

Ref: BHE/PW/PUR/LRPT2-RWR1-LG/2914/Corg 02

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ALL BIDDERS

Sub: Corrigendum-02: PQR amendment, Issuance of clarification, Issuance of Revised chapter-II & IV of TCC and Issuance of Revised BOQ

Job: Civil Works of Raw Water Reservoir-1 & Levelling and Grading except Block-1 at 2x800 MW NTPC Lara Stage-II

Tender Specification Number: BHE/PW/PUR/LRPT2-RWR1-LG/2914

NIC Tender ID: 2024_BHEL_32190_1

Bidders to kindly take note of the following:

AA) PQR B and C-1 are being revised as below:

SI No	Existing PQR	Amended PQR
B	<p>B Technical PQR</p> <p>Bidder shall essentially meet all the Qualifying Requirements (i.e. B.1 & B.2) as under, in the last seven years as on latest date of bid submission:</p> <p>B.1: Bidder should have Executed "Piling or Civil or Structure or 'Civil and Structural Works' or RCC Chimney or RCC Cooling Tower or RCC Silo or Mill Bunker or any combination of these works" for any one of the following in the last seven years from latest date of bid submission:</p> <p>B.1.1) Executed One work of value not less than ₹ 5988.8 Lakhs against single work order. OR B.1.2) Executed Two works each of value not less than ₹ 3743 Lakhs against maximum two work orders. OR</p>	<p>B Technical PQR</p> <p>Bidder shall essentially meet all the Qualifying Requirements (i.e. B.1 & B.2) as under, in the last seven years as on latest date of bid submission:</p> <p>B.1: Bidder should have Executed "Piling or Civil or Structure or 'Civil and Structural Works' or RCC Chimney or RCC Cooling Tower or RCC Silo or Mill Bunker or any combination of these works" for any one of the following in the last seven years from latest date of bid submission:</p> <p>B.1.1) Executed One work of value not less than ₹ 6165.6 Lakhs against single work order. OR B.1.2) Executed Two works each of value not less than ₹ 3853.5 Lakhs against maximum two work orders. OR</p>

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SI No	Existing PQR	Amended PQR
	<p>B.1.3) Executed Three works each of value not less than ₹ 2994.4 Lakhs against maximum three work orders.</p> <p style="text-align: center;">And</p> <p>B.2.1) Bidder should have executed at least 909548 Cum of Excavation in soil /Cutting in rock within a common period of twelve consecutive months in cumulative of TWO running/ completed contact. OR B.2.2) Bidder should have executed at least 702573 Cum of Earthwork in filling involving mechanical compaction within a common period of twelve consecutive months in cumulative of TWO running/ completed contact. OR B.2.3) Bidder should have executed at least 606365 Cum of Excavation in soil /Cutting in rock within a period of twelve consecutive months against ONE running/ completed contact. OR B.2.4) Bidder should have executed at least 468383 Cum of Earthwork in filling involving mechanical compaction within a period of twelve consecutive months against ONE running/ completed contact</p>	<p>B.1.3) Executed Three works each of value not less than ₹ 3082.8 Lakhs against maximum three work orders.</p> <p style="text-align: center;">And</p> <p>B.2.1) Bidder should have executed at least 757957 Cum of Excavation in soil /Cutting in rock within a common period of twelve consecutive months in cumulative of TWO running/ completed contact. OR B.2.2) Bidder should have executed at least 585477 Cum of Earthwork in filling involving mechanical compaction within a common period of twelve consecutive months in cumulative of TWO running/ completed contact. OR B.2.3) Bidder should have executed at least 530569 Cum of Excavation in soil /Cutting in rock within a period of twelve consecutive months against ONE running/ completed contact. OR B.2.4) Bidder should have executed at least 409835 Cum of Earthwork in filling involving mechanical compaction within a period of twelve consecutive months against ONE running/ completed contact</p>
C-1	Bidders must have achieved an average annual financial turnover (audited) of Rs. 2245.80 Lakhs or more over last three Financial Years (FY) i.e 2020-2021 , 2021-2022 & 2022-2023'	Bidders must have achieved an average annual financial turnover (audited) of Rs. 2312.1 Lakhs or more over last three Financial Years (FY) i.e 2020-2021 , 2021-2022 & 2022-2023'

BB) ISSUANCE OF CLARIFICATIONS:

Sr.no	Description	Existing	Bidders Query / Modification requested	BHEL's Reply
1	BOQ, ST No. 41	In ST No. (41) there is no specific size given for non woven geotextile membrane. Along with Flue Can in fabrication yard at site of bidder.	In ST No. (41) there is no specific size given for non woven geotextile membrane. Along with Flue Can in fabrication yard at site of bidder.	Refer Sec-C, NTPC Specification for Specific Size of non woven geotextile membrane
2	BOQ ST. No. A-1	<i>Supervision Services for PMX (Supplying Civil Engineers Diploma Holder having relevant experience of 5+ year of / Degree Engineer having relevant Experience of 3+ years in the field of Civil work execution, Quality or Planning, BHEL will utilize the services of Engineers as per requirement with in plant premises In any area of work. Oppointment of engineer will be done after approval from BHEL. (All statutory compliances, accomodation, Transportation of engineer etc will be in the scope of Sub- contractor)</i>	Under the above item quantity is given for 60 Man-Month, please clarify whether this quantity is only for this work or for any other work of BHEL as it is specifically mentioned that BHEL will utilize the services of Engineers as per requirement with in plant premises In any area of work. Also, please clarify for giving the quantity is 60 Man-Month as the work completion period of work as per NIT is for 20 months and there is no any provision given for maintenance period after completion	BHEL may utilize the man-power in any area of work with in plant premises till completion of work, not applicable for maintenance period after completion of work
3	BOQ		Refer BOQ item No.A-2 Handling.....50 MT - please clarify who will provide the materials. BHEL or Contractor	Pipe material shall be provided by BHEL. All consumables including rapping coating material shall be provided by agency.
	BOQ		Refer BOQ item No.25 MS Dowel Bar 45 MT- please clarify who will provide MS Dowel Bar	Shall be in bidder scope.
	BOQ		Refer BOQ Item No.38 Mild Steel Reinforcement 5 MT, who will provide the materials.	Shall be in bidder scope.
	BOQ		Item no 40: - Pressure release valve , housing pipe height is given 3.75 M which is appears to be incorrect. May please clarify	Tender condition shall prevailed

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Sr.no	Description	Existing	Bidders Query /Modification requested	BHEL's Reply
	BOQ		Specification for non-woven geotextile membrane is not given. Like thickness and GSM.	Refer Sec-C, NTPC specification

CC) Existing clause 2.17.6 of GCC of PRICE VARIATION COMPENSATION is amended as below :

Existing clause 2.17.6 of GCC	Amended clause
Base date shall be calendar month of the 'last date of submission of Tender'.	Base date shall be calendar month of the "date start of work duly certified by BHEL engineer."

DD) Chapter-II: Scope of work and Technical Specification has been revised in totality and same is enclosed for ready reference.

EE) Chapter-IV: T&Ps and MMEs to be deployed by Contractor revised in totality and revised Tool and plants is enclosed for ready reference.

Enclosure:

1. Revised-ChapterXIBOQandPercentageWeightages2914 : This Chapter revised in totality.
2. Revised-Chapter-IV: T&Ps and MMEs to be deployed by Contractor : This Chapter revised in totality.
3. Revised-Chapter-II: Scope of work and Technical Specification: This Chapter revised in totality.
4. Revised-ExcelSheetforCalculationPurposeOnly2914: This Sheet revised in totality.

All other Terms and conditions of the Tender Specification shall remain unaltered unless expressly amended by BHEL in writing.

Bidders are requested to submit as a part of Technical Bid, a copy of this corrigendum duly countersigned by the authorized signatory and stamped with the Official seal as a token of Bidder's unqualified acceptance of this corrigendum/ digitally signed.

BIDDERS WHO HAVE ALREADY SUBMITTED THEIR OFFERS PRIOR TO ISSUANCE OF THIS CORRIGENDUM IN E-TENDER PORTAL ARE REQUIRED TO RE-SUBMIT THEIR OFFER AFTER TAKING COGNIZANCE OF THIS CORRIGENDUM.

Thanking you,
Yours Sincerely,

(Purchase)

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2.0 SCOPE OF WORK:

The scope of work comprises of construction of Raw Water Reservoir-1 & Levelling and Grading of plant except block-1 and Below Ground Dismantling Works including supply of all materials, equipment and facilities for the project **except Cement, Reinforcement Steel (TMT), and Gratings that shall be supplied by BHEL free of cost as per Schedule of Items.**

2.1 The scope covers all Civil and Architectural works within the battery limits of this Package. The important works covered under this package are as below.

1. Clearance of site for all trees, stumps, roots, vegetation, rubbish and other objectionable materials.
- 2.. Cutting of trees including stacking of usable materials identified by BHEL at suitable location and disposal of unused materials at a location identified by engineer-in-charge and in a manner decided by him.
3. Complete leveling and grading of entire plant area as per drawing furnished during execution stage, specifications and as per directions of engineer in charge.
4. Disposal and stacking of surplus excavated earth at a location identified by BHEL/NTPC (Referred to as Owner here onwards).
5. Earth work for embankment.
6. Slope protection for embankment and side of filled –up area within the plot .
7. This work shall also include geo-synthetic lining, with grass turfing, supply and placing of concrete tile etc all complete as per technical specification and directed by engineer in charge.
8. Site levelling and grading including dismantling of underground/over ground structure encountered, if any.
9. Setting out substantial references marks; bench marks etc. and maintain them as long as required true to the curve, level and slopes.
10. Earthwork in excavation and backfilling including dewatering and protection of excavations for Earthen Raw Water Reservoir, Raw Water Pump House, Pipe Line, etc.
11. Construction of earthen embankment, providing sand filters, Gravel Filters, sand blanket in embankment, cut-off trench, mechanical compaction, slope protection, HDPE lining, PCC lining, non-woven geotextile, Inlet and Outlet Structures, RCC spillways.
12. Preparation and submission of detailed working drawings / plan and bar bending schedule for all reinforced concrete work and getting them approved before start of work by the BHEL Engineer.
13. Taking delivery of TMT Steel from BHEL stores / storage yards as free issue for utilization in construction work under this package

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14. Supply of all instruments and personnel for conducting necessary tests at site as specified/as directed by the Engineer.

15. Collection of materials from BHEL/client's stores/storage yard; transportation to site, Fabrication, erection, testing & commissioning, trial operation and handing over of piping, including valves, fittings, supports etc & wrapping & coating as per standards, final painting (including supply of paint, wrapping & coating), Laying of pipes and associated Civil Works, road works, construction of drains along the reservoir boundary etc. and other ancillary works associated with the completion of reservoir as per directions of the Engineer.

2.2 General Scope:

1. Furnishing all labour, materials, supervision, construction plans, equipment, supplies, transport, to and fro the site, fuel, electricity, compressed air, water, transit and storage insurance and all other incidental items and temporary works not shown on specified but reasonably implied or necessary for the proper completion, maintenance and handling over the works, except in accordance with the stipulations laid down in the contract documents and additional stipulations as may be provide by the engineer during the course of works.
2. Furnishing samples of all materials required by the engineers for testing/inspection and approval for use in the works. The samples may be retained by the engineer for final incorporation in the works.
3. Furnishing test reports for the products used or intended to be used, if called for the specifications or if so desired by the engineer.
4. Giving all notices, paying all fees, taxes, royalties etc., in accordance with the general conditions of contract as per Law of Land, that is required for all works including temporary works.
5. Arranging manufacturer's supervision for items of work done as per manufacturer's specifications when so specified.
6. Carrying out topographic survey of the entire and establish levels and coordinates at suitable intervals from existing grid levels and coordinates furnished by the owner established bench marks, setting out the locations and levels of proposed structures, constructions and marking of reference pillars and other identification works etc., The contractor shall provide the owner/BHEL such a assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used.
7. Providing all incidental items not shown or specified but reasonably implied or necessary for the successful completion of the work in accordance with contract.
8. Arranging for joint checking (with BHEL / BHEL's Customer / Consultant) of all site construction activities Preparation of joint protocols for each & every activity and maintaining quality records for audit/inspection as per approved FQP by BHEL.

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9. Contractor shall set up suitable storage facilities for Cement, sand, deck plate, bolts, aggregate, reinforcement steel, structural steel, handrail, grating, foundation bolts, shuttering item, inserts, water proofing material, admixture other BOI's etc. and all are stored properly as per IS recommendation/technical specifications/ manufacturer recommendation. Wastage due to lapse of storing will be because of contractor.
10. The drawings enclosed with this tender are intended to give the tenderer a general idea of the type and extent of work involved. The drawings are as such only indicative and not to be considered as the exact construction drawings.

Further this is to be noted that the drawings and the documents furnished along with this specification are the sole property of BHEL. It must not be used directly or indirectly in any way detrimental to the interest of the company.
11. BHEL at its discretion may include other area works, limited to 15% of awarded contract value, although not be specially mentioned in above scope of works. All such incidental works not specified but reasonably implied and necessary for completion of the project as a whole, contractor shall execute the works as desired and as directed by BHEL engineer which is binding on the contractor. The item rates & contract conditions shall remain unchanged for such works.
12. The scope of work will also include such other related works although they may not be specifically mentioned in the above paragraph and all such incidental items not specified but reasonably imply and necessary for completion of the job as a whole all as desired and as directed by the engineer.
13. The detail scope of work covered above is not a comprehensive list of items of work involved. The detail scope of work may vary considerably depending on the actual construction requirements as per RFC Drawings.
14. **Setting Up of Laboratory Works:** The contractor shall set up laboratory in the very close vicinity of the work site as required field QA & QC laboratory set up and as the directions of engineer-in-charge. The laboratory shall be equipped with latest testing equipment in sufficient number to carry out all the tests as required under a contract. The contractor should ensure that the equipment is available well in advance of starting of the work to avoid stoppage of work on this account. All the tests shall be carried out by the contractor in the presence of the Engineer's representative and a joint record of all observations and results thereof shall be maintained, and available with the Engineer. **Bidder can tie up with approved third party Lab for testing.**
15. In certain cases, Crushed Stone Sand/M-Sand may be added to Natural sand in order to achieve the required grading with prior approval of the Customer/Consultant and subsequent design mix report from reputed institute like IITs/NITs/Any Other Government Institutes as approved by BHEL/NTPC. Crushed Stone Sand/M-sand alone may be used only with the prior approval of the BHEL Engineer/Customer/Consultant for filling and Concreting works.

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16. The bidder shall quote his price considering only River Sand usage. If crushed stone sand/M-sand (arranged by contractor) is used in place of river sand, suitable rebate (rate shall be mutually decided based on market rate with applicable BHEL overhead) of M-Sand consumed shall be applicable for all items/ works where M-Sand is used in place of River sand.

Measurement for the rebate shall be calculated based on quantity of M-Sand consumed in the particular item, not on the quantity of the particular item.

17. **Labour and Staff Colony:** The following are in the Bidder's scope of work for labour & staff colony:

- Development of Bidders temporary staff colony and labour colony having adequate no. of rest rooms along with toilets & fencing etc. (enclosing drawing for ready reference).
- All Civil and Structural work associated with drinking and service water for Bidder's labour and other personnel at the work site/colony/offices including pump houses, pipes, overhead tank, tube wells etc.
- Providing and maintaining facilities for safety, welfare, drinking water and sanitation, hygiene, biennial health check-up etc. for construction workers at their workplaces as well as at labour & staff colonies.
- The facilities for occupational safety, healthy environment, first aid, drinking water, resting place & toilets, canteen, crèche, etc. shall be provided at the workplace for construction workers by the contractor.
- Development and maintenance of above facilities for construction workers hired by the Contractor shall solely rest with the Contractor.

2.3 Preamble for the schedule of quantities/BOQ:

1. Details of the items in this Schedule shall be read in conjunction with the Corresponding Consultants/ NTPC specifications, drawings and other documents and shall have precedence over any contrary statement mentioned anywhere in this document.
2. The work shall be carried out as per construction drawings, specifications, the description of the items in this schedule and/or Engineer's instructions, Drawings enclosed with these documents are only indicative giving some idea of the type of work involved. The layout, sizes and details of the building, structures and foundations shown in tender drawings may vary at a large extent during actual construction. Final drawings will be issued progressively during the execution of the work.
3. Items of work provided in this schedule but not covered in the specifications shall be executed strictly as per instructions of the Engineer.
4. Unless specifically mentioned otherwise in the contract, the bidder shall quote his rates for the finished items and shall provide for the complete cost towards fuel, tools,

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tackle, equipment, constructional plant, temporary works, labour materials, levies, taxes, transport, layout, repairs, rectification, maintenance till handing over, supervision, shops, establishments, services, temporary roads, revenue expenses, contingencies, overheads, profits and all incidental items not specifically mentioned but reasonably implied and necessary to complete the works according to the contract.

5. The rate quoted shall be inclusive of cleaning the site of any vegetation, dressing and levelling etc., required for commencement of site activities. The rates shall also be inclusive of final micro grading before handing over. No separate payment will be made towards the same.
6. The rate shall also be inclusive of carrying out topography survey of site to establish levels and coordinates at suitable intervals, from existing grid levels and coordinates furnished by the owner, establish bench marks, setting out the location and levels of the proposed structures, constructions and making references, pillars and other identification marks etc. No separate payment will be made towards the same.
7. The quantities of the various items mentioned in the schedule are approximate and may vary up to any extent or be deleted altogether. The overall variation in contract value on execution shall be dealt as per GCC. Contractor has to obtain prior approval of BHEL/ NTPC before procurement of bought out items/ building materials.
8. Engineer decision shall be final and binding on the contractors regarding clarification of items in this schedule with respect to the other section of the contract.
9. In case of any discrepancy between item description, relevant drawing and/or specification, clarification shall be sought at tender stage itself. Otherwise it shall be assumed that the bidder has quoted for the more stringent requirement.

2.4 Hierarchy:

In case of any conflict/deviations amongst various documents, the order of precedence shall be as follows:

- (1) Statutory Regulations
- (2) BOQ Items in Schedule of quantities
- (3) Technical specification (NTPC)/ Technical specifications (Section-C)
- (4) IS standards
- (5) BHEL's standard specification (Section D)

2.5 Construction Power (Chargeable):

1. Construction power (three phase, 415 V/ 440 V) will be provided chargeable at one point near the site at a distance of approx. 500M. Further distribution shall be arranged by the contractor at his own cost and services. Contractor shall be responsible for fulfilment of all requirements including statutory requirements in this

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regard. Contractor shall deploy and install required energy meter, cables, fuses, distribution boards, switchboards, bus bars, earthing arrangements, protection devices and any other installation as specified by statutory authority/act. Contractor shall also obtain approvals of appropriate authority and pay necessary fees, levies etc towards the clearance of such installations, prior to use at no cost to BHEL. Sufficient power factor compensation equipments like capacitor shall be provided by contractor for reactive loads like welding machines etc. In case of any fine/penalty on account of low power factor, same shall be shared by contractor proportionately according to power consumption.

2. Contractor shall make necessary arrangements for onward distribution of construction power taking due care of surrounding construction activities like movement of cranes & vehicles, civil work, fabrication/construction/assembly/ erection etc. and safety of personnel. It may become necessary to relocate some of the installations to facilitate work by other agencies or by him.
3. It shall be the responsibility of the Contractor to provide, maintain the complete installation on the load side of the supply with due regard to the safety requirements at site. All cabling and installations shall comply in all respects with the appropriate statutory requirements. The installation and maintenance of this shall be done by licensed and experienced electrician.
4. While reasonable efforts will be made to ensure continuous electric power supply, interruptions cannot be ruled out and no claim from the Contractor shall be entertained on this account such as idle labor, extension of time etc. The Contractor shall adjust his working shift accordingly and deploy additional manpower, if necessary, so as to achieve the target.
5. **Contractor to note that till construction power is made available by BHEL (approx. within 5 months from start of work); contractor shall make his own arrangement like DG set etc. The contractor shall also take the approval/ permission of statutory authorities for his DG set installation.** The Contractor has to make his own arrangement for the same as required to carry out the job under the scope of work within the quoted rate. Nothing extra shall be paid on this account of DG set up and running for construction and office maintenance etc.
6. Contractor shall be well equipped with back-up power supply arrangement like DG set and diesel operated welding machine etc. to tackle situations arising due to failure of supplied power, so as to ensure continuity and completion of critical processes like Operation of Batching Plant, Concreting, etc. that are underway at the time of power failure or important activities planned in immediate future.
7. BHEL is not responsible for any loss or damage to the Contractor's equipment as a result of variations in voltage or frequency or interruptions in power supply.

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8. Contractor is advised to maintain the calibrated energy measuring instruments and use their system as efficiently as possible to maintain the HT side input energy meter reading and LT side outgoing energy meter reading to sub-contractors as equal.
9. The bidder will have to Procure & install General mobile illumination system during construction right from start of his work. This system will include temporary pole lighting, portable lighting towers with DG back-up, within the quoted price. The illumination should be such that minimum illumination requirement as specified by Indian standards for general illumination is maintained.
10. Contractor to arrange energy meter for office.

General:

If any other voltage level (other than normally available) is required, the same shall be arranged by the contractor from power supply as above. Contractor will have to provide at his own cost necessary calibrated energy meters (tamper proof, suitably housed in a weather proof box with lock & key arrangement) at point of power supply along with calibration certificate from authorized/ accredited agency for working out the power consumption. In case of recalibration required for any reason the necessary charges including replacement by calibrated meters is to be borne by the contractor. Supply of electricity shall be governed by Indian Electricity Act and Installation Rules and other Rules and Regulation as applicable. The contractor shall ensure usage of electricity in an efficient manner and the same may be audited by BHEL time to time. In case of any major deviation from normally accepted norms is observed, BHEL will reserve the right to impose penalty as deemed fit for such cases.

Contractor to arrange calibrated energy meter (tamper proof, suitably housed in a weather proof box with lock & key arrangement) **for office** and this construction power at office is chargeable as per applicable tariff rates.

2.6 Construction water:

Arrangement of construction water is in bidder's scope in all stages of work.

2.7 Field Quality Assurance:

The contractor shall be responsible for day-to-day quality checks of concrete and other building materials during the progress of work. All quality records and log sheets shall be maintained as per the requirement of BHEL/BHEL'S customer and as per field quality plan approved by BHEL/ BHEL'S customer.

2.8 Handling of Materials issued by BHEL free of cost:

1. Materials shall be issued by BHEL based on the weighment basis/linear measurements & sectional weight. However, on specific request of the contractor **"as a special case to expedite the job"** the consignment received at BHEL stores can directly be diverted to the work site following issuance procedure of BHEL. Such direct issues shall be as

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per the Challan/dispatch document/LR received with the consignment. In such cases, Contractor shall do unloading of materials from trucks/lorry at their own cost.

2. All materials issued by BHEL shall be stacked, stored above ground level by use of concrete or wooden sleepers. No materials shall remain on ground at any time. All concrete or wooden sleepers required for stacking the materials shall be arranged by contractor (successful bidder of this package) at his own cost within the quoted rates. All other equipments like winches, D-Shackles, slings of various sizes, max puller, pulley blocks, jacks, trucks, trailers etc. Required for such handling of steel from BHEL stores/storage yard etc. Shall be arranged by contractor within quoted/accepted rates.
3. The contractor shall take delivery of the materials from the designated place within the project premises at his own cost and store the same at his stores as per standard norms. Open land for such purposes shall be provided by BHEL on free of cost basis. Temporary barbed wire fencing of the open storage yard is to be done by the contractor and is included under the scope of his work. Contractor shall also remove grass, bushes, trees etc wherever required off the land provided to him and shall make proper continuous up keeping of the open yard /land by removing grass, bushes trees etc and same is included under the scope of his work & No extra payment shall be made to the contractor in this regard. The bidder shall make complete arrangement of necessary security personnel to safeguard all such materials in his custody. Materials issued will be used only for construction of permanent works. The contractor shall take care of material issued by BHEL and shall protect the same from theft, damage and weathering. Excessive rusting of steel in custody of agency/contractor must be avoided. In case, due to any cause attributable to the contractor, such rusting of steel occurs rendering the same unusable, then such quantity of steel shall be recovered from the interim payment at the penal rate specified in the tender.

2.9 Cement (Issued by BHEL free of Cost):

1. On advance request of the contractor, the cement shall be supplied in 50kg tamper proof sealed Bags / Bulklers .
2. The contractor shall submit to the engineer, a statement indicating estimated quantity of cement required during a quarter, at least two months in advance of the quarter. In addition, the contractor shall also furnish the estimated requirement of cement during a month by the third week of the previous month indicating his requirement.
3. The theoretical weight of each bag of cement for issued purposes will be considered as 50kg, the contractor shall be accountable for the cement issued to the contractor on this notional weight only. No claim whatsoever will be entertained because of difference between theoretical and actual weight of the bags of cement.
4. The empty cement bags duly accounted for against issue shall be the contractor's property and the same shall be disposed as per statutory regulation prevailing in the project.

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5. The contractor shall satisfy himself of the quality and quantity of supplied cement at the time of taking delivery from BHEL stores. No claims whatsoever will be entertained by BHEL because of quality or quantity after the materials are taken by the contractor from BHEL stores.
6. Contractor will be responsible for unloading the cement as soon as the arrival of cement in the weather proof cement storage sheds/ Silo's having dense impervious bituminous or concrete floors which shall be kept swept clean at all times. The storage arrangements shall be fully completed and approved by the owner before any cement is delivered to site. The construction of cement storage sheds as per the requirement of BHEL, unloading of cement bags, stacking properly in the storage sheds, removal of the sheds after the completion of the work are in the scope of bidder. Though the cement is unloaded directly at the contractor storage shed, it will be deemed to be considered that the cement was issued from BHEL stores. Necessary documents are to be submitted by the contractor to the BHEL stores for having received cement.
7. Contractor will be responsible for sampling and testing of cement as per Indian Standard / Specification / approved quality plan in the testing laboratory established by the contractor.
8. One month shall be limit for the maximum quantity of BHEL issued cement that would be with the contractor at any point of time when work is in progress (excluding what has already been incorporated in the works).
9. "BHEL/BHEL's agency for providing RMC" shall carry out design mix as per IS 456/10262 latest revision and specification, using the OPC and/or OPC with Fly Ash and/or PPC (as the case may be) and get the design mix proportions approved by BHEL's Customer/Consultant. The design mix proportion shall be used for concreting at this project.
10. Before commencement of work, Contractor has to satisfy/ensure the above design mix proportion through conducting trial mix. Contractor shall not be absolved from the responsibility of quality of concrete works as per relevant specification, standard and to ensure satisfactory performance as per terms and conditions of contract. Any issue raised regarding design mix after successful completion of trial mix shall not be entertained and contractor shall not be entitled for any cost or damages.

2.10 Steel (Issued by BHEL free of Cost):

1. The structural and reinforcement steel shall be issued to the contractor on weighment basis. Embedment/Inserts, MS/GI Flats, etc. as applicable based on BOQ description shall also be issued to the contractor on weighment basis.
2. All the steel (as applicable) issued by BHEL shall be properly accounted for. The total quantity of steel required for the work will be calculated from the approved Bar Bending schedule, approved laps, chairs and lugs etc. The measurement for payment

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- as well as for accounting shall be based on the sectional weights as indicated in the following IS/BS/EN specifications.
3. The steel issued to the contractor shall be mainly in standard length and sections as received from the supplier. However, the contractor shall be bound to accept the steel in length and section as available in the project stores, no claims for extra payment because of issue of non-standard length will be entertained.
 4. The contractor shall satisfy himself of the quality and quantity of the materials at the time of taking delivery from BHEL stores. No claims whatsoever will be entertained by BHEL because of quality or quantity after the materials are taken by the contractor from BHEL stores.
 5. The contractor shall submit to BHEL, a statement indicating estimated quantity of steel required during a quarter. In addition, the contractor shall also furnish the estimated requirement of steel during a month by the third week of the previous month indicating his requirement.
 6. One month shall be limit for the maximum quantity of BHEL issue materials that would be with the contractor at any point of time when work is in progress (excluding what has already been incorporated in the works).
 7. The contractor must note that steel required for the contractor's enabling job like store/ site office/batching plant/temporary works etc. shall be arranged by the contractor at his own cost.

2.11 Cement (Issued by BHEL free of Cost):

1. "BHEL/BHEL's agency for providing RMC" shall carry out design mix as per IS 456/10262 latest revision and specification, using the OPC and/or OPC with Fly Ash and/or PPC (as the case may be) and get the design mix proportions approved by BHEL's Customer/Consultant. The design mix proportion shall be used for concreting at this project.
2. Before commencement of work, Contractor has to satisfy/ensure the above design mix proportion through conducting trial mix. Contractor shall not be absolved from the responsibility of quality of concrete works as per relevant specification, standard and to ensure satisfactory performance as per terms and conditions of contract. Any issue raised regarding design mix after successful completion of trial mix shall not be entertained and contractor shall not be entitled for any cost or damages.
3. Cement in 50kg tamper proof sealed Bags / Bulklers shall be provided by BHEL as per relevant BOQ Items.
5. The contractor shall submit to the engineer, a statement indicating estimated quantity of cement required during a quarter, at least two months in advance of the quarter. In addition, the contractor shall also furnish the estimated requirement of cement during a month by the third week of the previous month indicating his requirement.

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6. The theoretical weight of each bag of cement for issued purposes will be considered as 50kg, the contractor shall be accountable for the cement issued to the contractor on this notional weight only. No claim whatsoever will be entertained because of difference between theoretical and actual weight of the bags of cement.
7. The empty cement bags duly accounted for against issue shall be the contractor's property and the same shall be disposed as per statutory regulation prevailing in the project.
8. The contractor shall satisfy himself of the quality and quantity of supplied cement at the time of taking delivery from BHEL stores. No claims whatsoever will be entertained by BHEL because of quality or quantity after the materials are taken by the contractor from BHEL stores.
9. Contractor will be responsible for unloading the cement as soon as the arrival of cement in the weather proof cement storage sheds having dense impervious bituminous or concrete floors which shall be kept swept clean at all times. The storage arrangements shall be fully completed and approved by the owner

2.12 Return of Materials issued by BHEL free of cost:

1. **Return of Cement:** Sealed cement bags remaining unused and in perfectly good condition at the time of completion or termination of the contract shall be returned promptly, (within 15 days from assessment) if BHEL/ engineer is satisfied of the physical condition of the cement. Return of such cement to the project stores / place as identified within the project area by engineer/ BHEL will not be entitled to handling and incidental charges. Surplus sealed and good conditioned cement bags will be taken back on weightment basis.

Cement that has been unloaded in silo will not be taken back by BHEL. Sweep cement will not be taken back by BHEL.

2. **Return of Steel including Scrap:** All surplus steel and all wastage materials will be taken back on weightment basis. Surplus, unused and untampered steel shall be sorted section-wise and returned separately at a place directed by BHEL/Engineer within the project area. All wastage/ scrap (including melting scrap, wastage, and unusable scrap) shall be promptly returned to the stores and a receipt obtained for material accounting purposes. Return of such material will not be entitled to any transportation and incidental charge.

2.13 Scrap and Serviceable Materials:

1. All Structural steel (Rolled Section, MS/ GI Flats and MS Rails) of length above 2 metre except MS/SS Plates shall be considered as serviceable materials provided the materials is in good and acceptable condition. Structural steel in length less than 2 metre shall be treated as scrap.

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2. MS/SS Plates having both sides greater than 1 metre or if any side is less than 1 metre but greater than 0.5 metre and the total area is equal or greater than 2 Sqm shall be considered as serviceable.
3. All reinforcement steel and earthing rod/round bar measuring 3 metre and above in length shall be treated as serviceable material provided they are in good acceptable condition otherwise shall be treated as scrap.

2.14 Consumption and wastage of materials issued by BHEL free of cost:

1. Cement Consumption:

The theoretical consumption of cement shall be based on the following:

- (a) For design mix concrete as per approved design mix.
- (b) For nominal mix concrete work, as per minimum cement as specified or as approved by engineer-in-charge.
- (c) For item of works, where volume mix is permitted in writing by the BHEL, for masonry works, plaster other miscellaneous items, the cement consumption shall be governed by the “Statement of cement consumption” attached to the Delhi Schedule of Rates CPWD DSR Latest Revision unless otherwise specified in the specifications or the drawing of contract or mutually agreed by engineer-in-charge and the contractor.
- (d) Actual consumption = Issue – Surplus/ unused quantity of cement returned in good condition by the contractor to store.

1. Cement Wastage:

- (a) **Allowable wastage:** One and half percent (+1.5%) of theoretical consumption of cement unless specified otherwise in the technical specification.
- (b) For cement issued by BHEL to the contractor free of cost, and which is not accounted for by the contractor to BHEL, then recovery for such material shall be affected at penal rates.

Sl. No.	Cement consumption	Basis of issue & penal recovery
1	Theoretical consumption (without considering any wastage or loss).	Free
2	Actual consumption being Limited to one and half percent (+1.5%) of aforesaid theoretical consumption towards allowable wastage.	Free

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3	Actual consumption beyond one and half percent (+1.5%) of Sl. No. (1) above.	Penal rate
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2. Steel Consumption:

The theoretical consumption of various sections of structure steel and/or diameter of reinforcement steel shall be based on approved construction drawing and bar bending schedule. Weight shall be calculated considering the sectional weights as per Indian standards. No extra cost shall be payable to the contractor for any deviation in weights for the different procedures adopted for issue and calculation of the theoretical consumption including rolling tolerances.

- Actual consumption = Issue – Surplus.
- Surplus = un-tampered, unused, uncut QTY of steel **including serviceable material returned** by the contractor to BHEL store along-with relevant documents.
- Wastage = Actual consumption – Theoretical consumption.

3. Steel Wastage:

- Allowable Wastage of Reinforcement steel and Earthing Rod/Round Bar:** Three percent (+3%) of the theoretical consumption shall be considered as allowable wastage. Invisible wastage (Maximum limit to 0.5%), if any, shall be considered to be included in the specified 3% allowable wastage.
- Allowable Wastage of Structural Steel (Rolled Section, MS/SS Plates and MS/GI Flats):** Four percent (+4%) of the theoretical consumption shall be considered as allowable wastage. Invisible wastage (Maximum limit to 0.5%), if any, shall be considered to be included in the specified 4% allowable wastage.
- For steel issued by BHEL to the contractor free of cost, and which is not accounted for by the contractor to BHEL, then recovery for such material shall be affected at penal rates.

Sl. no.	Steel	Basis of issue & penal recovery
1	Theoretical consumption (without considering wastage and scrap or loss)	Free
2	Wastage limited to plus Three percent (+3%) for reinforcement steel of aforesaid theoretical consumption (1) towards allowable wastage.	Free
3	Wastage beyond Three percent (+3%) for reinforcement steel of the theoretical consumption as per Sl. No. (1) above.	Penal rate

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2.15 Reconciliation of materials issued by BHEL free of cost:

1. The contractor shall submit a reconciliation statement of cement and reinforcement steel issued to the contractor with each RA Bill.
2. At the time of submission of bills, the contractor shall properly account for the material issued to him as specified herein to the satisfaction of BHEL certifying that the balance material is available in the contractor custody at site.
3. At the time of submission of bills, if it is noticed by BHEL that the wastage is high and calls recovery at the penal rate then, BHEL will proceed for recovery for the excess wastage as per penal recovery rates as specified.
4. The reference drawings for actual material consumption to be used for the purpose of reconciliation shall be drawings prepared by the BHEL and drawings approved by BHEL for fabrication works and such other drawings approved by BHEL. This shall also include the bar bending schedule prepared by the contractor and approved by BHEL.

2.16 General Notes:

1. BHEL reserves the right to recover from the contractor any loss arising out of damage/ theft or any other causes or during verification/stacking or at any time under the custody of the contractor.
2. The contractor shall in no case be entitled for any compensation on account of any delay in supply or non-supply thereof for all or any such materials. However, in case of non-availability of any specific section(s) which delays the completion of work, such cases shall be recorded separately in monthly planning format (F14) and shall be considered for time extension of contract.
3. Contractor will have to make his own arrangement at his own cost for procurement of any other materials except as mentioned above, as required for the works and of such quality as acceptable to BHEL.
4. The contractor shall maintain proper store account for all the BHEL issued materials and shall give Three (03) copies of monthly-computerized reconciliation statement of such account showing total receipt, consumption and balance at site to the BHEL. BHEL Engineer's certification for the reconciliation of steel shall be final. The detailed reconciliation (diameter/section wise or as required) shall be done at least once in three months (03) or before submission of final bill which comes earlier.
5. Contractor shall also carryout in complete association with BHEL, the material management functions and execution like day-to-day update of materials, issued to contractor, accounting for surplus/scrap material returned etc. These functions shall also be carried out through computerized system utilizing suitable software. Contractor shall engage experienced software personnel to associate on dedicated basis for efficient discharge of the same in time.

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6. The contractor shall solely be responsible for the safety & security of material after it is handed over and issued to contractor by the BHEL.
7. BHEL issued materials, shall not be under any circumstances whatsoever, and shall be taken out of the project site unless otherwise permitted by BHEL for outside job.
8. In case of non-finalization of delay analysis, BHEL at its discretion may provide provisional time extension with withholding 10% of running bills.

2.17 Recovery of Materials (Penal Rates):

If wastage exceeds the specified limit, the recovery of excess wastage shall be made from monthly RA Bills as per following penal rates (excluding GST):

Sl. No.	Materials	Penal rate (Rs)
1	Cement	6,500/- per MT
2	Reinforcement Steel / Earthing Rod	65,000/- per MT
3	Structural Steel (Rolled Section, MS Plates, MS/GI Flats, etc.)	75,000/- per MT

2.18 Procurement and Testing of Materials by Contractor:

Material required for the entire job (other than issued by BHEL as explained above) like sand, aggregates, Fly ash, admixture GGBS etc. and all other material required for the completion of entire scope, have to be arranged by the contractor, except those specifically indicated as BHEL scope of supply. BHEL reserves the right to reject any material not found satisfactory. Rate quoted shall be inclusive of all such contingencies and no additional payment shall be made on this account. For this purpose, sample shall be collected at site in presence of BHEL/NTPC representative.

2.19 GENERAL REQUIREMENTS – COMMON TO ALL ERECTION WORK

2.19.1 The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the Contractor of the responsibility of providing such facilities to complete the work without any extra compensation.

2.19.2 The terminal points decided by BHEL shall be final and binding on the Contractor for deciding the scope of work and effecting payment for the work done.

2.19.3 The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The Contractor and his personnel shall cooperate with personnel of BHEL, BHEL'S Customer, Customer's consultants and other Contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work of the project as a whole.

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2.19.4 The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The Contractor should ensure proper planning and successful & timely completion of the work to meet the overall project schedule. The Contractor must deploy adequate quantity of tools & plants, modern / latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel. **2.19.5** Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and fronts will decide this. BHEL Engineer's decision regarding correctness of the work and method of working shall be final and binding on the Contractor. No claims for extra payment from the Contractor will be entertained on the ground of deviation from the methods / sequence adopted in erection of similar sets elsewhere.

2.19.6 All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory/ local authorities are to be arranged by the Contractor at his cost in time to ensure smooth progress of work.

2.19.7 The boiler shall be erected as per relevant provisions of latest Indian Boiler Regulations (IBR) and amendments/addendums thereof, if any.

2.19.8 The work shall conform to dimensions and tolerances specified in the various drawings / documents that will be provided during various stages of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations due to Contractor's fault, the Contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by BHEL and recoveries will be effected from the Contractor's bills towards expenditure incurred including cost of materials and departmental overheads of BHEL.

2.19.9 The Contractor shall perform any services, tests etc, which may not be specified but nevertheless, required for the completion of work within quoted rates.

2.19.10 All necessary certificates and licenses required for carrying out this work are to be arranged by the Contractor expeditiously.

2.19.11 The Contractor shall execute the work in the most substantial and workman like manner. The stores shall be handled with care and diligence.

2.19.12 BHEL reserves right to recover from the Contractor any loss which arises out of undue delay / discrepancy / shortage / damage or any other causes due to Contractor's lapse during any stage of work. Any loss to BHEL due to Contractor's lapse shall have to be made good by the Contractor.

2.19.13 All cranes, transport equipment, handling equipment, tools, tackles, fixtures, equipment, manpower, supervisors/engineers, consumables etc. except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by the Contractor. All expenditure including taxes and incidentals in this connection will have to be borne by Contractor unless otherwise specified in the relevant clauses. The Contractor's quoted rates should be inclusive of all such contingencies.

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2.19.14 During the course of erection, testing and commissioning certain rework / modification / rectification / repair / fabrication etc. may become necessary on account of feed back / revision of drawing etc. This will also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repair etc. promptly and expeditiously. Daily log sheets signed by BHEL engineer and indicating the details of work carried out, man-hours etc. shall be maintained by the Contractor for such reworks. Claim of Contractor if any, for such works will be governed by relevant clauses of 'General Conditions of Contract'.

2.19.15 All works such as cleaning, leveling, aligning, trial assembly, dismantling of certain equipments / components for checking and cleaning, surface preparation, fabrication of structures, tubes and pipes as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, gouging, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting up etc. as may be applicable in such erection works and which are treated incidental to the erection works and necessary to complete the work satisfactorily, shall be carried out by the Contractor as part of the work within the quoted rates.

2.19.16 The Contractor shall make all fixtures, temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work. Contractor shall arrange necessary steel for such usage. Only the steel for making temporary structure (cat head) for drum lifting will be provided by BHEL in random sizes materials available at site.

2.19.17 The Contractor shall take delivery of the components, equipments, chemicals, and lubricants etc. from the BHEL stores/ storage area after getting the approval of BHEL Engineer on standard indent forms of BHEL. Complete and detailed account of the materials and equipments after usage shall be submitted to the BHEL and reconciled periodically.

2.19.18 The distance between storage area and erection site is approx. 3 to 5 KM. Contractor shall plan and transport equipments, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the Contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas/ site to enable other agencies to carry out their work or for any other reason, same shall be done by Contractor most expeditiously as incidental to work.

2.19.19 Plant materials should not be used for any temporary supports / scaffolding/ preparing preassembly bed etc.

2.19.20 The details of equipments to be erected under this contract are generally as per the schedule given in relevant appendices. These details are approximate and meant only to give a general idea to the tenderer about the magnitude of the work involved. Actual quantum and type of equipments will be based on the relevant erection documents which will be furnished to the Contractor in due course of erection and the weight and quantity as per the relevant engineering documents will only be admissible for the billing purpose.

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2.19.21 Hangers & suspensions, supports etc. for tubes, piping, & ducts etc. will be supplied in running / random lengths / sizes which shall be cut to suitable sizes and adjusted as required.

2.19.22 Spring suspension / constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Adjustments, removal of temporary arrests/locks, cutting of excess thread length of hanger tie-rod etc. have to be carried out as and when required. Load setting of spring hangers, as per BHEL's documents/instructions, during various stages of erection & testing and after floating of piping/ducting during cold and hot condition will have to be done as part of work. This exercise may have to be repeated till satisfactory results are achieved.

2.19.23 Layout of field routed/ small bore piping shall be done as per site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the Contractor. There is a possibility of slight change in routing the above pipe lines even after completion of erection.

2.19.24 Welding of necessary instrumentation tapping points, thermo well, thermocouple pad, metal temp pad and clamps, root valve, condensing vessel, flow metering & measurement devices, and control valves to be provided on boiler & its auxiliaries and piping are covered within the scope of this specification. The installation of all the above items will be Contractor's responsibility even if:

- a) Items are not specifically indicated under the respective product groups as given in the technical specifications.
- b) Items are supplied by an agency other than BHEL. Pre-heating, NDE, and Post weld heat treatment for above shall be done as per the specifications as part of work.

2.19.25 Certain instrumentation like pressure switches, air sets, filters, regulators, pressure gauges, junction boxes, power cylinders, dial thermometers, flow meters, valve actuators, flow indicators, centrifugal/speed switches of motors, accumulators etc. are received in assembled condition as integral part of equipments. Contractor shall dismount such instruments for calibration and hand over the same to BHEL. C & I erection agency will do storage / re-erection calibration etc.

2.19.26 Fixing and seal welding of thermo wells & plugs before Hydro test/ steam blowing of equipment or other piping system is within the scope of work. Contractor shall also remove the seal welded plugs by process of grinding and fix and seal weld thermo wells after hydro test/steam blowing of lines as part of work.

2.19.27 Actuators/drives of valves, dampers, gates, powered vanes etc. may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.

2.19.28 All electrical motors have to be tested for IR & PI values prior to the trial run. Where required, dry out may have to be carried out by using external heating source. Contractor

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shall make all arrangements in this regard and complete the work as instructed. BHEL will provide the motorized insulation testers.

2.19.29 In installation of various equipments it may become necessary to install these on temporary supports/ hanger due to various reasons including non-availability of suspension materials. Contractor shall install such temporary suspensions/hangers and later on shift the relevant equipments to their respective permanent hangers/ suspensions/ supports as incidental to work. Requisite materials for such temporary arrangements will be provided by BHEL on free -returnable basis which shall be returned to BHEL after the use.

2.19.30 The work shall be carried out strictly in accordance to the “Field Quality Plan” approved by BHEL/client. Contractor, jointly with BHEL, shall prepare all necessary records of measurements/readings/ protocols etc.

2.19.31 All works such as cleaning, leveling, aligning, trial assembly, dismantling of certain equipments / components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per the general engineering practice and as per BHEL engineers instructions at site, cutting, weld disposing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scraping, lapping, fitting up etc. as may be applicable in such erection works and which are treated incidental to the erection work and necessary to complete the work satisfactorily shall be carried out by the Contractor as part of the work.

2.19.32 Interconnection/ hookup, if any, with the existing system shall form part of work. Such interconnections, hookups may require shut down of running plant and the relevant work have to be completed within such planned shutdowns. This may call for working with enhanced resources and on extended hours. Contractor's offer shall cover all such contingencies.

2.19.33 Contractor shall regulate flow of material to and from site in such a manner and sequence that material accumulation at site does not lead to congestion at site. In case it is necessary to shift and restack the materials kept at work areas / site to enable other agencies to carry out their work or further any other reason, it shall be done by the Contractor most expeditiously. No claim for extra payment for such work will be entertained.

2.19.34 It may so happen that certain components like manhole doors, hanger etc. may be supplied in loose items. They need to be assembled as per relevant drawings or as per advice of BHEL engineer prior to erection. This forms the part of the scope of work.

2.19.35 The Contractor shall have total responsibility for all equipment and materials in his custody at Contractor's stores, loose, semi-assembled, assembled or erected by him at site. He shall effectively protect the finished works from action of weather and from damages or defacement and shall also cover the finished parts immediately on completion of work as per BHEL engineer's instructions. The machine surfaces/finished surfaces should be greased and covered.

2.19.36 BHEL is operating web based computerized site operation management system (SOMS) that includes, inter-alia, issue of materials, daily progress reporting, Contractor's running monthly billing and material reconciliation through a computerized data

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management system. Contractor shall install necessary hardware to hook-up with the BHEL's system and use the same for his scope of work. In the event the computerized SOMS is inoperative for any reasons, the Contractor shall take delivery of materials from the storage area/sheds of BHEL/customer after getting the approval of the engineer/customer on standard indent forms to be specified by BHEL/customer. All these records however shall be updated in the SOMS as and when the SOMS is reactivated/ normalized.

2.19.37 Gases like argon, oxygen, acetylene etc. that are required for erection related activities shall be arranged by the Contractor at his cost. For T-91 material site weld joints argon as per grade-3 of is 5760: 1998 with oxygen and water vapor restricted to max 6 ppm each and with argon purity level of minimum 99.99% shall be arranged and used by the Contractor. The supply should accompany test certificate for the batch indicating individual element 'ppm' level and overall purity level.

2.19.38 Nitrogen gas, if required, for preservation of boiler and nitrogen capping during chemical cleaning process, will be provided by BHEL free of charge. Contractor shall arrange necessary connector, nipple, regulator, header and piping for usage of such gas from cylinders.

2.19.39 All lubricants and chemicals required for testing, preservation, chemical cleaning / acid cleaning, oil flushing, and the lubricants for trial runs of the equipments and trial operation of the unit will be supplied by BHEL free of charges.

2.20

2.20 WELDING, RADIOGRAPHY AND OTHER NON-DESTRUCTIVE TESTING, POST WELD HEAT TREATMENT

2.20.1 WELDING

2.20.1.1 Installation of equipment involves good quality welding, NDE checks, post weld heat treatment etc. Contractor's personnel engaged should have adequate qualification on the above works.

2.20.1.2 The method of welding (viz) arc, TIG or other method will be indicated in the detailed drawing/documents. BHEL Engineer will have the option of changing the method of welding as per site requirement.

2.20.1.3 Welding of high pressure joints shall be done by IBR certified high pressure welders who have been permitted by CIB of state concerned for deployment at the site of work.

2.20.1.4 Welding of all attachments to pressure parts, piping shall be done only by the qualified and approved welders.

2.20.1.5 Before any welder is engaged on work, he shall be tested and qualified by BHEL/ customer, though they may possess the IBR/other certificate. BHEL reserves the right to reject any welder without assigning any reason. All the expenditure in testing/qualification of the Contractor's welder shall be borne by Contractor.

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2.20.1.6 Unsatisfactory and continuous poor performance may result in discontinuation of concerned welder.

2.20.1.7 The welded surface shall be cleaned of slag and painted with primer paint to prevent rusting, corrosion. For this consumables like paint /primer etc. will be in the Contractor's scope.

2.20.1.8 HP joint fit-up, should be protected, where required, by use of tapes/protective paint as may be prescribed by BHEL. The Contractor shall arrange consumables like protective paints/tapes etc.

2.20.1.9 The Contractor shall maintain welding records in the form as prescribed by BHEL containing all necessary details, and submit the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability of the welds shall be final.

2.20.1.10 In the case of P-91 pipe welding, Contractor shall deploy welders having experience in welding of P91 material. The welders engaged by Contractor if not qualified for P-91 welding will be trained by BHEL at BHEL welding research institute (WRI) trichy and allowed to work only after passing the required test arranged by BHEL. All the expenditure towards such qualification including cost of training, traveling expenses, stay etc., shall be borne by the Contractor.

2.20.1.11 Joint fit up will be a stage of inspection. Where required, joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.

2.20.1.12 SOCKET WELDING: In execution of this work, considerable number of socket weld joints is involved. The exact quantity of such socket welds or probable variation in the quantum cannot be furnished. The tenderer shall take notice of this while quoting as no extra claim on this account will be entertained. The socket welding on HP parts/ HP piping shall be done by the IBR qualified welders. Contractor has to adhere to the procedures/specification as indicated in the drawing for socket welding.

2.20.1.13 Welding electrodes have to be stored in enclosures having temperature and humidity control arrangements. This enclosure shall meet BHEL specifications.

2.20.1.14 Welding electrodes, prior to their use, call for baking for specified period and will have to be held at specified temperature for specified period. Also, during execution, the welding electrodes have to be carried in portable ovens

2.20.2 HEAT TREATMENT:

2.20.2.1 For the purpose of temperature recording of stress relieving process, thermocouples have to be attached to the weld joint. The number of temperature measuring points and locations shall be as per the standards of BHEL. Thermocouples have to be attached using capacitor discharge type portable thermocouple attachment unit. Contractor shall arrange sufficient number of thermocouple attachment units.

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2.20.2.2 Contractor should provide temperature indicator / temperature recorder for measuring temperature during pre-heating for welding or for controlling temperature of metal for hot correction etc. The temperature recorders should be preferably of solid state type.

2.20.2.3 Heat treatment may be required to be carried out at any time (day or night) to ensure the continuity of the process. The Contractor shall make all necessary arrangements including labourer required for the same as per directions of BHEL.

2.20.2.4 In certain cases only the pre-heating of weld joints may be called for.

2.20.2.5 For weld joints of heavy structural sections, if heat treatment is required, the same shall be carried out as part of the work.

2.20.2.6 Checking effectiveness of stress relieving by hardness tests (by digital hardness tester or other approved test methods as per BHEL Engineer's instruction) including necessary testing equipments is within the scope of the work / specification.

2.20.2.7 Preheating, inter-pass heating, post weld heating and stress relieving after welding are part of erection work and shall be performed by the Contractor in accordance with BHEL engineer's instructions. Where the electric resistance heating method is adopted Contractor shall make all arrangement including heating equipment with automatic recording devices, all heating elements, thermocouples and attachment units, graph sheets, thermal chinks, & insulating materials like mineral wool, asbestos cloth, ceramic beads, asbestos ropes etc, required for all heating and stress relieving works. BHEL will provide the induction heating equipment set for SA 335 P-91 materials piping only. The set will comprise of following: (i) Main panel (ii) Capacitor panel (iii) Interconnection power & control cables between above panels (iv) 185 sq mm special connecting cable from capacitor panel output – 5m length. Contractor shall provide the input electrical power connection including arrangements such as DB, cables etc. thermocouple pads, thermocouples and compensating cables, induction heating annealing cables (from the capacitor panel to joint and for wrapping around the weld joint) (spec: single core 240 sq mm, 1200a, 3khz), ceramic wool and other consumables etc. as may be required. Quantum of annealing cable requirement will depend on many parameters e.g. weld joint size, heat input, type of connection i.e. series or parallel etc. Likely supplier: Mansfield Cable Co. Noida (UP).

2.20.2.8 All the recorded graphs for heat treatment shall be handed over to BHEL/ IBR authorities and due clearances obtained.

2.20.2.9 During welding & post weld heat treatment of main steam piping (P-91 material), the induction heating process shall continue un-interrupted. Therefore, contractor shall arrange back-up DG set to take care of power interruptions during the process.

2.20.2.10 Results of these processes shall be verified/ validated as per requirements of BHEL/client.

2.20.3 NON DESTRUCTIVE EXAMINATION:

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2.20.3.1 Contractor shall provide all resources and make all arrangements for the radiographic examination of welds for this work. for reasons of safety, invariably the radiography work will be carried out after the normal working hours and close of other site activities only. in this regard, the Contractor has to adhere to the safety rules / regulations laid by bark authorities from time to time.

2.20.3.2 Radiography inspection of welds shall be performed in accordance with requirements and recommendation of BHEL Engineer. The minimum quantum of radiographic inspection shall be as per provision of IBR/BHEL's erection documents. They may, however be increased depending upon the performance of the individual welder at the discretion of BHEL Engineer/Boiler inspecting authority. Bidder shall also arrange the UT equipment with recording facility at his own cost. Usage of UT equipment shall be as per direction of BHEL engineer. Records of UT shall be produced as per site requirement.

2.20.3.3 All X-Ray / Gamma Ray films of weld joints shall be preserved properly and be handed over to BHEL/ IBR authorities and requisite clearances shall be obtained by the Contractor.

2.20.3.4 The field welded joints shall be subject to Dye-penetrant/MPT/RT/ other non-destructive examination as specified in the respective engineering documents/ as instructed by BHEL.

2.20.3.5 Wherever required, surface preparation, like smooth grinding of welded area, prior to Radiography shall be done. It may also become necessary to adopt inter-layer radiography/MPT/UT depending upon the site/ technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The Contractor shall take all this into account in his offer. The required NDT method/procedure will be decided by BHEL engineer at site.

2.20.3.6 Tenderer shall note that 100% radiography shall be taken on all high pressure welding till such time the welders' performance is found by BHEL Engineers to be satisfactory. Subsequently, subject to consistency in welder's performance, the percentage of radiography will be based on BHEL's standard practice/code requirement. the defects shall be rectified immediately and to the satisfaction of BHEL engineer. The decision of BHEL engineer regarding acceptance / rejecting the joints will be final and binding on the Contractor.

2.20.3.7 100% radiograph of certain sizes in piping have to be taken as per BHEL standards/ drawings.

2.20.3.8 For carrying out ultrasonic testing of welding joints of large size tubes and pipes, it will be necessary to prepare surface by grinding and buffing a smooth finish and contour as necessary. The Contractor's scope of work includes such preparation as incidental to work.

2.20.3.9 After stress relieving 5% of UT for all critical lines and 2% of UT for other alloy steel lines to be taken to ensure soundness of joints particularly stress relieving cracks. No separate payment will be made.

2.20.3.10 Contractor may have to undertake radiography with cobalt-60 isotope camera in certain cases. However, for any reason if use of Cobalt-60 is not possible then these joints

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shall be checked by radiography after completion of welding up to suitable part of thickness with IR-192 other suitable source subsequently after completing the joint UT to be done. For this Contractor has to deploy level-II operator certified by BARC.

2.20.3.11 In the case of P-91 piping wherever radiography is not possible, alternatively ultrasonic test has to be carried out apart from other NDE checks.

2.20.3.12 For piping of thickness less than 25 mm no radiography plugs will be provided radiography shots to be taken by double wall technique or any other method to be adopted in consultation with BHEL engineer at site.

2.20.3.13 No separate payment for any NDE activities (including radiography) will be made.

2.21 WELDING, RADIOGRAPHY AND OTHER NON-DESTRUCTIVE TESTING, POST WELD HEAT TREATMENT

2.21.1 WELDING

2.21.1.1 Installation of equipment involves good quality welding, NDE checks, post weld heat treatment etc. Contractor's personnel engaged should have adequate qualification on the above works.

2.21.1.2 The method of welding (viz) arc, TIG or other method will be indicated in the detailed drawing/documents. BHEL Engineer will have the option of changing the method of welding as per site requirement.

2.21.1.3 Welding of high pressure joints shall be done by IBR certified high pressure welders who have been permitted by CIB of state concerned for deployment at the site of work.

2.21.1.4 Welding of all attachments to pressure parts, piping shall be done only by the qualified and approved welders.

2.21.1.5 Before any welder is engaged on work, he shall be tested and qualified by BHEL/customer, though they may possess the IBR/other certificate. BHEL reserves the right to reject any welder without assigning any reason. All the expenditure in testing/qualification of the Contractor's welder shall be borne by Contractor.

2.21.1.6 Unsatisfactory and continuous poor performance may result in discontinuation of concerned welder.

2.21.1.7 The welded surface shall be cleaned of slag and painted with primer paint to prevent rusting, corrosion. For this consumables like paint /primer etc. will be in the Contractor's scope.

2.21.1.8 HP joint fit-up, should be protected, where required, by use of tapes/protective paint as may be prescribed by BHEL. The Contractor shall arrange consumables like protective paints/tapes etc.

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2.21.1.9 The Contractor shall maintain welding records in the form as prescribed by BHEL containing all necessary details, and submit the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability of the welds shall be final.

2.21.1.10 In the case of P-91 pipe welding, Contractor shall deploy welders having experience in welding of P91 material. The welders engaged by Contractor if not qualified for P-91 welding will be trained by BHEL at BHEL welding research institute (WRI) trichy and allowed to work only after passing the required test arranged by BHEL. All the expenditure towards such qualification including cost of training, traveling expenses, stay etc., shall be borne by the Contractor.

2.21.1.11 Joint fit up will be a stage of inspection. Where required, joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.

2.21.1.12 SOCKET WELDING:

In execution of this work, considerable number of socket weld joints is involved. The exact quantity of such socket welds or probable variation in the quantum cannot be furnished. The tenderer shall take notice of this while quoting as no extra claim on this account will be entertained. The socket welding on HP parts/ HP piping shall be done by the IBR qualified welders. Contractor has to adhere to the procedures/specification as indicated in the drawing for socket welding.

2.21.1.13 Welding electrodes have to be stored in enclosures having temperature and humidity control arrangements. This enclosure shall meet BHEL specifications.

2.21.1.14 Welding electrodes, prior to their use, call for baking for specified period and will have to be held at specified temperature for specified period. Also, during execution, the welding electrodes have to be carried in portable ovens.

2.21.2 HEAT TREATMENT:

2.21.2.1 For the purpose of temperature recording of stress relieving process, thermocouples have to be attached to the weld joint. The number of temperature measuring points and locations shall be as per the standards of BHEL. Thermocouples have to be attached using capacitor discharge type portable thermocouple attachment unit. Contractor shall arrange sufficient number of thermocouple attachment units.

2.21.2.2 Contractor should provide temperature indicator / temperature recorder for measuring temperature during pre-heating for welding or for controlling temperature of metal for hot correction etc. The temperature recorders should be preferably of solid state type.

2.21.2.3 Heat treatment may be required to be carried out at any time (day or night) to ensure the continuity of the process. The Contractor shall make all necessary arrangements including labourer required for the same as per directions of BHEL.

2.21.2.4 In certain cases only the pre-heating of weld joints may be called for.

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2.21.2.5 For weld joints of heavy structural sections, if heat treatment is required, the same shall be carried out as part of the work.

2.21.2.6 Checking effectiveness of stress relieving by hardness tests (by digital hardness tester or other approved test methods as per BHEL Engineer's instruction) including necessary testing equipments is within the scope of the work / specification.

2.21.2.7 Preheating, inter-pass heating, post weld heating and stress relieving after welding are part of erection work and shall be performed by the Contractor in accordance with BHEL engineer's instructions. Where the electric resistance heating method is adopted Contractor shall make all arrangement including heating equipment with automatic recording devices, all heating elements, thermocouples and attachment units, graph sheets, thermal chinks, & insulating materials like mineral wool, asbestos cloth, ceramic beads, asbestos ropes etc, required for all heating and stress relieving works. BHEL will provide the induction heating equipment set for SA 335 P-91 materials piping only. The set will comprise of following: (i) Main panel (ii) Capacitor panel (iii) Interconnection power & control cables between above panels (iv) 185 sq mm special connecting cable from capacitor panel output – 5m length. Contractor shall provide the input electrical power connection including arrangements such as DB, cables etc. thermocouple pads, thermocouples and compensating cables, induction heating annealing cables (from the capacitor panel to joint and for wrapping around the weld joint) (spec: single core 240 sq mm, 1200a, 3khz), ceramic wool and other consumables etc. as may be required. Quantum of annealing cable requirement will depend on many parameters e.g. weld joint size, heat input, type of connection i.e. series or parallel etc. Likely supplier: Mansfield Cable Co. Noida (UP).

2.21.2.8 All the recorded graphs for heat treatment shall be handed over to BHEL/ IBR authorities and due clearances obtained. 2.21.2.9 During welding & post weld heat treatment of main steam piping (P-91 material), the induction heating process shall continue un-interrupted. Therefore, contractor shall arrange back-up DG set to take care of power interruptions during the process. 2.21.2.10 Results of these processes shall be verified/ validated as per requirements of BHEL/client.

2.21.3 NON DESTRUCTIVE EXAMINATION:

2.21.3.1 Contractor shall provide all resources and make all arrangements for the radiographic examination of welds for this work. for reasons of safety, invariably the radiography work will be carried out after the normal working hours and close of other site activities only. in this regard, the Contractor has to adhere to the safety rules / regulations laid by bark authorities from time to time.

2.21.3.2 Radiography inspection of welds shall be performed in accordance with requirements and recommendation of BHEL Engineer. The minimum quantum of radiographic inspection shall be as per provision of IBR/BHEL's erection documents. They may, however be increased depending upon the performance of the individual welder at the discretion of BHEL Engineer/Boiler inspecting authority. Bidder shall also arrange the UT

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equipment with recording facility at his own cost. Usage of UT equipment shall be as per direction of BHEL engineer. Records of UT shall be produced as per site requirement.

2.21.3.3 All X-Ray / Gamma Ray films of weld joints shall be preserved properly and be handed over to BHEL/ IBR authorities and requisite clearances shall be obtained by the Contractor.

2.21.3.4 The field welded joints shall be subject to Dye-penetrant/MPT/RT/ other non-destructive examination as specified in the respective engineering documents/ as instructed by BHEL.

2.21.3.5 Wherever required, surface preparation, like smooth grinding of welded area, prior to Radiography shall be done. It may also become necessary to adopt inter-layer radiography/MPT/UT depending upon the site/ technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The Contractor shall take all this into account in his offer. The required NDT method/procedure will be decided by BHEL engineer at site.

2.21.3.6 Tenderer shall note that 100% radiography shall be taken on all high pressure welding till such time the welders' performance is found by BHEL Engineers to be satisfactory. Subsequently, subject to consistency in welder's performance, the percentage of radiography will be based on BHEL's standard practice/code requirement. the defects shall be rectified immediately and to the satisfaction of BHEL engineer. The decision of BHEL engineer regarding acceptance / rejecting the joints will be final and binding on the Contractor.

2.21.3.7 100% radiograph of certain sizes in piping have to be taken as per BHEL standards/ drawings.

2.21.3.8 For carrying out ultrasonic testing of welding joints of large size tubes and pipes, it will be necessary to prepare surface by grinding and buffing a smooth finish and contour as necessary. The Contractor's scope of work includes such preparation as incidental to work.

2.21.3.9 After stress relieving 5% of UT for all critical lines and 2% of UT for other alloy steel lines to be taken to ensure soundness of joints particularly stress relieving cracks. No separate payment will be made.

2.21.3.10 Contractor may have to undertake radiography with cobalt-60 isotope camera in certain cases. However, for any reason if use of Cobalt-60 is not possible then these joints shall be checked by radiography after completion of welding up to suitable part of thickness with IR-192 other suitable source subsequently after completing the joint UT to be done. For this Contractor has to deploy level-II operator certified by BARC.

2.21.3.11 In the case of P-91 piping wherever radiography is not possible, alternatively ultrasonic test has to be carried out apart from other NDE checks.

2.21.3.12 For piping of thickness less than 25 mm no radiography plugs will be provided radiography shots to be taken by double wall technique or any other method to be adopted in consultation with BHEL engineer at site.

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2.21.3.13 No separate payment for any NDE activities (including radiography) will be made.

2.22 PAINTING

2.22.1 All exposed metal parts of the equipment including piping, structures, railings etc. wherever applicable, after installation unless otherwise surface protected, shall be first painted with at least one coat of suitable primer which matches the shop primer paint used, after thoroughly cleaning all such parts of all dirt, rust, scales, greases, oils and other foreign materials by wire brushing, and the same being inspected and approved by BHEL engineer for painting. Afterwards, the above parts shall be finished with two coats of alloyed resin machinery enamel paints.

2.22.2 Touch-up painting on damaged areas - a) For coatings damaged up to metal surface Surface preparation shall be carried out by manual cleaning. minimum 6 inches adjoining area with existing coating shall be roughened by wire brushing, emery paper rubbing etc., for best adhesion of patch primer. Primer coat of touch-up primer to be applied by brush immediately after the surface preparation. Over this primer coat, finish coat and final finish coat shall be applied as covered above by brush within maximum seven (7) days of application of touch up primer. Tentative Painting scheme is enclosed for information at Annexure-II. However, for execution only the latest document shall be applicable and no claim whatsoever shall be entertained in case of any variance between such documents. Similarly, documents as provided progressively during the execution of work for all other products/ equipment's etc. shall be applicable.

2.22.3 Painting of welded areas / painting of areas exposed after removal of temporary supports / touchup painting on damaged areas of employer's structures, where inter-connection, welding / modification etc. has been carried out by the bidder. (a.) clean the surface to remove flux spatters and loose rust, loose coatings in the adjoining areas of weld seams by wire brush and emery paper. (b.) painting procedure to be followed as mentioned above for touch-up painting on damaged areas.

2.22.4 The scope of work includes painting of color bands, lettering, marking and signs for direction of flow/rotation, names etc. of approved colors as per the standard color codes and specifications specified in tender specification or as advised by BHEL/customer engineer at site for the equipments/ components covered in these specifications. Applicable paints and primer shall be supplied by Agency.

2.22.5 All exposed metal parts of the equipment including piping, structures, hand railing, grating etc. shall be thoroughly cleaned off dust, rust, scales and other foreign materials by manual or mechanized wire brushing, scrapping, sand blasting etc. and the same being inspected and approved by BHEL/customer engineer before application of primer.

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Afterwards, the above parts shall be finish painted with specified number of coats as per specification.

2.22.6 In certain isolated instances where it is not possible to clean the equipments as explained above, cleaning by grinding might have to be resorted to. No damage to the equipment/components should be caused.

2.22.7 Surface to be painted should be free of oil and grease. It should be removed by using suitable cleaning agents including permitted solvents. Surface cleaned by chemical agent, if required, shall be treated further as prescribed in use of such cleaning agents. The Contractor at his own cost shall provide all the consumables and application implements.

2.22.8 During the preparation of surface, if the shop coat is damage by chemical cleaning or by mechanical means, Contractor shall repair the same free of cost to BHEL. Agency will make available the necessary primer and paints.

2.22.9 Specified drying time shall be permitted from one to another coat.

2.22.10 This work requires working at higher altitudes from ground level to as high as 90 m and more. The work spread is also substantial involving substantial run of structures and piping. Contractor shall take sufficient precautions to avoid any accident and hazard in all respects. The ropes, ladders, scaffolding materials, clamps etc. and climber used should be of standard quality for safe and smooth execution of work.

2.22.11 Contractor shall carry out the work in such a way that other erected equipment, structure, civil foundations and other property are not damaged. For damages in any of such cases due to lapses by Contractor, BHEL shall have the right to recover the cost of such damages from the Contractor.

2.22.12 Contractor shall take due care to cover/protect the equipment which are already painted while carrying out the painting of other adjacent equipment. If so happens, it shall be cleaned and repainted by the Contractor without any extra charges.

2.22.13 In general, painting of structural parts and color bands, lettering, marking of direction of flow/rotation etc. will be carried out by brush painting. However, areas/equipments inaccessible for manual painting have to be painted by spray painting. The decision of BHEL engineer, in this regard, shall be final and binding on the Contractor. For the purpose of spray painting, air at one point will be made available by BHEL free. Laying of air hose pipe and any other line required shall be done by Contractor at his cost. The Contractor shall provide spray equipment set.

2.22.14 The Contractor shall provide all the necessary scaffolding materials, temporary structures and necessary safety devices etc. during execution of the work.

2.22.15 Final painting work shall be started after obtaining clearance from BHEL engineers and as per his instructions.

2.22.16 PRIMER AND PAINTS FOR FINAL PAINTING

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All primer and paints (including Black Bituminous paint) required for final painting shall be supplied by agency.

2.23 Bidders are requested to specifically note the following:

*Bidders are requested to have **pre-bid visit/ inspection of site** to make them fully acquainted with the site situation & nature of job. No claim shall be entertained at later date on account of non-familiarization of site conditions. Bidders may fix up their site visit in consultation with below mentioned contact person:*

Sh Abdul Munaf BHEL Site Office: 2x800 MW NTPC LARA Email: munaf@bhel.in Ph. No: +91-8884711993	Sh Rohit Agrawal PSWR Nagpur Email: rohitagr@bhel.in Ph. No: +91-9974066147
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4.0 Tools and Plants:

Nos. of T&Ps to be deployed at site shall be decided w.r.t. monthly plan and review format (F-14) based on site requirement. Below given Nos are tentative for planning purposes by the bidder.

Sl. No.	Description of T&P	Quantity
1	Self-Loading Mixture	2 Nos / as per requirement
2	Batching plant 30 Cum/hr capacity with 2 cement silo of 100 MT	1 No / as per requirement
3	Concrete Transit Mixer	3 Nos
4	Concrete Mixer	As per Requirement
5	Concrete Pump of Suitable Capacity	As per Requirement
6	Hydraulic Excavator /Poclain	4 Nos
7	JCB	As per Requirement
8	Dumper	10 Nos
9	Concrete Boom placer min. 35m long	As per Requirement
10	Vibrators (electrical/diesel)	As per requirement
11	Self-priming Dewatering pump of various capacity (Diesel/Electric) From 2 HP to 15 HP	As per requirement
12	Curing / dewatering pump – 1.5 / 2 HP	As per requirement
13	De-watering pump (diesel operated) – 20 HP & 30 HP	As per Requirement
14	Hydraulic Excavator /Poclain with rock breaker arrangement	As per Requirement
15	Pneumatic rock breaker with jack hammer	As per Requirement
16	Ply Shuttering board with adequate supporting structure – (Old steel shuttering plates will not be allowed).	As per requirement
17	Farana crane (Required Capacity) *Note- Hydra is not allowed at project site	As per requirement

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18	Trailer (20MT Capacity)	As per requirement
19	Tractor mounted grader/ loader	As per requirement
20	Fully mechanized paver fitted with electronic sensors for construction techniques	01 No.
21	Reinforcement bending machine	As per requirement.
22	Reinforcement cutting machine	As per requirement.
23	Plate compactor	As per requirement.
24	Earth Compactor- 3MT Capacity	As per requirement.
25	Total Station	As per Requirement
26	Auto level & staff	As per Requirement
27	Road roller/Vibro roller	As per Requirement
28	Water Tanker with sprinkler attachment	As per Requirement
29	All equipments for area Lightning like LED/Halogen bulbs and Portable light Towers etc.	As per requirement
30	Computer with printing/photocopy & CD writing facility	As per Requirement
31	Man lift crane of Minimum 20m reach	As per requirement
32	DG Set of 125 KVA Capacity	As per Requirement
33	Flexture Testing Machine (for testing of road)	1 No

Bidder may tie up for the concrete with RMC plant available with in the plant premises with prior approval of BHEL & NTPC. Bidder has to arrange interrupted concrete during entire course of work.

Note:

T&Ps shown in the above mentioned list is suggestive requirement considering parallel working in Raw Water Reservoir and L&G. However, mobilization schedule as mutually agreed at site for major T&Ps, have to be adhered to. Numbers/time of requirement will be reviewed from time to time at site and contractor will provide required T&Ps/equipment to ensure completion of entire work within schedule/target date of completion without any additional financial implication to BHEL. Vendor will give advance intimation & certification regarding capacity etc. prior to dispatch of heavy equipment. Also on completion of the respective activity, demobilization of T&Ps in total or in part can be done with the due approval of engineer in charge. Retaining of the T&Ps

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during the contract period will be mutually agreed in line with construction requirement. In the event of non-mobilization of any T&P by the successful bidder and as a result progress of work suffered, BHEL reserves the right to deduct suitable amount from the dues of the bidder, with assigning reasons thereof.

4.1 Measuring and Monitoring Device (MMD):

To be finalized as per site requirement.

4.2 Supervisors / Engineer and Computer for exclusive use of BHEL:

- (a) The successful bidder(s) will have to provide **supervisors / Engineers (Civil Engineering)** as per BOQ, acceptable to BHEL Site with sufficient computer knowledge (knowledge of MS office) to whom works will be assigned in consultation and acceptance of BHEL for original contract and extended period. BHEL may utilize this manpower in any area of work with in plant premises as per requirement. All statutory compliances, gate passes, food and accommodation of these manpower shall be arranged by bidder.
- (b) In case, the contractor fails to provide supervisors / Engineers from 3rd month from LOI or as decided by BHEL for a continuous period of fifteen days or more, BHEL shall have the right to depute it on behalf of bidder, all statutory compliances, gate passes, food and accommodation of these manpower shall be arranged by bidder.
- (c) The bidder will have to provide **Two (02) Nos. of Laptops** (X-86 Architecture Based, 64-Bit Supported, Microprocessor with minimum 8 cores, On-board Graphics feature compatible with supplied OS, Minimum 8 GB RAM 2666 MHZ SDRAM upgradeable to 16 GB, 512 GB SSD M.2 Hard Drive or higher, 13" - 14" (both included) high definition anti-glare LED back lit Screen, OEM USB Optical Travel Mouse, Integrated High definition audio with integrated speakers and volume control (Hardware/Software). Single audio jack (single pin) for connecting ear phones and mic, Built-In HD Webcam with Built-In Microphone, Integrated 100/1000 Mbps port, Integrated Wi-Fi 6, supporting industry standard IEEE 802.11ax + Bluetooth 5.0 or higher, Minimum 2 xUSB 3.1 Ports , 1 x Type C, Stereo headphone/ microphone combo jack,1 x HDMI Port. 1 x RJ – 45, Minimum 3-cell battery capable of providing 6 hours or more backup in standard business environment, ACPI Compliant, OEM AC Adaptor suitable for 230V supply, Should come pre-installed with Windows 11 Professional Edition or latest version with 64bit latest service pack, OEM carry bag to be supplied with OS Certification from Microsoft and required software like MS Office 2010 Professional, AutoCAD 2011, ADOBE PDF CREATOR (version 8.0) **with one laser jet printer compatible for A4 and A3 size printing (ink/ cartridge for which to be supplied as and when required, (the consumption may be assumed as 1 cartridge per month) with power backup at places, as per instruction of BHEL.**
- (d) These laptops/ printers shall remain contractor's property/ownership for all legal/technical purposes. However, contractor will be allowed to take out the same after completion of the site works. The computer/printer shall remain at BHEL offices.

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- (e) This facility has to be provided from 3rd month from LOI date till completion of site works or as decided by BHEL. If contractor fails to provide computer/ printer as per requirement, for a continuous period of fifteen days or more, BHEL shall have the right to purchase it at risk and cost of bidder.
- (f) In the event of the contract period getting extended beyond the stipulated time for reasons not attributable to the bidder, the bidder will be reimbursed at Rs. 10,000/- per month for two computers with printer incl. 1 cartridge per month facility, if the services of computer and printer are being used by BHEL.

Note:

- 1 Heavy equipment will be tracked with real-time position location for fleet management. Deployment vs planned reports shall be generated. Equipment condition monitoring data like service meter reading, operation maps, loading, fuel levels, operating information, idle time etc. Shall be captured. This data shall be captured through integrated online project monitoring system. All t&p equipment deployed by contractor will be covered/ monitored through this system. Minimum 5 signals per equipment should be made available to provide the input to integrated online project monitoring system. Necessary software/ hardware for aforesaid system shall be provided by BHEL.
- 2 Few manpower hired/deployed by contractor for this project shall be monitored through online project monitoring system. Such personnel entering in to ntpc site premises for carry out any work shall be tracked. Tracking devices shall be provided by bhel on chargeable basis to contractor. Bhel will provide tags free of cost at first instance. In case of damage or missing of issued worker tag, rs. 1000/- per tag will be charged for issuing new worker tag.
- 3 Medical/First aid center/medicine purchased for emergency/Doctor purpose along with ambulance services with fuel and operator (round the clock) shall be arranged by BHEL for handling medical emergencies. Cost against these facilities shall be distributed / shared among the vendors working in Lara Project site proportionately based on contract value.

Revised- Chapter XI-BOQ and Percentage Weightage-2914**Job Description; Civil Works of Raw Water Reservoir-1 & Levelling and Grading except Block-1 at 2x800 MW NTPC Lara Stage-II**

ST No.	Description of item	Unit	Qty	% Weightage
A-1	Supervision Services for PMX (Supplying Civil Engineers Diploma Holder having relevant experience of 5+ year of / Degree Engineer having relevant Experience of 3+ years in the field of Civil work execution, Quality or Planning, BHEL will utilize the services of Engineers as per requirement with in plant premises In any area of work. Appointment of engineer will be done after approval from BHEL. (All statutory compliances, accommodation, Transportation of engineer etc will be in the scope of Sub- contractor)	Man-Month	60	0.179025548474511
A-2	Handling at site stores / storage yard, transporting to site, Fabrication, inspection, preassembly, erection, alignment, welding, NDT, fixing of supports, Fixing of butterfly valve or any other type of valve, water flushing, hydro testing, surface finish, supply & application of primer & finish paints/ Anti corrosive / Wrapping and coating as applicable including labelling & flow direction on the piping, pre-commissioning for piping and its associated items, etc. as directed by Engineer-in-Charge. (Pipe Size - Any Higher Dia/ 1200NB/900NB/ 800NB/ 600NB/250NB/ 200NB/ 150NB/ 100 NB/ 25NB) 1. Pipe upto and including 150 NB shall be Carbon Steel , ERW IS:1239 (Heavy Duty) 2. Pipe 200 NB & above shall be Carbon Steel and Welded as per IS-3589 fabricated from Carbon Steel plates as per IS:2062 Gr-B Design Pressure for CW Piping: 5 Kg/ Sq.cm Design Pressure for ACW Piping: 7.5 Kg/ Sq.cm Payment Term: i. Pre-Assembly: 25% ii. Erection/ Alignment: 10% iii. Welding: 25% iv. NDT: 15% v. Hydro Test: 10%	MT	50	0.151336478495930
1	Cutting of trees having girth more than 300 mm measured at a height of 1m above ground level including removal of roots, stacking the serviceable material like trunks, branches etc at specified area within the plant boundary and disposal of unserviceable parts/materials within a lead upto 1km etc all complete.			
a	300 mm upto 600 mm girth.	EACH	25	0.001351583456341
2	Earth work in stripping of top soil upto a maximum depth of 0.30m below ground level so as to exclude all debris, grass, vegetation, bushes, trees having girth upto 300 mm including roots and organic materials etc for leveling and grading including dressing to specified levels & grades and compacting the graded/stripped surface by manual/mechanical means, disposal of stripped materials within a lead upto 1km etc all complete as per specification, drawing and as directed by the engineer-in-charge.	SQM	1038185	2.545750935900040
3	Earth work in excavation upto any depth below ground level in all types of soil including moorum, ash which can be excavated by any means for grading including setting out, levelling, dewatering (wherever required), dressing the sides & bottom, levelling to grade, all lifts, ramming/compacting the excavated bottom/graded surface, stacking/disposal of surplus excavated materials within a lead upto 1km, spreading/levelling of disposed materials etc all complete as per specification, drawing and as directed by the engineer-in-charge.	CUM	1432252	14.048196805515600
8	Earth work in filling upto any depth below ground level for grading to proper grade and level in layers not exceeding 300mm compacted thickness so as to achieve at least 95% maximum dry density as per IS-2720 (Part-VIII) with selected approved soil/soft rock directly from excavation within a lead upto 1km and compacted as specified including dewatering if required, sorting, spreading, breaking clods, watering, ramming/compaction by manual/mechanical means, dressing, finishing to required lines, grades and slopes, testing etc all complete as per specification, drawing and as directed by the engineer for the following.	CUM	1432252	6.856857964596920
A9	Earth work in filling upto any depth below ground level for grading to proper grade and level in layers not exceeding 300mm compacted thickness so as to achieve at least 95% maximum dry density as per IS-2720 (Part-VIII) with selected approved soil/soft rock from compulsorily excavated earth (SOIL SHALL BE EXCAVATED FROM RAW WATER RESERVOIR AREA) available within a lead upto 2km and compacted as specified including re-excavation of stacked earth, all lifts, sorting, spreading, breaking clods, watering, ramming/compaction by manual/mechanical means, dressing, finishing to required lines, grades and slopes, testing etc all complete as per specification, drawing and as directed by the engineer for the following.	CUM	163600	2.005829229324080
10	Extra over ST No. 1 to A9 for carriage of unserviceable material/earth for every 500m or part thereof beyond an initial lead of 1km.			
a	Carriage for stacking/ backfilling of serviceable material/ earth			
b	Carriage for disposal of serviceable/unserviceable material/ earth	CUM	311456	0.327310834615719

Revised- Chapter XI-BOQ and Percentage Weightage-2914**Job Description; Civil Works of Raw Water Reservoir-1 & Levelling and Grading except Block-1 at 2x800 MW NTPC Lara Stage-II**

ST No.	Description of item	Unit	Qty	% Weightage
12	Providing and laying 300mm thick stone pitching including caulking with 1 cement: 4 sand mortar on the slopes of earth fill/cut with approved quality of rock fragments including materials, testing, necessary excavations if any, compaction etc all complete as per specification, drawing and as directed by the engineer. Payment Terms: 1) On receipt of material at site - 60% 2) Balance on execution as per item description	CUM	18913	5.929765469094830
14	Concrete of grade M10 (1 part cement, 3 part sand, 6 parts of 40 mm graded aggregate by volume) as lean concrete, levelling course, mud mat under and around foundations/floors at any depth below finished floor level etc. (Cement shall be issued by BHEL free of cost as per TCC) 1) On receipt of sand at site (for accepted quantity) - 10% 2) On receipt of aggregate at site (for accepted quantity) - 40% 3) Balance on execution as per item description	CUM	395	0.158959283267653
15	Providing and laying Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size at all level below / above finished floor level, any shape, position or thickness etc complete including use of plasticizer/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete as per specification & drawing for the following. (Cement shall be issued by BHEL free of cost as per TCC) 1) On receipt of sand at site (for accepted quantity) - 10% 2) On receipt of aggregate at site (for accepted quantity) - 40% 3) Balance on execution as per item description			
a	M25 Grade	CUM	1582	0.693508204994438
16	Fairface form work with good quality water proof ply wood of required thickness and smooth surface above finished ground floor level for columns, beams, suspended floors, roofs, lintels, cantilevers, staircases, landings, balconies, domes, arches, circular overhead tanks etc. for all heights.	SQM	11981	0.872955841901131
A17	Transportation, straightening, cutting, bending, placing in position at all level, binding in position of steel reinforcements of TMT steel bars of grade Fe- 500 conforming to IS 1786 (minimum elongation shall be 14.5%). including cost of reinforcement steel, binding wire, labour, scaffolding, transportation to & from stores etc complete all as per specifications, drawings and as directed by Engineer. (BHEL to supply steel free of cost)	MT	159	0.194588419528899
EARTHERN RAW WATER RESERVOIR				
1	Earth work in stripping of top soil for minimum depth of 300 mm below ground level so as to exclude all debris, grass, vegetation, bushes, trees having girth upto 300mm including roots and organic materials etc including dressing to specified levels & grades and compacting the graded/stripped surface by manual/mechanical means, disposal of stripped materials within a lead upto 1km etc all complete as per specification, drawing and as directed by the engineer-in-charge.	Sq.m	87662	0.214957467640998
2	Earth work in excavation upto any depth below ground level in all types of soil including moorum, ash which can be excavated by any means inside reservoir/ash pond area and for foundation of reservoir/ash pond embankment and cut-off trench including site clearance, setting out, levelling, dewatering (wherever required), shoring & strutting (wherever required), dressing the sides & bottom, levelling to grade, all lifts, ramming/compacting the excavated bottom, stacking/disposal of surplus excavated materials within a lead upto 1km, spreading/levelling of disposed materials etc all complete as per specification, drawing and as directed by the engineer-in-charge.	CUM	1038110	10.182268108544000
3	Earth work in excavation upto any depth below ground level in soft rock (rock without any recovery of excavated materials in the form of hard stone/boulder) including weathered rock which can be excavated by means of crow bar, pick axe, pneumatic rock breaker attachment with excavator machine etc (but does not require chiselling or blasting) inside reservoir area and for foundation of reservoir embankment and cut-off trench including setting out, levelling, dewatering (wherever required), dressing the sides & bottom, all lifts, ramming/compacting the excavated bottom, stacking/disposal of surplus excavated materials within a lead upto 1km, spreading/levelling of disposed materials etc all complete as per specification, drawing and as directed by the engineer-in-charge.	CUM	31889	0.562263271769040

Revised- Chapter XI-BOQ and Percentage Weightage-2914**Job Description; Civil Works of Raw Water Reservoir-1 & Levelling and Grading except Block-1 at 2x800 MW NTPC Lara Stage-II**

ST No.	Description of item	Unit	Qty	% Weightage
B4	Earth work in excavation upto any depth below ground level in hard rock requiring controlled blasting including wedging, line drilling, pre shearing etc inside reservoir area and for foundation of reservoir embankment and cut-off trench as required for grading, setting out, levelling, dewatering (wherever required), dressing the sides & bottom, all lifts, necessary licenses/statutory clearances for blasting, supply, storage & handling of blasting materials, stacking/disposal of surplus excavated materials within a lead upto 1km, spreading / levelling of disposed materials etc all complete as per specification, drawing and as directed by the engineer-in-charge.	CUM	24271	0.816210214758320
A4	Earth work in embankment filling/bed filling upto any level below/above ground level in layers not exceeding 300 mm compacted thickness with selected approved soil from compulsorily excavated soil available within a lead upto 1km and compacted so as to achieve atleast 98% of maximum dry density (Standard Proctor Test) as per IS:2720, Part-7 including setting out, re-excavation of stacked earth, sorting, handling, spreading, breaking clods, watering, ramming/compaction by manual/mechanical means, dressing, finishing to required lines, grades and slopes, tesing, dewatering if required, all lifts etc all complete as per specification, drawing and as directed by the engineer-in-charge.	CUM	335927	3.765633181068190
A5	Extra over ST No. 1, 2, 3 and A4 for carriage of soil/excavated materials for every 1 km or part thereof beyond an initial lead of 1km.			
a	Carriage for disposal of serviceable/unserviceable material/ earth in layers not exceeding 300 mm compacted thickness with 85% Standard Proctor denisty at optimum moisture content as per specification	CUM	26300	0.027638859966812
b	Carriage for disposal of serviceable/unserviceable material/ earth with 85% of original volume in case of boulders as per specification	CUM	24271	0.025506569211198
c	Carriage for disposal of serviceable earth	CUM	734073	0.771442617962646
7	Earth work in embankment filling/bed filling upto any level in layers not exceeding 300 mm compacted thickness with selected approved borrowed soil (borrowed soil shall be CL/CI type having permeability less than $1 \times 10^{(-6)}$ cm/sec and shall be arranged by the bidder) and compacted so as to achieve atleast 95% of maximum dry density (Standard Proctor Test) as per IS:2720, Part-7, including setting out, supplying borrowed soil, royalty/seignorage fee (if any), sorting, handling, spreading, breaking clods, watering, ramming/compaction by manual/mechanical means, dressing, finishing to required lines, grades and slopes, tesing, dewatering if required, all leads and lifts etc all complete as per specification, drawing and as directed by the engineer-in-charge.	CUM	19814	0.726480019493357
8	Supplying, stacking and laying sand of approved quality as sand blanket/cushion over base/bed and on slopes of embankment including screening, washing (wherever required), watering, compaction, dressing, necessary trimming if any including all leads and lifts etc all complete as per specification and as directed by the engineer-in-charge. Payment Terms: 1) On receipt of sand at site (for accepted quantity) - 60% 2) Balance on execution as per item description	CUM	92293	9.839236694394600
9	Supplying, stacking and laying sand filter of approved quality inside the body/ slope of embankment including screening, washing (wherever required), watering, compaction, dressing, necessary trimming if any including all leads and lifts etc all complete as per specification and as directed by the engineer-in-charge. Payment Terms: 1) On receipt of sand at site (for accepted quantity) - 60% 2) Balance on execution as per item description	CUM	28458	4.266691732932940
A10	Supplying, stacking and laying 300mm thick graded gravel filter of approved quality below/above rock-toe in slopes, on the embankment including screening, washing (wherever required), watering, compaction, dressing, necessary trimming if any including all leads and lifts etc all complete as per specification and as directed by the engineer-in-charge. Payment Terms: 1) On receipt of gravel at site (for accepted quantity) - 60% 2) Balance on execution as per item description	CUM	1497	0.381939969641503
11	Providing and placing approved quality of 1mm thick heavy duty high density polyethylene liner (HDPE) film manufactured from polyethylene resin in the base/bed of reservoir as well as on side slopes of embankment to prevent seepage including joining with approved method including testing, fixing at the edges in plain cement concrete by providing 400mm wide and 300mm thick plain cement concrete 1:2:4 on the top of embankment (the cost of plain cement concrete 1:2:4 shall be excluded and shall be payable separately) as shown in the drawing etc all complete as per specification and as directed by the engineer-in-charge. Minimum width of HDPE liner shall be 6m. Payment Terms: 1) On receipt of material at site - 60% 2) Balance on execution as per item description	SQM	307644	4.220930328206650

Revised- Chapter XI-BOQ and Percentage Weightage-2914**Job Description; Civil Works of Raw Water Reservoir-1 & Levelling and Grading except Block-1 at 2x800 MW NTPC Lara Stage-II**

ST No.	Description of item	Unit	Qty	% Weightage
A12	Providing and laying 1000mmx1000mm size and 75mm thick cast-in-situ concrete panels of grade M-20 (with graded stone chips 12.5mm nominal size) over non-woven geotextile laid over HDPE liner at the bed/slope of reservoir etc all complete as per specification and as directed by the engineer-in-charge. The rate shall be inclusive of cement sand mortar as well. (Synthetic Polyester triangular fibre of length 12mm, effective diameter 10-40 microns and specific gravity of 1.34 to 1.40 shall be mixed in Plain Cement Concrete of grade by using 125gms of synthetic Polyester triangular fibre for 50 Kg cement used as per directions of Engineer.) (Cement shall be issued by BHEL free of cost as per TCC) 1) On receipt of sand at site (for accepted quantity) - 10% 2) On receipt of aggregate at site (for accepted quantity) - 40% 3) Balance on execution as per item description	SQM	307644	15.570742559669600
13	Supplying, stacking and laying hand placed rock toe at the down stream side of embankment with approved quality of rock fragments including materials etc all complete as per specification, drawing and as directed by the engineer-in-charge. Payment Terms: 1) On receipt of material at site (for accepted quantity) - 60% 2) Balance on execution as per item description	CUM	11905	3.275114995115910
14	Supplying, stacking and laying 300mm thick rip rap on the slopes of embankment with approved quality of rock fragments including materials etc all complete as per drawing, specification and as directed by the engineer-in-charge. Payment Terms: 1) On receipt of material at site (for accepted quantity) - 60% 2) Balance on execution as per item description	CUM	5700	1.568093697787540
15	Providing and placing turfing with approved quality of grass on the outer slopes of embankment including materials, transportation, watering etc all complete as per drawing, specification and as directed by the engineer-in-charge.	SQM	6965	0.041371829477626
16	Providing and laying of 900 mm diameter R.C.C hume pipes of class NP3 conforming to IS:458 with collars, jointing the pipes with 1cement : 1sand mortar and testing of joints etc all complete as per specification and as directed by the engineer-in-charge. Payment Terms: 1) On receipt of material at site - 60% 2) Balance on execution as per item description	RM	100	0.065378106022045
17	Providing and fixing of 150mm square and 900mm long guard stones over the top of embankment (cost of PCC grade M10 for encasement will be paid separately) etc all complete as per drawing, specification and as directed by the engineer-in-charge.	EACH	1400	0.028111558035750
18	Providing and laying cement concrete (Pavement quality concrete) of grade M35 using 20 mm nominal size stone aggregate with approved admixture (if required), provision for necessary joints including compaction, finishing to lines and grades, curing and providing & fixing forwork etc. all complete. (Excluding the cost of reinforcement and dowel bar). 1) On receipt of sand at site (for accepted quantity) - 10% 2) On receipt of aggregate at site (for accepted quantity) - 40% 3) Balance on execution as per item description	CUM	2252	0.995567849915322
19	Providing & laying dry lean cement concrete of grade M10 with 20 mm nominal size graded stone aggregate over a prepared sub-grade including compaction, finishing, curing etc all complete. 1) On receipt of sand at site (for accepted quantity) - 10% 2) On receipt of aggregate at site (for accepted quantity) - 40% 3) Balance on execution as per item description	CUM	2071	0.832846776704376
20	Providing & Laying granular sub-base using close graded Material conforming to MORTH specification (Table 400-1, Grading-I) , mixing in a mechanical mix plant at OMC, carriage of mixed material to work site, for all leads & lifts, spreading in uniform layers of specified thickness on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications, drawings and directions of Engineer-in-Charge.	CUM	4863	1.215745874338140
21	Providing and laying impermeable 125 micron thick polythene sheet laid flat without creases conforming to relevant BS code or equivalent international code etc all complete as per specification, drawing and as directed by Engineer.	SQM	9006	0.021684153411052
22	Providing and laying compacted moorum over WBM base course including watering and compaction with road roller to make required line, slope and levels etc all complete as per drawing, specification and as directed by the engineer-in-charge.	CUM	480	0.029705644172188

Revised- Chapter XI-BOQ and Percentage Weightage-2914**Job Description; Civil Works of Raw Water Reservoir-1 & Levelling and Grading except Block-1 at 2x800 MW NTPC Lara Stage-II**

ST No.	Description of item	Unit	Qty	% Weightage
23	Providing & installation of bitumen impregnated fibre board of 25 mm thickness conforming to IS 1838 as joint filler including nailing, coating of both faces with coal tar pitch/bitumin etc. all complete as per specification, drawing and as directed by engineer. Payment Terms: 1) On receipt of material at site - 60% 2) Balance on execution as per item description	RM	2252	0.278475000808327
24	Providing and filling in position hot applied bitumen sealing compound (Grade A) of specified thick confirming to IS 1834 including cleaning, mixing, heating, pouring/injecting sealing compound in gaps in joints, sealant primer etc all complete as per specification, drawing and as directed by Engineer.	RM	2252	0.014199858398158
25	Providing and fixing in position MS dowel bar reinforcement including surface painted with bitumen and greasing, dowel end caps with cotton fills etc all complete as per specification, drawing and as directed by Engineer. Payment Terms: 1) On receipt of material at site - 60% 2) Balance on execution as per item description	MT	45	0.394321408241338
26	Supplying and erecting in position GI barbed wire fencing of height of 1 m confirming to IS 298 at top of 600 mm high toe wall shall be provided with 4 strands of barbed wire hot dip galvanised wire of 12G comprising of 2 ply of wires with barbs of 16G spaced at 100mm. Cost to include for GI hook bolts, rings & washers, hot dip galvanised tension wires, 25X6 mm GI flat stretcher bar at end posts, accessories, etc. all complete (steel for structural posts will be supplied by BHEL). Payment Terms: 1) On receipt of material at site - 60% 2) Balance on execution as per item description	RM	2962	0.037353446336896
	Earth work In excavation for foundations, trenches, drains, pipelines, sumps, substructures etc, backfilling and disposal including necessary labour, materials, equipment, loading, transportation, unloading, dewatering etc as per specification, drawing and as directed by engineer- in-charge for the following.			
28	Earth work in excavation up to any depth in all types of soil including moorum, ash which can be excavated by any means including setting out, levelling, dewatering (but excluding special type of dewatering viz. well point method), shoring & strutting (wherever required), dressing the sides & bottom, all lifts, ramming/compacting the excavated bottom, stacking, disposal of surplus excavated materials within a lead upto 1km, spreading/levelling of disposed materials etc all complete.	CUM	5974	0.069059317256999
29	Back filling upto any depth below ground level around foundations, plinths, trenches, drains, pipe lines, sumps, substructures etc to proper grade and level in layers not exceeding 250 mm thickness with selected materials from compulsorily excavated soil available within a lead upto 1km and compacted so as to achieve at least 90% maximum dry density as per IS-2720 (Part-VII) including re-excavation of stacked earth, watering, ramming/compaction by manual/mechanical means, dressing etc all complete.	CUM	1483	0.014892289490694
30	Extra over ST No. 28 and 29 for carriage of excavated earth for every 1 km or part thereof beyond an initial lead of 1km.	CUM	4491	0.006292832451759
	Providing and placing concrete work including cost of labour, materials and equipment for handling, transportation, batching, mixing, placing, vibrating and curing, (excluding cost of centering, shuttering and reinforcement) with mechanised equipments like batching plant, transit mixer, concrete pump etc. complete as per drawing, specifications and as per direction of engineer in charge for the following.			
31	Concrete of grade M10 (1 part cement, 3 part sand, 6 parts of 40 mm graded aggregate by volume) as lean concrete/ levelling course/encasement, mud mat under and around foundations/floors, drains, pits, sumps etc at all levels complete. (Cement shall be issued by BHEL free of cost as per TCC) 1) On receipt of sand at site (for accepted quantity) - 10% 2) On receipt of aggregate at site (for accepted quantity) - 40% 3) Balance on execution as per item description	CUM	862	0.346650855393130
32	Concrete of grade M15 (1 part cement, 2 part sand, 4 parts of 40 mm graded aggregate by volume) as lean concrete, levelling course, mud mat under and around foundations/floors at any depth etc at all levels complete. (Cement shall be issued by BHEL free of cost as per TCC) 1) On receipt of sand at site (for accepted quantity) - 10% 2) On receipt of aggregate at site (for accepted quantity) - 40% 3) Balance on execution as per item description	CUM	721	0.289948105265019

Revised- Chapter XI-BOQ and Percentage Weightage-2914**Job Description; Civil Works of Raw Water Reservoir-1 & Levelling and Grading except Block-1 at 2x800 MW NTPC Lara Stage-II**

ST No.	Description of item	Unit	Qty	% Weightage
33	Concrete of grade 1:2:4 (1 part cement, 2 part sand, 4 parts of 20mm graded aggregate by volume) as levelling course, pipe encasement and anchoring of HDPE liner etc at all levels complete. (Cement shall be issued by BHEL free of cost as per TCC) 1) On receipt of sand at site (for accepted quantity) - 10% 2) On receipt of aggregate at site (for accepted quantity) - 40% 3) Balance on execution as per item description	CUM	650	0.261395656618949
34	Providing and laying design mix cement concrete of grade M20 conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in foundations/ substructure, superstructures, drains, under floors, sumps, culverts etc at all levels including use of plasticizer/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete. (Cement shall be issued by BHEL free of cost as per TCC) 1) On receipt of sand at site (for accepted quantity) - 10% 2) On receipt of aggregate at site (for accepted quantity) - 40% 3) Balance on execution as per item description	CUM	670	0.291500645535905
35	Providing and laying design mix cement concrete of grade M30 conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in foundations/ substructure, superstructures, drains, under floors, sumps, culverts etc at all levels including use of plasticizer/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete. (Cement shall be issued by BHEL free of cost as per TCC) 1) On receipt of sand at site (for accepted quantity) - 10% 2) On receipt of aggregate at site (for accepted quantity) - 40% 3) Balance on execution as per item description	CUM	2051	0.906709440575633
36	Breaking/dismantling existing concrete work at any level including reinforced concrete, removing the rubbish materials and disposal of the same within a lead of 1 km including transportation, loading, unloading etc all complete.	CUM	5	0.000913121609381
	Providing, fixing and removing formwork at any elevation for all structures as per specification including labour, materials, scaffolding, centering, providing pockets etc. complete as per drawing, specification and as per directions of engineer in charge for the following.			
37	Fairface form work with good quality water proof ply wood of required thickness and smooth surface at any level/elevation for foundations, footings, base of columns, walls, columns, pilasters, beams, drains, sumps mass concrete, trenches etc for enexposed/exposed concrete works all complete.	SQM	10106	0.736352475481841
	REINFORCEMENTS			
38	Providing, straightening, cutting, bending, placing in position at all levels, binding in position of mild steel reinforcements conforming to grade-1 of IS:432, Part-1 in concrete including cost of reinforcement, binding wire, labour etc all complete as per specification, drawing and as directed by the engineer-in-charge. Payment Terms: 1) On receipt of material at site - 60% 2) Balance on execution as per item description	MT	5	0.043813489804593
39	Transportation, straightening, cutting, bending, placing in position at all levels, binding in position of steel reinforcements of TMT steel of grade Fe-500D or 500EQR conforming to IS:1786 including cost of binding wire, labour etc all complete per specification, drawing and as directed by engineer-in-charge. (BHEL to supply steel free of cost)	MT	272	0.333487892121737
40	Providing and fixing PVC pressure release valve of minimum dia 100mm in water retaining structure including 160 mm dia housing pipe of minimum length 3.75 m with perforation as per IS4558, nylon jali, perforated end plug, collar, graded filter, excavation, fixing in concrete slab/wall etc. all complete. Payment Terms: 1) On receipt of material at site - 60% 2) Balance on execution as per item description	EACH	577	0.502346730585304
41	Providing and laying of approved quality of non woven geotextile membrane including unrolling, cutting all complete as per specification and as directed by Engineer-in-charge. Payment Terms: 1) On receipt of material at site - 60% 2) Balance on execution as per item description	SQM	307644	1.955997075496610

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Job Description; Civil Works of Raw Water Reservoir-1 & Levelling and Grading except Block-1 at 2x800 MW NTPC Lara Stage-II

ST No.	Description of item	Unit	Qty	% Weightage
	BRICK WORK MASONRY INCLUDING SUPPLY OF MATERIAL, COST OF LABOUR ETC. COMPLETE AS PER SPECIFICATION			
42	Providing brick work in cement sand mortar 1:6 (1 part cement: 6 part coarse sand) in walls, chambers etc at all depths, places and positions below plinth including crest drains, slope drains, toe drains, connecting drains etc on embankment at all levels including raking out joints, curing, scaffolding etc all complete excluding plastering and painting using bricks of class designation 7.5 of nominal dimensions as per specification.	CUM	139	0.086850359171336
43	Breaking existing brick work at any level including plastering, cutting of reinforcement, removing the rubbish within a lead of 1 km including transportation, loading, unloading etc all complete as directed by the Engineer-in-charge.	CUM	10	0.002314331240145
	CEMENT MORTAR PLASTER INCLUDING ALL MATERIALS, SCAFFOLDING, CURING ETC COMPLETE AS PER SPECIFICATION			
44	Providing 12mm thick plaster in walls, drains/culverts with a paste of neat cement @ 1kg/sqm and rubbed smooth with trowel etc. all complete.	SQM	832	0.016126988710335
			Total	100.00000000000000

*** NOTE:**

1. Payment Terms for receipt of material as defined in BOQ item rate shall be compared with the invoice value of the material purchased by the contractor. Measurement/payment against receipt of material shall be as per the percentage defined in BOQ Item or 75% of invoice value for corresponding material, whichever is less.
2. Clause 2.13.3 (SECURED ADVANCE AGAINST MATERIAL BROUGHT TO SITE) of GCC shall not be applicable for Sl. No. 1 above.