and also for all other damage to any property arising out of or incidental to the negligent or defective carrying out of this Contract.

4.10.4 The CONTRACTOR shall also indemnify the OWNER/PROJECT MANAGER in respect of any costs, charges or expenses arising out of any claim or proceedings and also in respect of any award of compensation of damage arising on account of the above.

4.10.5 The OWNER/PROJECT MANAGER/ENGINEER shall be at liberty and is hereby empowered to deduct the amount of any damages, compensation costs, charges and expenses arising or accruing from or in respect of any such claim or damage from any sum due or to become due to the CONTRACTOR.

4.10.6 The OWNER/PROJECT MANAGER and/or ENGINEER shall not be responsible or be held liable for any damage to person or property consequent upon use, misuse or failure of any construction tools and equipment used by the CONTRACTOR or any of his SUB-CONTRACTORS even though such construction tools and equipment be furnished, rented or loaned to the CONTRACTOR or his SUB-CONTRACTORS by the OWNER/PROJECT MANAGER. The acceptance and/or use of any construction tools and equipment by the CONTRACTOR or his SUB-CONTRACTORS shall be construed to mean that the CONTRACTOR accepts all responsibility for and agrees to indemnify

and save harmless, the OWNER/PROJECT MANAGER and/or the ENGINEER from any and all claims for said damages resulting from said use, misuse or failure of such construction tools and equipment for which the OWNER/PROJECT MANAGER may be liable.

5. FOSSILS, INSPECTION & TESTING

5.1 All fossils, coins, articles of value or antiquity, human remains and structures and other remains or things of geological or archaeological or religious or artistic interest or monetary value discovered on the Site shall be the property of the OWNER/PROJECT MANAGER, except as required under applicable law. 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

5.2 Inspection and Testing

5.2.1 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 Works.

5.2.2 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 Specification. 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.

5.2.3 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

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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.

- 5.2.4** 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.
- 5.2.5** 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.
- 5.2.6** 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.
- 5.2.7** 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.
- 5.2.8** 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 Works as specified in the Contract. The Contractor shall give 15(fifteen) Days notice for inspection of indigenous Materials and 30(thirty) days for Offshore Materials. The Owner/Project Manager/Owner's Representative shall give the Contractor not less than 24 (twenty four) hours'

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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.

- 5.2.9** 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.
- 5.2.10** The Contractor shall promptly forward to the Owner/Project Manager/Owner's Representative duly certified reports of the Tests.
- 5.2.11** 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.

5.3 Rejection

If, as a result of inspection, examination or testing, the Owner/Project Manager/Owner's Representative decides that any works, 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 Works, 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 retesting 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. DELAY AND EXTENSIONS OF TIME

- 6.1** The time allowed for carrying out the work as mentioned in the Contract shall be strictly observed by the Contractor.
- 6.2** The Contractor agrees that the work shall be commenced and carried on at such points and in the order of precedence and at such times and seasons as may be directed by the OWNER/PROJECT MANAGER in accordance with the schedule for completion of the work as outlined elsewhere in the Contract. The Contractor declares that he has familiarised himself with the site and rights-of-way, with all the local conditions, and with all the circumstances which may, or are likely to affect the performance and completion of the work, and that he has allowed for such conditions. However, if a time schedule is submitted by the Contractor so as to keep the phasing of work generally in line with the time schedule drawn up and to keep the components unchanged, such time schedule after approval from the OWNER/PROJECT MANAGER, shall be accepted and complied with by the Contractor and it shall form a part of the Contract. The progress of work will be checked at regular monthly intervals and the percentage progress achieved should be commensurate with the time elapsed after the award of the Contract.
- 6.3** If the Contractor shall desire an extension of time for completion of work on the grounds of his having been unavoidably hindered in its execution or any other ground, he shall apply in writing to the OWNER/PROJECT MANAGER within 7 days of the date of hindrance on account of which he desires such extension as aforesaid. This application shall invariably be accompanied by sufficient documentation giving reasons for seeking such extension. No application for such extension shall be entertained if it is not received in sufficient time to allow the OWNER/PROJECT MANAGER to consider it and the Contractor shall be responsible for the consequences arising in relation thereto. Upon receipt, OWNER/PROJECT MANAGER may accept or reject such application.

In the event of a disruption (other than suspension by OWNER/PROJECT MANAGER) to the Schedule and if in the opinion of Contractor it is not the responsibility of Contractor or its any Sub-contractor and which might have been caused due to action of any third parties which CONTRACTOR might not have reasonably prevented, and that Contract entitles Contractor to time extension 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

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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. . Upon receipt, OWNER/PROJECT MANAGER shall take reasonable action in accordance with the Contract.

Contractor in any case has to inform to OWNER immediately upon learning of any possible hindrances to the Works which have caused or may cause delay or other impact to the Works to enable OWNER take suitable action.

6.4 No necessity for an extension of time is anticipated but if untoward or extraordinary circumstances beyond the control of the Contractor should arise, which in the opinion of the OWNER/PROJECT MANAGER should entitle the Contractor to a reasonable extension of time, such extension may be granted but shall not operate to release the Contractor from any of his obligations, other than in relation to payment of liquidated damages for such delay (only to the extent of the extension granted by the OWNER / PROJECT MANAGER. For purpose of this clause, untoward and extraordinary circumstances are defined under clause 13.0 hereinafter. Under above circumstances, only extension of time may be granted but the Contractor will not be entitled to any additional compensation. In case of strike or lockout, the Contractor shall, as soon as possible, give written notice to the OWNER/PROJECT MANAGER, but the Contractor shall nevertheless constantly use his endeavours to prevent delay and shall do all that may reasonably be required to the satisfaction of the OWNER/PROJECT MANAGER to proceed with the work.

6.5 The OWNER/PROJECT MANAGER shall have the right to order discontinuance/suspension of the work, in whole or in part, for such time as may be necessary in the opinion of OWNER. In such an event, the OWNER/PROJECT MANAGER will grant such extension of time for completion of the Contract which in its opinion is proper and/or other relief in accordance with Contract in consequence of such delay.

6.5.1 Resumption of Work

After receipt of permission or of instruction to proceed, the Contractor shall, after notice to the OWNER/PROJECT MANAGER, and together with the OWNER's Representative, examine the Works and Materials affected by the suspension. The Contractor shall make good any deterioration or defect in or loss of the Works or Materials, which has occurred during the suspension. The Work after resumption shall be started by the Contractor within 7 (seven) Days of receipt of permission or instruction to proceed.

6.6 Rate of Progress

6.6.1 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.

6.6.2 If any steps taken by the Contractor in meeting his obligations under this sub clause no. 6.6 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.

6.7 Non Performance by Contractor

6.7.1 If the CONTRACTOR, except on account of any legal restraint upon the OWNER/PROJECT MANAGER, is preventing the continuance of the work or in case of a certificate for interim payment not paid within the period for honouring certificate, shall suspend the works or in the opinion of the ENGINEER shall neglect or fail to proceed with due diligence in the performance of his part of the Contract or if he shall more than once make default in respect of Scope of Contract, the OWNER/PROJECT MANAGER and/or the ENGINEER shall have the power to give notice in writing to the CONTRACTOR requiring that the work be proceeded within a reasonable manner and with reasonable dispatch, such notice shall purport to be a notice under this clause. After such notice shall have been given, the CONTRACTOR shall not be at liberty to remove from the site of the works or from any ground contiguous thereto any plant or materials belonging to him which shall have been placed thereon for the purpose of the works and the OWNER/PROJECT MANAGER shall have a lien upon all such plant and materials to subsist from the date of such notice being given until the notice shall have been complied with. If the CONTRACTOR shall fail for 7 days after such notice has been given to proceed with the works as therein prescribed, the OWNER/PROJECT MANAGER may proceed as provided in Clause 11.0 hereinafter.

6.7.2 If the CONTRACTOR fails to perform as per the expectations of the OWNER/PROJECT MANAGER and consistently fails to achieve intermediate milestones as mentioned in the contract or fails to proceed with due diligence in the performance of his part of the contract or fails to make such due progress as would enable the works to be completed within period agreed, then in addition to the action proposed in clause 11 hereinafter, the OWNER/PROJECT MANAGER shall take recourse to the following (as per clause 6.7.3) :

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- 6.7.3** After giving 7 days notice of non-performance to the CONTRACTOR, as per clause 11 hereinafter, the OWNER/PROJECT MANAGER shall be at liberty to remove items or part of the scope of the works of this contract and get the same executed by third party at the CONTRACTOR's risk and cost. The OWNER/PROJECT MANAGER has the right to recover the cost difference between the actual amount spent by the OWNER/PROJECT MANAGER in getting these works executed by third party and the amount that would have been payable to the CONTRACTOR at the quoted rates of this contract.

7. CERTIFICATE OF COMPLETION**7.1 Certificate of Virtual Completion**

Upon successful provisional takeover of the Works as per the criteria defined in Special conditions of Contract, the OWNER/PROJECT MANAGER shall issue certificate of virtual completion to the Contractor.

7.2 Certificate of Completion

Upon successful final takeover of the Works as per the criteria defined in Special conditions of Contract, the OWNER/PROJECT MANAGER shall issue "Certificate of completion" or "Completion certificate" to the Contractor for the Works under this Contract. Defect liability period and warranties shall commence from the date of issuance of this certificate of completion.

8. LIQUIDATED DAMAGES**8.1 Liquidated Damages**

Liquidated Damages shall be as per Special Conditions of Contract

9. WARRANTIES**9.1 Contractor Warranties**

Contractor warrants to OWNER/PROJECT MANAGER with respect to the Performance of Work that all construction equipment and materials comprising the Contract Works will be new, conforming to Technical Specifications and free from defective workmanship. If OWNER/PROJECT MANAGER notifies Contractor in Writing with adequate detail of any such defects or deficiencies in the Works discovered during the applicable Warranty Period thereof, Contractor shall (a) re-perform any of the work hereunder to correct any errors, omissions, defects or deficiencies in the Works, and (b) in the case of any defective equipment or materials, at Contractor's option either repair or replace at its Cost.

9.2 Warranty Period

- 9.2.1** The Warranty Period for various items/systems shall be as per Technical Specifications or as per standard industry practice in the event it is not specified in Technical specifications.

9.2.2 To Remedy Defective Work and Defect Liability Period

If the work or any portion thereof shall be damaged in any way excepting by the acts of the OWNER/PROJECT MANAGER, or if defects not readily detected by proper inspection shall develop before the final completion and acceptance of the whole work, the Contractor shall forthwith make good, without compensation from the OWNER / PROJECT MANAGER, such damage or defects in a manner satisfactory to the OWNER/PROJECT MANAGER / OWNER's Representative. In no case shall defective or imperfect work be retained.

Duration of defect liability period shall be as stated in Special Conditions of Contract. In case any defects in the work due to bad materials and/or bad workmanship develop in the work before the expiry of this period, the Contractor on notification by the OWNER/PROJECT MANAGER shall rectify or remedy the defects at his own cost and he shall make his own arrangements to provide materials, labour, equipment and any other appliance required in this regard. The retention of Security Deposit/Performance Bank Guarantee by the OWNER/PROJECT MANAGER during this Defects Liability Period shall be as indicated in Special Conditions of Contract. In case even on due notification by the OWNER/PROJECT MANAGER, the Contractor fails to rectify or remedy the defects, the OWNER/PROJECT MANAGER shall have the right to get this done by other agencies and recover the cost incurred, by deductions from any money due or that may become due to the Contractor or from his security deposit/ Performance Bank Guarantee.

The OWNER/PROJECT MANAGER may, in lieu of such amending and making good by the Contractor, deduct from any money due to the Contractor or from his security deposit Performance Bank Guarantee, a sum to be determined by the OWNER/PROJECT MANAGER equivalent to the cost of amending such work and in the event of such security deposit/ Performance Bank Guarantee being insufficient, recover the balance from the Contractor together with any expense the OWNER/PROJECT MANAGER may have incurred in connection therewith.

The Contractor shall remain liable under the provisions of this clause notwithstanding the passing by the OWNER/PROJECT MANAGER of any certificate, final or otherwise or the passing of any accounts.

10.INTERIM AND FINAL PAYMENTS

10.1 The Contractor's organisation shall maintain an independent estimate & billing division. Contractor shall be responsible for working out the detailed quantities for various items of work, from the progressive drawings, released for construction, within two months from the date of receipt of drawings. Detailed bill of quantities along with the abstract shall be submitted to the Engineer for his approval. Increase or decrease in these approved quantities due to revision in drawings or due to Engineer's instructions shall be incorporated by the Contractor and submitted to the Engineer for revised approval within 30 days from the receipt of revised drawings/instructions.

10.2 Bills are to be submitted in the format approved by the Owner/Engineer. Interim / Final bills shall be submitted on the basis of work completed against these approved quantities. Payment will be released by the Owner on verification of work completed against these approved

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quantities. No other method for billing shall be accepted by the Owner. Each bill shall be submitted along with the detailed measurement sheets, pour cards, reconciliation statements for all the materials issued by the Owner.

- 10.3** R.A bill shall be monthly and in computerised format prepared in Microsoft-EXCEL. The bills shall be error free and accompany all the supporting documents like JMRs, quality related documents, pour card, etc. The bill shall be submitted in soft copy (non-rewritable CDs) also.
- 10.4** Any interim payments shall be regarded as payments by way of advance against the final payment only and not as payments for work actually done and completed and shall not preclude the right of OWNER/ ENGINEER from getting bad, unsound and imperfect or unskilled work to be removed and reconstructed by the CONTRACTOR or be considered as an admission of the due performance of the Contract or any part thereof in any respect or the accruing of any claim nor shall it conclude, determine or affect in any way the powers of OWNER/ENGINEER under these conditions or any of them as to the final settlement and adjustment of the payment or otherwise, or in any other way vary or affect the Contract.
- 10.5** A bill shall be submitted by the CONTRACTOR each month on or before the date fixed by the OWNER for all works executed in the previous month and OWNER shall take or cause to be taken the requisite measurement for the purpose of having the same verified. If the CONTRACTOR does not submit the bill within the time fixed as aforesaid, the ENGINEER at its discretion may depute within seven days of the date fixed as aforesaid a subordinate to measure the said work in the presence of the CONTRACTOR whose counter signature to the measurement list will be sufficient warrant and the ENGINEER may prepare a bill from such list which shall be binding on the CONTRACTOR in all respects. If the CONTRACTOR fails to countersign or to record the differences within a week from the date of measurement in the manner required by the ENGINEER then in any such event, the measurements taken by the ENGINEER or by the subordinate deputed by him as the case may be, shall be final and binding on the CONTRACTOR and the CONTRACTOR shall have no right to dispute the same.
- 10.6** The final bill shall be submitted by the CONTRACTOR within two months of the date of the certificate of completion furnished by the ENGINEER, otherwise the ENGINEER'S certificate of the measurement and the total amount payable for the work accordingly shall be final and binding on all parties.
- 10.7** The CONTRACTOR shall submit all bills in printed forms and the charges in the bills shall always be entered at the agreed rates as per the Contract or in the case of any extra work ordered in pursuance of these conditions and not mentioned or provided for in the Contract at the rates subsequently accepted by the OWNER for such work.
- 10.8** In case work is nearly or is anticipated to be suspended, or in case only unimportant progress is being made, or in case it is apparent that the CONTRACTOR is about to forfeit his Contract or that the money yet due to him will not complete his Contract, the ENGINEER may, at his discretion, withhold any payment which may be due to the CONTRACTOR.

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10.9 The CONTRACTOR shall not demand, nor be entitled to receive payment for the work any portion thereof except, in the manner set forth in this Contract and only after the ENGINEER shall have given a certificate for such payment. For final payment, when the work covered by this Contract has been completed, and Completion certificate has been issued to the Contractor, the CONTRACTOR shall prepare a final abstract showing the total amount of work done and its value under and according to the terms of this Contract. The CONTRACTOR shall attach copies of the ENGINEER's completion certificate with his final abstract. From the total value thus arrived, all previous payments will be deducted and all deductions made in accordance with the provisions of this Contract and the remainder shall be paid by the OWNER to the CONTRACTOR within three months of the date of submission of the CONTRACTOR's final bill except in case of disputed items.

10.10 Deduction from / Withholding Contractor's Bills/Payment

10.10.1 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 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.

10.10.2 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 thereof;
- 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 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 its 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.

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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 the Contract by the Contractor.

10.10.3 In addition to the provisions of the clause No.10.10.1 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.

10.10.4 Notwithstanding any dispute that Contractor may have, and regardless of the basis thereof or grounds thereof, Contractor agrees that it will, for so long as the Contract has not been terminated diligently proceed with the Works up to Final Performance Acceptance and final Take-over of Relevant Package, all in accordance with the terms of the Contract.

10.10.5 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 short term Prime Lending 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.

10.10.6 Idle time charges for any reason whatsoever shall not be borne by the OWNER.

10.11 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 takeover. 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 by Owner/Project Manager. Upon completion of the Punch List Items, Contractor may submit to Owner/Project Manager and the Owner's Representative a Request for Final Takeover and shall furnish with such a request a certificate that all Punch List Items have been completed. OWNER/PROJECT MANAGER shall examine and certify claim of Contractor of having satisfactorily attended the punch list items.

10.12 Change Orders

A Change Order shall be issued by the Owner/Project Manager in accordance with this clause, when either Owner/Project Manager or Contractor proposes to make any change in the Scope, Services, the Contract Price, the Performance Guarantees and/or the Schedule.

10.12.1 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.

10.12.2 Right to Change Order

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.

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.

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.

10.12.3 Change Order Procedure

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) 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.

10.12.4 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;

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- 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.

10.12.5 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.

10.12.6 If the Owner/Project Manager/Owner's Representative instructs or approves in Writing a Change Order, the parties shall proceed with adjustments to the Contract Price, Schedule of Payments, Performance Guarantees and/or Guaranteed Time for Completion.

10.12.7 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.

10.12.8 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.

10.13 WORK PARTLY ABANDONED

10.13.1 If any time after commencement of the work, the OWNER shall for any reason whatsoever, not require the Partly work thereof as specified in the Contract to be carried out, the ENGINEER shall give notice in writing of the fact to the CONTRACTOR who shall have no claim to any payment of compensation whatsoever on account of any profit or advantage which he might have derived from the execution of the work in full but which he did not derive in consequence of the full amount of the work not having been carried out nor shall he have any claim for compensation by reason of any change having been made in the original specifications, drawings, designs and instructions which shall involve any curtailment of the work as originally contemplated.

10.13.2 The CONTRACTOR shall be paid the charges on the cartage only of materials actually brought to the site by the CONTRACTOR and rendered surplus as a result of the abandonment or curtailment of the work or any portion thereof and taken back by the CONTRACTOR, provided however, that the ENGINEER shall have in all such cases, the right to purchase these materials at their purchase price or at current local rates whichever may be less.

11. TERMINATION BY THE OWNER/PROJECT MANAGER

If the Contractor (being an individual or a firm) commit any 'Act of Insolvency', or shall be adjudged as insolvent, or shall make an assignment or composition for the greater part in number or amount of his creditors, or shall enter into a Deed of Assignment with his creditors, or (being an Incorporated Company) shall have an order made against him or pass an effective

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Resolution for winding up either compulsorily or subject to the supervision of the Court or voluntarily, or if the Official Assignee of the Contractor shall repudiate the Contract, or if the Official Assignee or the Liquidator in any such winding up shall be unable, within seven days after notice to him requiring him to do so, to show to the reasonable satisfaction of the OWNER/PROJECT MANAGER that he is able to carry out and fulfil the Contract and if required by the OWNER/PROJECT MANAGER to give security therefor, or if the Contractor shall subcontract, assign or sublet the Contract without the consent in writing of the OWNER/PROJECT MANAGER first obtained, or if the Contractor shall charge or encumber this Contract for any payments due or which may become due to the Contractor there under, or if the ENGINEER shall certify in writing to the OWNER/PROJECT MANAGER that in his opinion the Contractor.

- i. Has abandoned the Contract, or
- ii. Has failed to commence the works, or has, without any lawful excuse under these conditions suspended the progress of the works for fourteen days after receiving from the OWNER/PROJECT MANAGER written notice to proceed, or
- iii. Has failed to proceed with the works with such due diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon, or
- iv. Has failed to remove materials from the site or to pull down and replace works within seven days after receiving from the OWNER/PROJECT MANAGER written notice that the said materials or work were condemned and rejected by the OWNER/PROJECT MANAGER under these conditions, or
- v. Has neglected or failed persistently to observe and perform all or any of the acts, matters or things required by this Contract to be observed and performed by the Contractor for seven days after written notice shall have been given to the Contractor requiring the Contractor to observe or perform the same, or
- vi. Has to the detriment of good workmanship or in defiance of the OWNER/PROJECT MANAGER's instructions to the contrary sublet any part of the Contract.

Then and in any of the said causes the OWNER/PROJECT MANAGER with the written consent of the ENGINEER may, notwithstanding any previous waiver, after giving seven days notice in writing to the Contractor, terminate the Contract. Notwithstanding any such termination, the Contractor shall continue to be responsible for all liabilities that have accrued under this Contract prior to the date of such termination. And further, the OWNER/PROJECT MANAGER with the consent of the ENGINEER by his agents or servants may enter upon and take possession of the works and all plant, tools, scaffolding, sheds, machinery, steam and other power, utensil and materials, lying upon premises or the adjoining lands or roads, and use the same as his own property or may employ the same by means of his own servants and workmen in carrying on and completing the works or by employing any other Contractor's or other persons or person to complete the works and the Contractor shall not in any way interrupt or do any act, matter or thing to prevent or hinder such other Contractor or other person or persons employed for completing and finishing or using the materials and plant for the works.

When the work shall be completed, or as soon thereafter as convenient, the ENGINEER shall give a notice in writing to the Contractor to remove his surplus materials and plant and should the Contractor fail to do so within a period of 14 days after receipt thereof by him, the OWNER/PROJECT MANAGER may sell the same by public auction and shall give credit to the Contractor for the amount so realised. The OWNER/PROJECT MANAGER shall thereafter ascertain and certify in writing under his hand what (if anything) shall be due or payable to the Contractor by the OWNER/PROJECT MANAGER, for the value of the said plant and materials so taken possession of by the OWNER/PROJECT MANAGER, and the expense or loss which the OWNER/PROJECT MANAGER shall have been put to in getting the works to be so completed, and the amount, if any owing to the Contractor and the amount which shall be so certified shall, thereupon, be paid by the OWNER/PROJECT MANAGER to the Contractor or by the Contractor to the OWNER/PROJECT MANAGER as the case may be, and the certificate of the OWNER/PROJECT MANAGER shall be final and conclusive between the parties.

12. INDEMNIFICATION

12.1 General Indemnity

12.1.1 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"), including by way of claims from third parties in respect of death or bodily injury or in respect to loss or damage to any property (other than the Works, 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 Indemnified Parties.

12.1.2 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/PROJECT MANAGER'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.

12.2 Specific Indemnification

12.2.1 Contractor shall fully indemnify, save harmless OWNER 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.
- d) Material breach by the Contractor of any provision of this Contract.

12.2.2 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 has brought on and caused the release thereof from the Project Site.

12.3 Intellectual Property Indemnification

12.3.1 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.

12.3.2 Contractor shall provide Owner/Project Manager with royalty free license for the sole purpose to operate and maintain the Relevant Package.

12.3.3 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.

12.3.4 If, in any suit or claim relating to the foregoing, a temporary restraining order or preliminary injunction 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 completion schedule, 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.

12.3.5 Final payment to the Contractor by the Owner/Project Manager will not be made while any such suit or claim remains unsettled.

12.4 Notice and Legal Defence

12.4.1 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.

12.4.2 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.

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12.4.3 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.

12.5 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.

12.6 Survival: Expiration of Indemnity

The provision of this Clause 12 shall survive final take over or the termination of this Contract; provided that neither Party shall have any indemnity obligations pursuant to this Clause 12 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 Defect Liability Period; and provided further that neither Party shall have any indemnity obligation pursuant to this Clause 12 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 Defect Liability Period.

13.FORCE MAJEURE

13.1. 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 from 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.

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- e) Natural 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.

13.2 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.

13.3 Limitations

Notwithstanding anything to the contrary contained herein:

- 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.

13.4 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.

13.5 Payment to Contractor

If, in consequence of Force Majeure, the Site 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.

13.6 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 [180 days], the Owner/Project Manager at its discretion may give to Contractor 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 Event continues, the Contract shall terminate. If the Contract is so terminated, the Owner/Project Manager shall determine the work done and pay to the Contractor all amounts due and payable for such work.

14. EXTRA ITEMS

- 14.1** Extra items if any shall be paid on the basis of vouchers of cost of materials and labour produced by the Contractor. Vouchers produced for materials, labour, machinery etc. shall be as per the prevailing market rates. The Contractor shall be paid 20 percent of the cost of materials, labour and operation of plant and machinery etc. required to execute the item towards his profit and overhead charges. Cost of materials will not be added for calculation of overheads/profits if the same is supplied by the OWNER/PROJECT MANAGER. For such extra work, the Contractor shall maintain time sheets of personnel engaged and machinery used for execution of same and get them certified by the OWNER/PROJECT MANAGER. Only such labour and plant cost based on above records, which in the opinion of the OWNER/PROJECT MANAGER is justified, shall be taken into account to determine the extra item rate.

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- 14.2** Items not covered by the Schedule of Quantities but are similar in nature to the items already covered shall be paid for, the rates being worked out on the basis of rates quoted for similar items.

15. DRAWINGS AND SCHEDULE OF QUANTITIES

- 15.1** One set of the drawings and specifications and schedule of quantities shall be furnished by the OWNER/PROJECT MANAGER to the Contractor, and OWNER/PROJECT MANAGER shall furnish, within such time as he may consider reasonable, one copy of any additional drawing/s which in his opinion may be necessary for the execution of any part of the work. Such copies shall be kept on the works and the OWNER/PROJECT MANAGER and their representatives shall at all reasonable times have access to the same, and they shall be returned to the OWNER/PROJECT MANAGER by the Contractor before the issue of the certificate for the balance of his account under the Contract. This contract and the signed drawings and specifications and schedule of quantities shall remain in the custody, of the OWNER/PROJECT MANAGER, and shall be produced by him at his office as and when required by the OWNER/PROJECT MANAGER or by the Contractor.
- 15.2** OWNER shall also supply construction drawings and details progressively during the contract period, to cover all the works envisaged in the scope of the contract. Construction drawings would be issued at the commencement of the work and subsequently to ensure that progress is maintained at the required pace, to meet the agreed work schedule of completion provided design data are available. If the Contractor apprehends any delay in construction for want of drawings and details, he shall, immediately advise the OWNER/PROJECT MANAGER in writing accordingly. In case the work is retarded or even stopped temporarily for lack of details and construction drawings to proceed with, the Contractor would be given extension of time to the extent his work has been held up for want of drawings. The OWNER/PROJECT MANAGER's decision in regard to the extension of time allowed on this account shall be final and binding.
- 15.3** Only figured dimensions on drawings will be followed and drawings to large scale shall generally take precedence over those to a smaller scale. Detailed drawings and notes appended thereon shall be deemed to form part of the specifications and to supersede the specification in case of discrepancies. However, all documents shall be considered mutually explanatory.
- 15.4** CONTRACTOR shall prepare and submit detailed fabrication drawings based on the drawings and/or instructions furnished by OWNER for structural steel and works which require further detailing for successful execution of works. OWNER's ENGINEER shall review and comment such detailed drawings submitted by CONTRACTOR. CONTRACTOR will have to re-submit the commented drawings till the OWNER approves the drawings as fit for fabrication / construction. CONTRACTOR must note that it is his responsibility to timely submit and obtain OWNER'S approval on the fabrication / detailed drawings without affecting the project progress and schedule. The CONTRACTOR must submit and adhere to fabrication / detailed drawing schedule in accordance with the project requirements and to the OWNER's satisfaction as would be decided during the kick-off meeting with him.

16. MEASUREMENT OF WORKS

- 16.1** The OWNER/PROJECT MANAGER/ OWNER'S representative may from time to time intimate to the Contractor that they require the works to be measured and the Contractor shall attend or send a qualified agent to assist the OWNER/PROJECT MANAGER and OWNER'S representative in taking such measurements and calculations and to furnish all particulars or to give all assistance required by either of them.
- 16.2** Should the Contractor not attend or neglect or omit to send such agents then the measurements taken by the OWNER/PROJECT MANAGER /OWNER'S representative or approved by them shall be taken to be the correct measurements of the work. Such measurements shall be taken in accordance with the Mode of Measurements mentioned in the specification.
- 16.3** Any claim which the Contractor may have to make in respect of such measurement shall be made by him in writing to the OWNER/PROJECT MANAGER within seven days of the date of these measurements, failing which the measurements shall be deemed to have been accepted by the Contractor.
- 16.4** Where mode of measurement is not specified, the measurements will be taken at site as per I.S. Code of Practice for Measurements. The Contractor shall give all assistance for taking measurements like steel measuring tapes, scaffolds, ladder and including surveyors with surveying instruments for checking and confirming levels.

17. NIGHT WORK

- 17.1** The Contractor is normally expected to work during daytime only and is required to complete the work in all respects as stipulated elsewhere. However, night work may be stipulated by the OWNER/PROJECT MANAGER or permitted in exigencies with prior approval of the OWNER/PROJECT MANAGER.
- 17.2** 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.

18. ARBITRATION

- 18.1** In case any dispute or difference shall arise between the OWNER/PROJECT MANAGER or the ENGINEER on his behalf and the CONTRACTOR arising out of or in relation to or concerning this Contract or the construction, meaning, operation or effect hereof or of any clause herein contained or as to the rights, duties or liabilities of the parties hereto respectively or of the ENGINEER under or by virtue of these presents or otherwise or in connection with the subject matter of these presents or arising out of or in relation thereto (except as to matters left to the sole discretion of the ENGINEER) the same shall be referred to the arbitration of a single arbitrator in case the parties can agree upon one, otherwise, to two arbitrators, one to be appointed by each party and an umpire to be appointed by the two arbitrators before entering upon the references and in either case in accordance with and subject to the provisions of the

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Indian Arbitration and Reconciliation Act 1996 or any statutory modification or re-enactment thereof for the time being in force. All arbitration proceedings shall be conducted in English language only and the decision of the arbitration tribunal constituted in accordance with the above shall be final and binding upon the parties. Each party to the dispute shall bear its own costs, unless otherwise specified by the arbitration tribunal in its order. The seat and venue of all arbitration proceedings under this Contract shall be Mumbai.

- 18.2** Work under the Contract shall, continue during the arbitration proceedings and no payments due or payable by the OWNER/PROJECT MANAGER shall be withheld on account of such proceedings.

19.SCHEDULE OF QUANTITIES - NO CLAIM BECAUSE ACTUAL QUANTITIES DIFFER FROM PRELIMINARY STATEMENT

- 19.1** The quantities of the various kinds of work to be done and materials to be furnished under this Contract which have been estimated and are set forth in the proposal or the Agreement or the Schedule of Quantities and Rates are the best available, but may not be accurate in any or all particulars and are only for the purpose of comparing on a uniform basis the bids offered for the work under this Contract
- 19.2** The CONTRACTOR agrees that neither the OWNER/PROJECT MANAGER nor the ENGINEER nor any of the employees or agents thereof shall be held responsible if any of the said estimated quantities should be found to be not even approximately correct in the construction of the work and that he will not at any time dispute or complain of such statement nor assert that there was any misunderstanding in regard to the character, size and type of work to be done or the kind or amount of the materials to be furnished or work to be done. Further, the CONTRACTOR shall make no claim for anticipated profits, for loss of profit or for damage because of a difference between the quantities of the various kinds of work to be done or materials actually delivered and the estimated quantities set forth by the OWNER/PROJECT MANAGER or the ENGINEER
- 19.3** The rates/prices quoted by the CONTRACTOR in the schedule of rates/prices shall be firm irrespective of any variation in the quantities of individual items of work and/or in the total Contract Price unless otherwise specified in Special Conditions of Contract.

20.CONTRACTOR INFORMED, AS TO THE CONDITIONS

- 20.1** The CONTRACTOR shall inspect, examine and obtain all information and satisfy himself regarding all matters and things such as right of way, surface and sub-surface water conditions to be encountered, the character of equipment and facilities needed for the prosecution of work; the location and suitability of all construction materials, the quantities of various sections of the work, and local labour conditions, relating to the execution and maintenance of the works to be carried out under the Contract or any hindrances or interference's to or with construction and maintenance of the works from any cause whatsoever including any other operation of works,

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which may or will be carried out on or adjacent to the site of the works under the Contract and shall make allowance for all such contingencies in the Contract Price and will not raise any claims or objections against the OWNER/PROJECT MANAGER in any of such matters as mentioned above.

- 20.2** The acceptance of the order or making of a Contract will be construed as evidence that such an examination was made and later claims for labour, equipment or materials required for difficulties encountered will not be allowed.
- 20.3** Any record of subsurface condition, water records and other observations which may have been made by the ENGINEER/OWNER/PROJECT MANAGER have been made with reasonable care and accuracy. Such records may be made available to the CONTRACTOR for his information, if available, but there is no expressed or implied guarantee, as to the accuracy of the records nor any interpretation of them. The CONTRACTOR shall recognise this and form his own opinion of the character of the materials to be encountered or excavated, from an inspection of the ground and put his own interpretation on records.
- 20.4** The prices quoted by the CONTRACTOR shall be based on his own knowledge and judgement of the conditions and hazards involved and not upon any representation of the OWNER/PROJECT MANAGER or ENGINEER.

21. CONTRACTOR TO PROVIDE EVERYTHING NECESSARY

- 21.1** The CONTRACTOR shall provide everything necessary for the proper execution of the Works according to the intent and meaning of the drawings, schedule of quantities and specifications taken together whether the same may or may not be particularly shown or described therein provided that the same can reasonably be inferred there from and if the CONTRACTOR finds any discrepancy therein shall immediately and in writing refer the same to the ENGINEER whose decision shall be final and binding on the parties.
- 21.2** The CONTRACTOR shall supply, fix and maintain at his cost, during the execution of any works all the necessary cantering, scaffolding, staging, planking, timbering, strutting, shoring, pumping, fencing, hoarding, watching and lighting by night as well as by day, etc required not only for the proper execution and protection of the Works, but also for the protection of the public and the safety of any adjacent roads, streets, cellars, vaults, walls, houses, buildings and all other erections, matters or things, and the CONTRACTOR shall take out and remove any or all such cantering, scaffolding, staging, planking, timbering, strutting, shoring etc. as occasion shall require or when ordered to do so and shall fully reinstate and make good all matters and things disturbed during the execution of the works to the satisfaction of the ENGINEER. The CONTRACTOR shall be paid no additional amount for the above and for any access roads to be made to reach the construction site.
- 21.3** All materials shall be new and of the best respective kinds described in the schedule of quantities and/or Technical Specifications and in accordance with the Engineer's Instructions and the CONTRACTOR shall upon the request of the ENGINEER, furnish him with all invoices,

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accounts, receipts, certificates and other vouchers, to prove that the materials comply therewith. The CONTRACTOR shall at his own cost arrange for and/or carry out any test of materials which the ENGINEER may require. The contractor shall establish and operate a full-fledged cement and concrete testing laboratory at site and depute a full time qualified QA/QC engineer for the duration of the contract at no extra cost to the Owner/Project Manager. Such full-fledged cement and concrete testing laboratory at the site shall be as per provision of IS: 456 and CONTRACTOR shall also depute an independent qualified QA/QC engineer full-time at the site for the duration of the contract.

- 21.4** It shall be the responsibility of the CONTRACTOR to unload and store in a safe and acceptable manner all construction materials as directed by the Owner/Project Manager.
- 21.5** The CONTRACTOR is required to provide and maintain all tools, and equipment and instruments necessary to perform his work. He shall provide all fuels, lubricants and compressed air for the operation and maintenance of his construction tools.
- 21.6** The CONTRACTOR is to arrange for all his requirements of such materials including but not limited to oxygen, Acetylene, pipes, ropes, welding rods etc required for performing the Works.
- 21.7** Samples of all materials to be used, whether cement, steel, bricks, rubble stone, aggregate, sand, timber, tiles, granite, finishing & building interior etc. shall be submitted by the CONTRACTOR and must be got approved by the Owner/Project Manager before they are used. Approved samples shall be kept with the Owner/Project Manager and all supplies shall strictly conform to the approved samples. Materials not strictly conforming to the samples are liable to the rejected.
- 21.8** The CONTRACTOR shall not sell, assign, mortgage, hypothecate or remove equipment or materials which have been installed or which may be necessary for the completion of the Contract without the written consent of the Owner/Project Manager.
- 21.9** CONTRACTOR shall provide and maintain at the site necessary number and type of machinery and equipment including survey instruments, TOTAL Station, Auto level etc. in good working condition for proper setting out and timely completion of the various works covered under Relevant Package. All arrangements for transporting the equipment to and from the site shall be done by the CONTRACTOR at his own expense. Contractor has to provide all the survey equipments including all technicians, helpers etc., for checking other works also if so desired by Owner with no additional cost of the Owner. No claim shall be entertained for mobilising additional equipment and/or personnel to complete the work within the stipulated time.
- 21.10** CONTRACTOR shall provide all fuels and lubricants required for the operation and maintenance of construction machinery and equipment as well as his transport vehicles.
- 21.11** CONTRACTOR shall at his cost arrange for all his requirements of such materials as, but not limited to, oxygen, acetylene, welding electrodes, ropes, form ties, turn-buckles, clamps, wiping rags and sand papers etc. which are required to satisfactorily perform his work.

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- 21.12** It shall be ensured by the CONTRACTOR that work shall proceed uninterrupted even in the event of power failures with the help of DG Sets and Diesel compressors. As such, adequate number of diesel operated machinery (such as boring rigs, concrete mixers, vibrators, welding sets, etc.) shall be provided by the CONTRACTOR as an alternative arrangement in case electrically operated machinery are proposed to be brought to site.
- 21.13** The CONTRACTOR will be required to provide at his own cost all facilities for his office, warehouse, tool room, change room or any other building/structure required to the Works.
- 21.14** CONTRACTOR shall establish his own office / shed at specified place inside/near the project site for his worker/staff. The CONTRACTOR's office/shed shall be porta-cabin type. Only the shed for storing Cement shall be in brick masonry. In addition the office/shed shall have proper ventilation lighting and sanitary facilities. CONTRACTOR shall plan their site facilities and obtain clearance from the OWNER before construction of the Office/shed.
- 21.15** All royalties shall be paid by the CONTRACTOR as also all tolls, local and other taxes, etc. at no extra cost to OWNER. The rates quoted for excavation shall include Collector's permissions for Excavation permits, Royalty payments, disposal in MCGM (Debris Cell management) approved yard etc.
- 21.16** All materials supplied by the CONTRACTOR shall be of the best quality and shall conform to the Technical Specification. Approval in writing shall be obtained from OWNER before any alternative or equivalent material is proposed to be used by the CONTRACTOR.
- 21.17** The CONTRACTOR shall get tested all materials supplied by him in a OWNER approved laboratory, as directed by ENGINEER or as specified in the corresponding code of practice, at no extra cost to the OWNER. This is in addition to furnishing the Manufacturer's Test Certificate where available.
- 21.18** CONTRACTOR shall obtain all necessary permits and licenses before commencement of work at no extra cost to OWNER.
- 21.19** The CONTRACTOR shall have PF coverage, for all workmen in his permanent employee as well as those temporarily hired by him for the said project. He shall also have ESIC cover for all workmen, permanent as well as temporary if required by law. The cost for both the above viz. PF as well as ESIC shall be deemed to have been covered in the rate quoted by contractor. The OWNER shall not pay any extra charges over and above the rates quoted for these statutory payments.
- 21.20** Ash shall be utilized in Civil Works to the extent possible without affecting the quality and engineering requirements. Vendor shall declare Ash utilization Quantity or Percentage of ash used in allied civil works. Wherever available, ash shall be made free of cost at point of generation for the purpose by Owner. The usage of ash for the purpose shall be approved by Engineer-in-charge / Order Manager .

22. TO DEFINE TERMS AND EXPLAIN PLANS

- 22.1** The various parts of the Contract are intended to be complementary to each other, but should any discrepancy appear, or any misunderstanding arise as to the import of anything contained therein, the explanation of the OWNER/PROJECT MANAGER shall be final and binding. The correction of any errors or omissions of the drawings and specifications may be made by the OWNER/PROJECT MANAGER, when such correction is necessary to bring out clearly the intention, which is indicated by a reasonable interpretation of the drawings and specifications as a whole.
- 22.2** The OWNER/PROJECT MANAGER may from time to time prepare for his own use estimates of quantities or bills of materials required for the work. Copies of such estimate or bills of materials which may be given to the CONTRACTOR for his convenience, or any lists, weights, or quantities of materials or structures which may appear on the drawings shall not be considered as finally correct, sufficiently complete, or accurately covering any portion or all the work to be done under this Contract. Such bills or estimates may be carefully assembled and prepared but their accuracy is not guaranteed. They may or may not be accurate as to any particular detail and are given only as the best information available at the time of issue of the information. It is mutually understood that any such lists or estimates are furnished to the CONTRACTOR for his convenience only and not as lists or estimates of work to be done, many necessary items of work being omitted.

23. ENGINEER TO DIRECT WORK AND ORDER ALTERATIONS, MODIFICATIONS, DELETIONS

- 23.1** The OWNER/PROJECT MANAGER shall have the right but not obligation to direct the manner in which all work under this Contract shall be conducted in so far as may be necessary to secure the safe and proper progress and the specified quality of the work, and all work shall be done and all material shall be furnished to the satisfaction and approval of the OWNER/PROJECT MANAGER.
- 23.2** Additional drawings and explanations to exhibit or illustrate details may be provided by the OWNER/PROJECT MANAGER and shall be so provided whenever necessary and shall be binding upon the CONTRACTOR. The written decision of the OWNER/PROJECT MANAGER as to the true interpretation and meaning of the drawings and specifications and of such additional drawings and explanations shall be binding upon the CONTRACTOR.
- 23.3** If at any time the CONTRACTOR's methods, materials, or equipment appear to the OWNER/PROJECT MANAGER to be unsafe, inefficient or inadequate for securing the safety of the workmen or the public, the quality of work or the rate of progress required, he may order the CONTRACTOR to increase their safety, efficiency and adequacy, and the CONTRACTOR shall comply with such orders. If at any time the CONTRACTOR's working force and equipment are, in the opinion of the ENGINEER, inadequate for securing the necessary progress, as herein stipulated, the CONTRACTOR shall, if so directed, increase the working force and equipment to such an extent as to give reasonable assurance of compliance with the schedule of completion.

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The failure of the OWNER/PROJECT MANAGER to make such demands shall not relieve the CONTRACTOR of his obligations to secure the quality, the safe conducting of the work, and the rate of progress required by the Contract, and the CONTRACTOR alone shall be and remain liable and responsible for the safety, efficiency, and adequacy of his methods, materials, working force, equipment and timely completion of job irrespective of whether or not he makes any change as a result of any order or orders received from the OWNER/PROJECT MANAGER.

23.4 The OWNER/PROJECT MANAGER shall have the power to make any alteration in, omissions from additions to the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the CONTRACTOR shall be bound to carry out the work in accordance with any instructions that may be given to him in writing by the OWNER/PROJECT MANAGER and such alterations, omissions, additions or substitutions shall not invalidate the Contract. Any altered, additional or substituted work which the CONTRACTOR may be directed to do in the manner above specified as part of the work, shall be carried out by the CONTRACTOR on the same conditions in all respects on which he agreed to do the main work and at the same rates as are specified in the Contract for the main work, unless such alterations are not identical with items of work and form extra items.

23.5 The time for completion of the work shall be extended in the time proportion that the altered, additional or substituted work bears to the original contract and the decision of the OWNER/PROJECT MANAGER shall be conclusive and binding on the CONTRACTOR.

24.CONTRACTOR'S SUPERVISION

24.1 The CONTRACTOR shall, during the whole time the work is in progress, employ a qualified engineer to be in-charge of the works with adequate experience in handing of jobs of this nature and with the prior approval of the OWNER / PROJECT MANAGER. Such engineer shall be constantly in attendance at the site during working hours. During Contractor's representative's absence during working hours, when it may be necessary to give directions and orders by the ENGINEER / OWNER/PROJECT MANAGER, such orders shall be received and obeyed by the CONTRACTOR'S engineer in-charge who may have charge of the particular part of the work in reference to which orders are given.

If requested to do so, the ENGINEER /OWNER / PROJECT MANAGER shall confirm such orders in writing. Any directions, instructions or notices given by the ENGINEER/OWNER / PROJECT MANAGER to Contractor's Engineer-in-charge shall be deemed to have been given to the CONTRACTOR. Such engineer in-charge of CONTRACTOR shall have all necessary powers to engage labour or purchase materials and proceed with the work as required for speedy execution in accordance with the Contract.

Apart from the above, a separate and independent planning and monitoring cell of adequate and suitable back-up in the form of computers and project management software (Microsoft Project or Primavera Only) shall also be available at site full time. This cell shall prepare overall and detailed construction programmes and submit weekly / fortnightly / monthly progress and hold-up reports.

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- 24.2** None of the CONTRACTOR's Superintendents, engineers, supervisors or labour should be withdrawn from the work without due notice being given to the OWNER/PROJECT MANAGER/ENGINEER; further no such withdrawals shall be made if in the opinion of the OWNER/PROJECT MANAGER/ENGINEER such withdrawals will jeopardise the required pace of progress/successful completion of the work.
- 24.3** The CONTRACTOR shall employ in or about execution of the work only such persons as are careful, skilled and experienced in their respective trades, and the OWNER/PROJECT MANAGER shall be at liberty to object to and require the CONTRACTOR to remove any person employed by the CONTRACTOR in or about execution of works who in the opinion of the ENGINEER misconducts himself or is incompetent or negligent in the proper performance of his duties and all such persons shall not again be employed upon the works without the prior permission of the OWNER/PROJECT MANAGER.
- 24.4** Neither the CONTRACTOR, the OWNER/PROJECT MANAGER nor the ENGINEER shall hire or employ any employee of the other party except by mutual consent.

25.SETTING OUT WORKS

- 25.1** The CONTRACTOR shall set out the works and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions and alignment of all parts thereof. If at any time, any error shall appear during the progress of any part of the work, the CONTRACTOR shall at his own expenses rectify such error, if called upon, to the satisfaction of the OWNER/PROJECT MANAGER.
- 25.2** The CONTRACTOR shall establish and maintain base lines and bench marks adjacent of the various sections of work. All such marks and stakes must be carefully preserved by the CONTRACTOR, and in case of their destruction by him or any of his employees, they will be replaced at the CONTRACTOR's expense.
- 25.3** The CONTRACTOR shall be responsible for the accuracy of all dimensions within the various sections of the work according to the figures of dimensions on the drawings.

26.CONSTRUCTION SUPERVISION AND WORKMANSHIP

- 26.1** The OWNER/PROJECT MANAGER will engage his own supervisory staff at the site of works as may be deemed fit. The CONTRACTOR shall afford the supervisors every facility and assistance for examining the works and materials for checking and measuring the works and materials. The supervisors shall have no power to revoke, alter, enlarge or relax any requirement of the CONTRACTOR, but may sanction any day work, additions, alterations, deviations or omissions, or any extra work whatever as may be authorised by the OWNER/PROJECT MANAGER.
- 26.2** The Supervisors engaged by OWNER/PROJECTMANAGER will act ENGINEER's representatives and shall have power to give notice to the CONTRACTOR or to his Foreman of non-approval of

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any work or materials, and such work shall be suspended or the use of such material shall be discontinued, until the decision of the ENGINEER is obtained.

- 26.3** The work shall be conducted under the general direction of the ENGINEER and is subject to inspection by his supervisors to ensure strict compliance with the terms of the Contract. No failure of the ENGINEER or his supervisors during the progress of the work to discover or to reject materials, or work not in accordance with the requirement of this Contract shall be deemed as acceptance thereof or a waiver of defects therein and no payment by the ENGINEER on partial or entire occupancy of the premises shall be construed to be an acceptance of the work or materials which are not strictly in accordance with the requirements of this Contract. No changes whatsoever to any provision of the specifications shall be made without written authorisation of the OWNER/PROJECT MANAGER.
- 26.4** The CONTRACTOR shall execute the whole and every part of the work in the most substantial and workmanlike manner as regards material and in all other respects.
- 26.5** If it shall appear to the ENGINEER/OWNER/PROJECT MANAGER that any work has been executed with unsound, imperfect or unskilled workmanship, or that any materials or articles provided by him for the execution of the work are unsound, or of a quality inferior to that contracted for, or otherwise not in accordance with the Contract, the Contractor shall on demand in writing from the ENGINEER/OWNER/PROJECT MANAGER, notwithstanding that the same may have been inadvertently passed, certified and paid for, forthwith rectify or remove and reconstruct such work in whole or in part as the case may require or as the case may be, remove such materials or articles at his own proper charge and cost. In the event of his failing to do so within seven days of receipt of the ENGINEER'S written notice thereof, or any other period mentioned in such notice, the ENGINEER may rectify or remove and re-execute the work or remove and replace with other materials and articles complained of, as the case may be, at the risk and expense of the CONTRACTOR in all respects.

Also in the event the CONTRACTOR fails to carry out the rectification within the period stipulated above, the CONTRACTOR shall be liable to pay compensation at the rate of quarter (1/4) percent of the total Contract Value, for every week or part thereof, beyond the period stipulated above, that the rectification work remain incomplete.

- 26.6** The provisional acceptance of sections of the work for the purpose of preparing partial estimates and the payment of money for such partial estimates shall not operate as a waiver of any portion of this Contract and shall not be construed so as to prevent the ENGINEER from requiring replacement of defective work that may become apparent after the said provisional acceptance and shall not be construed in any way as the basis for a claim of extra compensation for any cause whatsoever by the CONTRACTOR.

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27. UNFIXED MATERIALS WHEN TAKEN INTO ACCOUNT TO BE THE PROPERTY OF OWNER/PROJECT MANAGER

- 27.1** Wherein any certificate, of which the CONTRACTOR has received payment, the ENGINEER has included the value of any unfixed materials intended for and/or placed on or adjacent to the works, such materials shall become the property of the OWNER/PROJECT MANAGER (for any loss or damage to materials the CONTRACTOR shall be responsible) and they shall not be removed from the site, except for the works, without the written authority of the OWNER/PROJECT MANAGER.

28. INTOXICANTS

- 28.1** The CONTRACTOR shall not permit or suffer the introduction or use of intoxicating liquor upon the works embraced in this Contract, or upon any of the ground occupied or controlled by him.

29. WORK IN MONSOON AND DEWATERING

- 29.1** The construction and erection work may entail working in monsoon also. The CONTRACTOR must maintain a minimum labour force as may be required for the job and plan and execute the construction and erection according to the prescribed schedule. No extra rate will be considered for such work in monsoon.
- 29.2** During monsoon and other period it shall be the responsibility of the CONTRACTOR to keep the construction site free from accumulating of water, at his own cost.
- 29.3** During inclement weather, rains, CONTRACTOR shall suspend concreting for such time as the ENGINEER may direct and shall protect from damage all works already in progress or completed just then. All such temporary protective measures shall be at CONTRACTOR's cost and any damage to works shall be made good by the CONTRACTOR at his own expense. Upon resumption with ENGINEER's consent/notice, CONTRACTOR shall make good any deterioration or defect in or loss of the Works or Materials, which has occurred during the suspension.

30. HOLD HARMLESS CLAUSE

- 30.1** The CONTRACTOR shall be fully responsible for the due compliance by him and his sub-contractors with all statutory requirements and with all applicable labour laws including Contract Labour Abolition and Regulation Act, Workmen's Compensation Act, P.F./E.S.I., Labour welfare fund, Act as may be applicable to the Contractor, the sub-contractors and their employees. The Contractor shall fully indemnify and save harmless the OWNER/PROJECT MANAGER from and against all claims, demands, expenses, losses, liabilities, charges, actions, suits and proceedings whatsoever including claims under aforesaid Acts and laws which may be brought or made against the OWNER/PROJECT MANAGER, its Officers or servants by reason or in consequence of any matter or thing done or omitted to be done by the CONTRACTOR and/ or the sub-contractors and all costs, charges and expenses which may become payable by the OWNER/PROJECT MANAGER in respect thereof.

31. DEMOBILISATION

Upon completion of work, the CONTRACTOR shall promptly demobilise from the site and leave the place in a manner as directed by the OWNER/ENGINEER, including cleaning of the area. CONTRACTOR shall start demobilisation only after the successful completion of the contract. No equipment, plant material or personnel shall be de-mobilised from the site unless with the express consent of the OWNER's Project Manager. The OWNER reserves the right to disallow in de-mobilisation if works under this scope of this contract are not completed to his satisfaction.

32. NOT USED**33. SUSTAINABILITY**

The Contractor shall abide to the Owner / Project Manager's Corporate Environment policy, Corporate Sustainability Policy and Tata Power Sustainable Procurement Policy (enclosed).

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, Contractor shall certify that the handling, use and disposal of all materials & products shall be consistent with sound environment management.

The Contractor commits that: 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 commits 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.

34. Total Compliance to TCOC, SHE and Safety Terms & Conditions

The Contractor shall abide and comply with Owner / Project Manager's Safety, Health & Environment policies, Safety Terms & Conditions, Sustainability and TCOC manuals / documents as enclosed, in totality.

35. CHANGES IN CONSTITUTION

Where the CONTRACTOR is a partnership firm, the previous approval in writing of the ENGINEER and the OWNER / PROJECT MANAGER shall be obtained before any change is made in the constitution of the firm and where the Contractor is an incorporated entity, the previous approval in writing of the ENGINEER / PROJECT MANAGER should be obtained before any change in Control of the Contractor. Where the CONTRACTOR is an individual or a Hindu undivided family business concern, such approval as aforesaid shall likewise be obtained before the CONTRACTOR enters into any partnership agreement where-under the partnership firm would have the right to carry out the work hereby undertaken by the CONTRACTOR.

36. MISCELLANEOUS**36.1 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.

36.2 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.

36.3 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.

36.4 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.

36.5 Amendment

No amendment, waiver or consent relating to this Contract shall be effective unless it is in writing and signed by the Parties.

36.6 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 Indemnities, and is not for the benefit of any other Person.

36.7 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.

36.8 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.

36.9 Certification

The Contractor should be ISO 14001 and SA 8000 and OHSAS-18001 certified. In the event Contractor does not have the certification, then the Contractor should certify that the handling, use and disposal of the product shall be consistent with sound environment management.

36.10 Liability Limitation:

CONTRACTOR's total liability to the OWNER/PROJECT MANAGER for all matters under or arising out of this Contract, other than the Excluded Matters, is limited to 100% of the Total Contract value in aggregate. For the purposes of this clause 36.10, "Excluded Matters" shall mean liabilities arising on the Contractor on account of fraud, willful default, reckless misconduct by the Contractor or any regulatory penalties / third party claims that are made on the Owner on account of a breach of this Contract by the Contractor..

37. 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.

38. 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.

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 statutes: (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

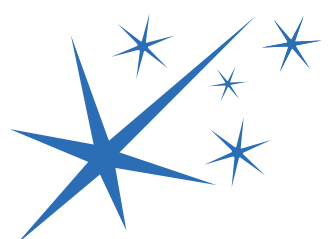
- We will uphold the values of honesty, partnership and fairness in our relationship with stakeholders
- We shall provide and maintain a clean, healthy and safe working environment for employees, customers, partners and the community
- We will strive to consistently enhance our value proposition to the 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



Supplier Code of Conduct

Tata Power follows the Tata Code of Conduct (TCoC) and the Whistle blower Policy and expect all its Suppliers to adhere to the same principles. “**Supplier**” here means any business, company, corporation, person or other entity that provides, sells or seeks to sell, any kind of goods or services to Tata Power, including the Supplier’s employees, agents and other representatives. The suppliers are expected to adhere to the following Do’s and Don’ts:

Do’s

1. The Suppliers shall be committed to supplying products and services of high quality that meet all applicable standards and laws, including product packaging, labelling and after-sales service obligations.
2. Comply with all applicable laws and regulations, both in letter and in spirit, in all the territories in which it operates.
3. Strive to provide a safe, healthy and clean working environment for its employees.
4. Strive for environmental sustainability, particularly with regard to the emission of greenhouse gases, consumption of water and energy and the management of waste and hazardous materials.
5. The Supplier shall represent our company (including Tata brand) only with duly authorised written permission from our company.
6. Safeguard the confidentiality on the use of intellectual property, information and data of the Company.
7. Gifts and hospitality given or received should be modest in value and appropriate as per Company Policy.
8. The assets of Tata Power shall be employed primarily and judiciously for the purpose of conducting the business for which they are duly authorised.
9. All actual or potential conflicts due to financial or any other relationship with a Tata Power employee shall be disclosed.

Don’ts

1. The Supplier shall not make unfair or misleading statements about the products and services of competitors.
2. Children shall not be employed at workplaces.
3. Forced labour shall not be used in any form.
4. The Suppliers shall neither receive nor offer or make, directly or indirectly, any illegal payments, remunerations, gifts, donations or comparable benefits that are intended, or perceived, to obtain uncompetitive favours for the conduct of its business with Tata Power.

Reporting Violations

The Supplier shall notify the Company regarding any known or suspected improper behaviour of other suppliers or employees relating to its dealings with Tata Power, by email to: cecounsellor@tatapower.com.

The same can also be raised through our 3rd party ethics helpline facility:

1. Email id: tatapower@ethics-line.com ; Website: www.tip-offs.com
2. Helpline numbers: Toll free - 0008001004382 and 0008001008277. Also accessible at normal domestic call rates within India: +91-11-71279005
3. Postal address: Deloitte Touche Tohmatsu India LLP
c/o Arjun Rajagopalan, Partner (Ethics Helpline Services)
19th Floor, 46 - Prestige Trade Tower, Palace Road,
High Grounds, Bengaluru, Karnataka – 560001

The Tata Power Company Ltd		<i>OPEN TENDER NOTIFICATION</i>
<i>Tender Reference: CC25NP022</i>		<i>Document Date: 10th July 2024</i>

Section E.4: Annexure to GCC

The Tata Power Company Ltd	TPC ~~ODL~~ TPS ~~ODL~~	 TATA TATA POWER	TPN ~~ODL~~ TPW ~~ODL~~	Appendix 3 to CSCC Safety Terms and Conditions
Document No. TPSMS/GSR/STC/009 REV 05				Date of Issue: 01/08/2023

Appendix 3:

Safety Terms and Conditions

Reason for Change	Date of Last Revision	Prepared By	Reviewed By	Approved by
Inclusion of Odisha Discom and periodic Revision	<u>10-Jan-2021-R4</u>	All Discom and CFT members	Debi Prasad Acharya (Head-Safety-Odisha Discom)	Suresh H Khetwani (Chief safety and Environment)

The Tata Power Company Ltd Document No. TPSMS/GSR/STC/009 REV 05	TPCODL TPSODL  TPNODL TPWODL	Appendix 3 to CSCC Safety Terms and Conditions Date of Issue: 01/08/2023

Clause	Sub-clause	Description	Page No
1.0		Objectives	3
2.0		Scope	3
3.0		Safety Organization & Responsibilities	3
	3.1	Contractor Site Management and Supervision	3
	3.2	Contractor Supervisors and General Staff	4
	3.3	Contractor Workforce	4
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4.0		<u>Tools and Tackles(R5)</u>	6
5.0		Site Safety Rules and Procedures	6
6.0		Critical safety Rules and Procedures	6
7.0		<u>General Safety Rules and Procedure(R5)</u>	8
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10.0		Safety performance retention(R5) and Safety Performance Evaluation	12
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<u>General Safety Conditions for various contracts Specific to Discom(R5)</u>			
13.0		<u>Safety Conditions for maintenance of STS (Sub Transmission System) Network for Discom(R5)</u>	14
14.0		<u>Safety Conditions for maintenance of 11 KV and LT Network for Discom(R5).</u>	15
15.0		<u>Safety Conditions for the major contract work in Civil Projects for Odisha Discom(R5)</u>	16
16.0		<u>Safety Conditions for the major contract work in Commercial Department like - MMG, RRG, EAG, etc(R5)</u>	17
17.0		<u>Safety Conditions for Major Projects in Distribution Network(R5)</u>	18
18.0		<u>Schedule of Safety Audits by BA Safety Staff(R5)</u>	19

The Tata Power Company Ltd Document No. TPSMS/GSR/STC/009 REV 05	 TPCDDL TPSDDL TPNDDL TPWDDL	Appendix 3 to CSCC Safety Terms and Conditions Date of Issue: 01/08/2023

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 through 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 through 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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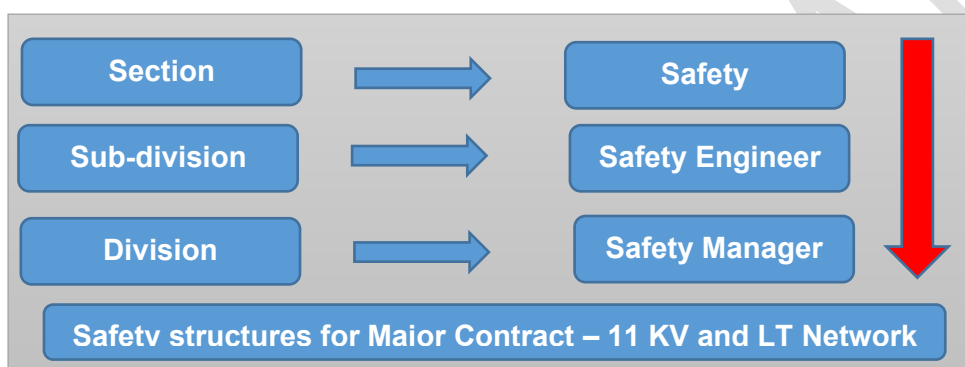
14.0 Safety Conditions for maintenance of 11 KV and LT Network.

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.

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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.
- 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:

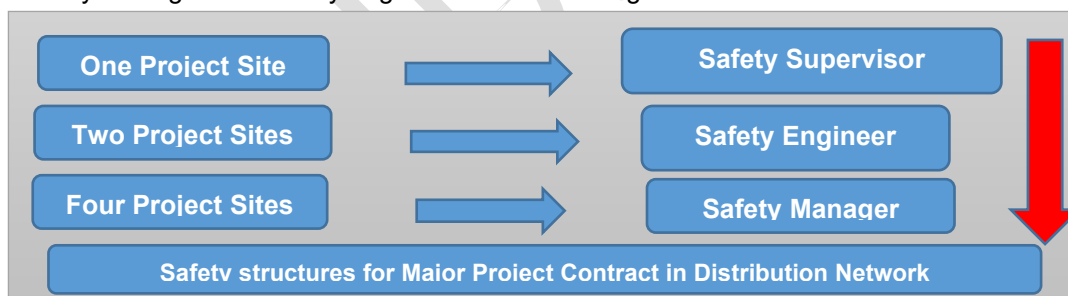
- Availability of Discharge Rods - Minimum 6 Nos. for each project site, fit for purpose and in good conditions and defective rods are removed from service.
- Availability of Neon tester - Minimum one Neon Tester in each project site, in good and working condition and defective or non-standard neon testers 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 be 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

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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.

VERIFICATION

DEPONENT

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

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 (%)
<i>Very high/High risk job/ Medium Risk jobs</i>	Up to 10 Lakhs	2.5
<i>Very high/High risk job/ Medium Risk jobs</i>	10 – 50 Lakhs	2
<i>Low/Very Low Risk jobs</i>	10 – 50 Lakhs	1
<i>Very high/High risk job</i>	0.5 to 10 Cr	2
<i>Medium Risk jobs</i>	0.5 to 10 Cr	1.5
<i>Low/Very Low Risk jobs</i>	0.5 to 10 Cr	1
<i>Very high/High risk job</i>	>10 Cr	1.5
<i>Medium Risk jobs</i>	>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---

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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 <i>with correct voltage rating and expiry date normally one year from Manufacturing date-(R7)</i> & 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.	

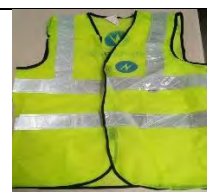
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02	HDPE Safety helmet with chin strap and ratchet type for adjustment for non-Electrical work	IS:2925-1984	Monthly and visual check every day for any crack in shell.	
03	Full body harness (Safety belt)	EN 361	Monthly and visual check every day of the 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)	<u>Signature</u>	<u>Date</u>	

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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)

						
Acute Toxic	Health Hazard	Corrosive	Dangerous For the environment	Oxidising	Highly flammable	Explosives
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*

<i>Safety Helmet / Hard Hats</i>		<i>Safety Shoe / Safety Boots</i>	
<i>Gum Boot</i>		<i>Double Lanyard Safety Harness with work positioning attachment</i>	
<i>Electrical Hand gloves</i>		<i>Other hand gloves</i>	
<i>Eye protection</i>		<i>Respiratory protection</i>	
<i>Ear Protection</i>		<i>Electrical Arc flash suit</i>	
<i>Chemical resistant suit</i>		<i>Reflective Jackets</i>	
<i>Any Other</i>		<i>Any Other</i>	

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 Earthing 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				Action Required
Sr.No.	Type of Injury	1st	2nd	3rd	4th	
1	Major Injury (Bone injury or burn or hospitalization >48 hrs.) Non-fatal	F	F	G	G	Intolerable
2	Major Injury (Bone injury or burn or hospitalization >48 hrs.) Non-Fatal (Two or more non-Fatal in one event)	G	G	H		
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)	The no. of violations shall be calculated cumulative during the contract period for all contracts in SBU, not on a monthly basis
F	Memo to BA and Levy of Penalty	Order Manager/Engineer in charge	200000	
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

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



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

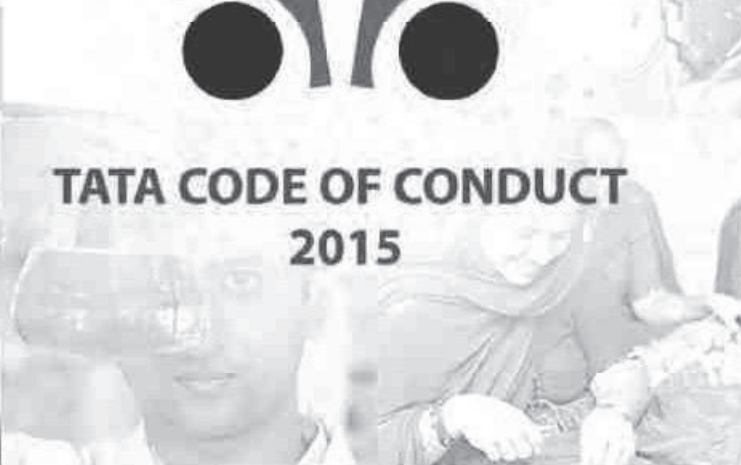
The management will commit all the necessary resources required to meet the goals of Corporate Sustainability.



(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018





**TATA 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.



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:



These universal values serve as the foundation for the Tata Code of Conduct. They find expression within the value system of every Tata company.

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.

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)

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.

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)

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.

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.

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.)

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.

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.

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.

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.

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.

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)

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.

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.

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)

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.

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)

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.

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.

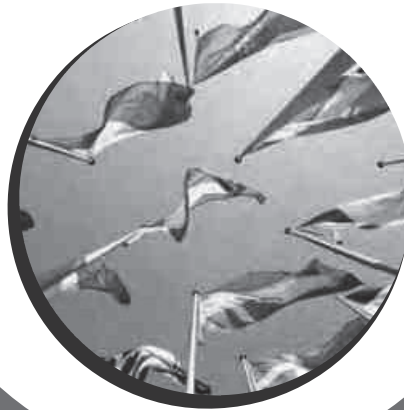
Ratan Tata

Chairman, Tata Sons (1991 – 2012)

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)

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-authorized, 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.

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)

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.

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.

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

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.

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: _____

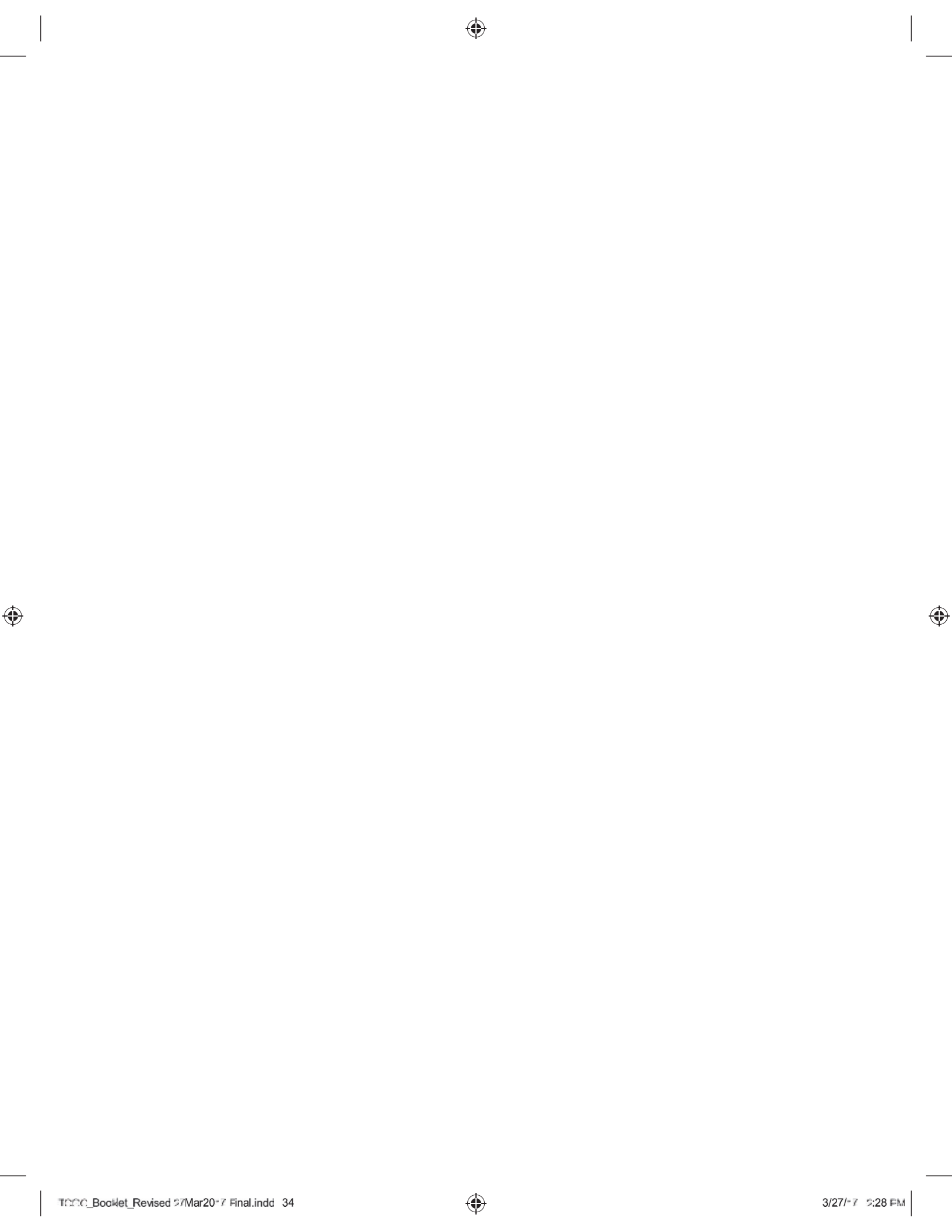
Date: _____

Name: _____

Department: _____

Address: _____

(Please submit this declaration to your Ethics Counsellor or the Human Resource department of your company.)



NOTES

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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

The Tata Power Company Ltd		<i>OPEN TENDER NOTIFICATION</i>
<i>Tender Reference: CC25NP022</i>		<i>Document Date: 10th July 2024</i>

Section F: EMD Format

CONFIDENTIAL

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.