भारत हेवी इलेक्ट्रिकल्स लिमिटेड
(सार्वजनिक क्षेत्र का उपक्रम)
Bharat Heavy Electricals Limited
(A Public Sector Undertaking)

पावर सेक्टर- पश्चिमी क्षेत्र Power Sector-Western Region
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Ref: BHE/PW/PUR/BWT6-CVL-MECH-ELE-NDCT/2123/Corg-03 Date: 01/08/2019

To,

ALL BIDDERS,

Sub: Corrigendum-**03**: **Out-come of Pre Bid Discussions held on 02/07/2019, 16/07/2019 & 17/07/2019 at BHEL PSWR Nagpur, Amendments and Clarifications.**

Job: CIVIL, ARCHITECTURAL, MECHANICAL, ELECTRICAL, CONTROL & INSTRUMENTATION WORKS FOR NATURAL DRAUGHT COOLING TOWER (NDCT) AT MSPGCL, 1X660 MW BHUSAWAL THERMAL POWER STATION, UNIT-06, MAHARASHTRA.

References: -

1. E-Tender Specification Nos: **BHE/PW/PUR/BWT6-CVL-MECH-ELE-NDCT/2123**
2. Corrigendum-01 ref. BHE/PW/PUR/BWT6-CVL-MECH-ELE-NDCT/2123/Corg-01 dated 12/07/2019.
3. Corrigendum-02 dated 30/07/2019 for tender due date extension.

Bidders kindly to take note of the following:

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AA) ISSUE OF CLARIFICATIONS AGAINST THE QUERIES:

Sl No	Reference clause of Tender Document	Existing provision	Bidder's query	BHEL's clarification
1.	NIT, Cl. 2.0 & Cl. 5.0. c	Bidders to note specifically that all pages of tender document, including these NIT pages of this particular tender together with subsequent correspondences shall be submitted by them, duly digitally signed on each page, as part of offer.	This is the e-tender floated online by BHEL and we have to submit our digitally signed offer on e-tender portal - https://bhel.abcprocure.com. In view of above, we presume, we can upload the tender document & corrigendum (Approx. 4,400 Pages) in the form we receive it from BHEL instead of signing on each page as the entire bid submission along with above documents shall be digitally signed by us. Please confirm.	It is confirmed.
2.	NIT, Cl. 4.0	In case of remittance of EMD through Electronic Fund Transfer, Bank account details of BHEL PSWR to be used is as below: - Name of the Company - Bharat Heavy Electricals Ltd Address Of The Company - Shree Mohini Complex 345, Kingsway, Nagpur Name Of Bank - State Bank of India Name Of Bank Branch	We presume, we can use these bank details for issuing the Bank Guarantee for EMD amount. Please confirm.	It is confirmed.

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		And Branch Code - SBI, Kingsway branch, Branch Code - 00432 City - Nagpur Account Number - 31380025872 Account Type - Current A/C IFSC Code of The Bank Branch - SBIN0000432 MICR Code of The Bank Branch - 440002002		
3.	NIT, Cl. 4.0	**Procedure for Earnest Money Deposit:** Submission of EMD to BHEL PSWR, Nagpur - The Original Bank Guarantee/any extensions /amendments shall be sent directly by the Bank to BHEL under Registered Post (Acknowledgement Due), addressed to the Purchase Department, BHEL PSWR, Nagpur. In case of Demand Draft/ Payorder/FDR/BG, Original Demand Draft/ Payorder/FDR/BG shall be sent to the officer inviting tender within a reasonable time failing which the offer is liable to be rejected.	In addition to this, we presume, we can submit the original EMD to the officer inviting tender, BHEL, PSWR, Nagpur directly by our representative or through courier to avoid any postal delay so that it can reach to BHEL within a due date & time. Please consider and confirm.	In case of Demand Draft/ Payorder/FDR/BG, Original Demand Draft/ Payorder/FDR/BG shall be sent to the officer inviting tender within a reasonable time failing which the offer is liable to be rejected.
4.	NIT, Cl. 4.0	**Procedure for Earnest Money Deposit :** In case of Demand Draft/ Payorder/FDR/BG, Original Demand Draft/ Payorder/FDR/BG shall be sent to the officer inviting tender	As we are uploading the scan copy of EMD on e-tender portal - https://bhel.abcprocure.com, within due date & time of offer submission, we request you to allow us to submit the original EMD to the officer inviting tender, BHEL, PSWR, Nagpur within 4 days after due date & time of offer	It is confirmed.

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		within a reasonable time failing which the offer is liable to be rejected.	submission. Please consider & confirm.	
5.	Vol. IA, TCC, Part I, Chapter IV, Cl. 4.2	**Computer Infrastructure for exclusive use of BHEL:** The successful bidder(s) will have to establish computerized project management system along with **one supervisors** (Diploma in Civil Engineering)……. (a) The bidder will have to install **1 Nos. of PCs** ……. (b) **These computers/ printers** along with three supervisors shall remain..... . . (e) 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 **three computers with printer** facility including one supervisors,	The clause is contradictory for no. of computers & supervisors to be provided. We presume, the successful bidder will have to establish computerized project management system with 1 No. Computer, 1 no. supervisors and one no. laser jet printer compatible for A4 and A3 size printing. Please confirm.	Vol-IA TCC, Clauses 4.2 (b) and (e) are hereby amended as below: (b) The computer/printer along with one supervisor 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. However, the computer/printer along with technical supervisor shall remain at BHEL offices. (e) 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 one computer with printer facility including one supervisors, if the services of computer and printer are being used by BHEL.
6.	Vol. IA, TCC, Part I, Chapter VI, Cl. 6.1	**Time Schedule:** The contractor has to subsequently augment his resources in such a manner that the entire works are completed within the contract period of 24 (Twenty-Four) months from the date of start of work in a manner required by BHEL to match with	As the proposed NDCT is large in size (Sill dia. 128.22 m & height of NDCT - 174.30 M), we request you for a realistic completion schedule of 30 months from start of work. Also request you to revise the corresponding intermediate milestone mentioned at cl. 6.2. Please consider & confirm.	Tender conditions shall prevail.

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		the project schedule.		
7.	Vol. IA, TCC, Part I, Chapter VI, Cl. 6.3	Provision of penalty in case of slippage of intermediate milestones	As the liquidated damages for overall delay in contract are applicable as per Cl. No. 2.7.9, "LIQUIDATED DAMAGES / PENALTY" of GCC, we request you to delete/withdraw cl. no. 6.3 of "Provision of penalty in case of slippage of intermediate milestones" Please consider & confirm.	Tender conditions shall prevail.
8.	Vol. IA, TCC, Part I, Chapter XI, BOQ, Sr. no. A1, A.1.1 to A.1.7	Earthwork in excavation, backfilling & disposal	We presume that royalty charges (if any) shall not be included in the rates of below items, i) Excavation (item no. A.1.1 to A.1.5), ii) Backfilling with selected material from compulsorily excavated earth (item no. A.1.6) iii) Carriage of material/earth (item no. A.1.7). Please confirm.	Tender conditions shall prevail.
9.	Vol. IA, TCC, Part I, Chapter XI, BOQ, Sr. no. B.7.1 to B.7.3	B.7.1 - Providing & fixing OD 250, 200,180 PVC pipes of 6kg/cm2 (Class3). B.7.2 - Providing & fixing PVC Puddle Pipes suitable for OD 250, 200, 180 pipes. B.7.3 - Providing & fixing End caps with glue and additional rivets, if necessary for OD 250, 200, 180 PVC pipes.	We request you to give us the diameter wise breakup of the pipes quantity for 250mm, 200mm, 180mm as mentioned in the BOQ description. Please consider & confirm.	The approx. break up is as under: 250 OD - 10476 RMT 200 OD - 2426 RMT 180 OD - 138 RMT

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10.	Vol. IE (Part 1 of 4), Tech. Specs., Section I, Sub Section IA, Cl. 8.03.07 & Cl. 11.00.00	**Cl. 8.03.07 -** In case the test cold water temperature as determined from the PG test is higher than the predicated value (based on the performance curves). Purchaser reserves the right to accept all the towers after assessing the Penalty for performance of the cooling tower as per the revised clause 11.00.00 mentioned. **Cl. 11.00.00 - Performance Guarantees And Liquidated Damages** A. Performance testing of cooling tower shall be conducted by the Bidder for cooling water temperature of 32 deg. C at rated duty point. In case the test cold water temperature as determined in test is higher than the predicted value due to Bidder's fault in his scope of work under this contract, i.e the materials supplied and workmanship in placement of fills and other materials/ equipments is found unsatisfactory to the requirement, Owner reserves the right to reject / replace the fills and other materials / equipments. In the event of its acceptance by purchaser, a) Penalty of 5% of the contract value pertaining to Civil	Since the thermal & structural design of cooling tower is not in the scope of bidder, we request you that, the guarantee towards performance shall also not be in the scope of bidder. However the bidder shall demonstrate the performance of cooling tower within one year after completion. In view of above, we request you to delete/withdraw the clause no. 8.03.07 & corresponding cl. no. 11.00.00. Please consider & confirm.	NDCT contractor may suggest modifications to the thermo-hydraulic components (listed at **S. Nos. 24.1 to 24.6 and 25.1 to 25.5 in the BOQ)** with technical reasoning/ analysis/calculations to justify the measures to improve the thermal performance of the NDCT which will be guaranteed by the bidder. **Amendment to specification regarding same is being issued separately.**

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		works only, in case, the achievement of temperature is unsuccessful due to workmanship of Civil work only, shall be deducted for not meeting the performance criteria. and/or b) 5% of the contract value pertaining to Bought out items works (including supply & erection), in case, the achievement of temperature is unsuccessful due to workmanship of Bought out items work only (including supply & erection), shall be deducted for not meeting the performance criteria B. The successful bidder shall demonstrate the above guarantees during performance testing at site. The purchaser is, however, not bound to accept the equipment and reserves the right to out rightly reject it if the actual values exceed beyond the plant design limits.		
11.	Vol. IE (Part 1 of 4), Tech. Specs., Section I, Sub Section IA, Schedule - II, Procedure for Performance Test (Page no. 64 of 571 of pdf file , "Volume-IE-Technical Specification and Plot Plan-Part-01 of 04"	**Schedule - II : Procedure For Performance Test** The Contractor is required to comply with the Thermal Design Calculations, GA Drawing and Design Basis Report enclosed with this specification and stand guarantee for thermal performance of the NDCTs as per the specification	Since the thermal design & structural design of cooling tower is not in the scope of bidder, this clause is not acceptable to us. We request you that, the guarantee towards thermal performance shall also not be in the scope of bidder. However the bidder shall demonstrate the performance of cooling tower within one year after completion.	Please refer reply for sl. no. 10 above.

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		requirements.	Please consider & confirm.	
12.	Vol. ID, Forms & Procedures, Form no. F-29 (WAM 23)	**Proforma Of Bak Guarantee (in lieu of Earnest Money)** Note no. 1 - Units are advised that expiry of claim period may be kept 3-6 months after validity date. It may be ensured that the same is in line with the agreement/ contract entered with the Vendor.	We presume, claim period of BG for EMD shall be 3 months after validity date. Please confirm.	Tender conditions are self-explanatory.
13.	NIT Clause No 4.0	Procedure for Earnest Money Deposit	Please confirm that original EMD BG can be submitted by the bidder (and NOT directly by the Bank) to BHEL - PSWR by courier service or by Registered Post (Acknowledgement Due). Thus timely reaching of original BG to Beneficiary's address can be controlled by the bidder. Also please confirm that original EMD BG can reach BHEL - PSWR office within 7 days after the bid due date.	Tender conditions are self-explanatory.
14.	NIT Clause No 14.0	Milestone LD	Milestone L/D is not acceptable to us. L/D on overall completion period, for reasons solely attributable to us, is acceptable. Please confirm.	Tender conditions will prevail.
15.	NIT Clause No 19.0	Reverse auction	Please delete this clause. As a company policy we do not participate in Reverse Auction process for cooling tower tenders.	Tender conditions will prevail.
16.	NIT / Annexure-2, Clause No 18	Capacity evaluation of bidder	We understand that capacity evaluation of bidder is in BHEL's scope and bidder need not submit any documents under this head.	It is confirmed.
17.	NIT / Annexure-4, Clause No 17.0	Reverse auction	Please delete this clause. As a company policy we do not participate in Reverse Auction process for cooling tower tenders.	Tender conditions will prevail.
18.	TCC / Chapter II Clause No 2.0	Structural steel	Please confirm whether MS plates required for fabrication of hot water piping will be issued free of	Reinforcement Steel under BOQ Item No. A.4.1 and Structural Steel under BOQ item No. A.11.1 shall only be supplied by BHEL

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			cost by BHEL or not. Also confirm that all structural steel required for incorporating in NDCT e.g for Handrails, ladders, access doors, etc. will be also free isssued by BHEL at site (near cooling tiower location).	free of cost as per Tender Condition.
19.	TCC / Chapter II Clause No 2.4. a	Pitot tube	Instruments like pitot tube, etc. required for the performance guarantee test of cooling tower would be loaned by Contractor / Performance Testing Agency for the duration of the test but shall remain their property. The same shall not be left with Customer after the completion of test. However, bidder may supply 1 set of pitot tube as part of their scope for this tender. Please confirm.	BHEL Confirms the same.
20.	TCC / Chapter II Clause No 2.6.11	Design mix report	In such cases, all charges towards obtaining design mix report from reputed institute should be borne by Purchaser. Please confirm.	Design mix is to be achieved by the Contractor. Hence, demonstration to this effect and associated costs will be in the scope of the Contractor
21.	TCC / Chapter II Clause No 2.7.9.1	Milestone LD	If the delay in achieving the milestone would be attributed to Purchaser, contractor shall be paid extra at actuals.	Tender conditions are self-explanatory.
22.	TCC / Chapter II Clause No 2.8	Hierarchy	For BOQ based offers, bidders are quoting strictly as per available BOQ / Schedule of Quantities. Hence Schedule of Quantities should govern.	Tender conditions are self explanatory and shall prevail.
23.	TCC / Chapter II Clause No 2.13	Issue of cement	Silos should be established by Purchaser near cooling tower location. Please confirm.	Tender conditions are self explanatory.
24.	TCC / Chapter II Clause No 2.14	Issue of steel	We understand that steel will be issued from BHEL stores. Please furnish the distance stores from cooling tower location.	Tender conditions are self explanatory.
25.	TCC / Chapter VIII, Clause No 8.0 (2)	Variation in taxes	Any statutory variations (increase of taxes) or introduction of new taxes and duties should be in Purchaser's scope.	Please refer the Vol-IA Tender conditions
26.	SCC Clause No 5.4	Target date set by BHEL	Extra cost involved will have to be reimbursed by	Tender Conditions shall prevail

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			Purchaser. The contractual completion date for the purpose of delay L/D will remain unchanged.	
27.	SCC Clause No 5.11	Accuracy and aesthetics of the work	(i) The accuracy and aesthetics of the work will be as per drawing along with permissible tolerance. Bidder will be responsible to perform the work as per drawings prepared by BHEL. Adequacy of the structural design will not be bidder's responsibility. (ii) In the event the job is delayed for non-availability of drawings, contractor shall be eligible to claim extra cost and time extension, as the case may be.	(i) Accuracy and aesthetics of construction work are not dependent on adequacy of structural design. Accuracy of work to meet the drawing requirements and aesthetics, i.e. finish of the work depend solely on workmanship, which is in the hands of the Contractor. (ii) It shall be dealt as per the tender conditions.
28.	GCC Clause No 2.7.9	LD	Liquidated damages for delay in completion of work for reasons attributable to us will be acceptable to us @ 0.5% of the contract value per week of delay or part thereof subject to maximum of 5% of the contract value. The zero date shall be counted from the date of handling over of clear front and unhindered access to cooling tower site.	Tender Conditions shall prevail
29.	GCC Clause No 2.7.10	Recovery against issue of materials	We understand that this clause is not applicable for this tender since cement, reinforcement steel and structural steel will be issued free by Purchaser.	Tender Conditions shall prevail
30.	GCC Clause No 2.13	MOB advance	We expect interest-free mobilization advance.	Tender Conditions shall prevail
31.	GCC Clause No 2.21	Arbitration	Dispute resolution should be by joint arbitration method only.	Tender Conditions shall prevail
32.	General	Termination of contract	In the event of any termination for reasons not attributable to contractor, contractor shall be eligible to claim all expenses incurred by them till the date of such termination, in addition to the material / equipment ready for despatch / use, sub-vendor order	Tender Conditions shall prevail

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			cancellation charge, etc.in addition to the demobilization charge incurred by the contractor.	
33.	General	Risk purchase	Any risk purchase should be made only after giving necessary chance to the contractor and after obtaining written confirmation from them.	Tender Conditions shall prevail
34.	General	Globalization of free issue items	As cement, reinforcement steel and structural steel are free issue items, Purchaser should permit globalization of the quantities without affecting the sum total of the free issue items.	Tender Conditions shall prevail
35.	Sec I, Technical Specification Clause No 1.01	Item rate	Cooling tower being a critical item in a power plant, we being the leading designer cum manufacturer of NDCT in the country, wish to execute the job on lumpsum basis. In case the cooling tower work has to be executed as per available BOQ, question of ndct contractor being responsible for the performance of a 3rd party designed cooling tower does not arise. Hence please delete this sentence. However, we will be happy to undertake thermal and civil design of the cooling tower based on specified design conditions. We can assure Purchaser that our designed cooling tower will be more cost effective compared to the cooling tower designed by Purchaser internally (as per available BOQ).	NDCT contractor may suggest modifications to the thermo-hydraulic components **(listed at S. Nos. 24.1 to 24.6 and 25.1 to 25.5 in the BOQ)** with technical reasoning/analysis/calculations to justify the measures to improve the thermal performance of the NDCT which will be guaranteed by the bidder. **Amendment to specification regarding same is being issued separately.**
36.	Sec I, Sub-Section IA, Technical Specification Clause No 2.01.01 i)	The bidder shall terminate pump discharge pipe work at a distance of 100M from sludge pit.	We propose flexible hose pipe for sludge discharge.	Specification and drawing requirements shall be followed
37.	Sec I, Sub-Section IA, Technical Specification Clause no	Piling	As per available BOQ, piling is not applicable. In case actual soil profile varies and piling becomes applicable, price implication for same	Work execution will be based on BOQ items

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	2.01.04 a)		should be borne by Purchaser.	
38.	Sec I, Sub-Section IA, Technical Specification Clasue No 8.03.00	Conductance of test	Please note that cooling tower design has been done by Purchaser internally and hence the performance testing shall also be done by Purchaser separately instead of assigning the same to NDCT contractor. Performance test should be responsibility of BHEL / 3rd Party Cooling Tower designer only. However, contractor may be present at site to witness the performance test. Kindly confirm. Instruments required for performance guarantee testing of the cooling tower will remain the testing agency's property and will be taken back by him after the test. Please confirm. For cooling tower already designed by Purchaser / 3rd Party Cooling Tower Designer, preparation of performance curves should be their responsibility. Moreover, for item-rate contract, stipulations like rectification of fills and other materials associated with the performance of cooling tower (Clause # 8.03.06) is irrelevant.	Reply as at Sl. No. 35. Performance Curves will be prepared by BHEL Consultant.
39.	Sec I, Sub-Section IA, Technical Specification Clause No 11.00.00	Performance guarantees and liquidated damages	Since the thermal & structural design of cooling tower is not in the scope of bidder, penalty / LD for non-performance of cooling tower shall not be imposed on bidder / NDCT contractor. Since the cooling tower is already designed and cooling tower dimensions including fill quantities have been already freezed based on Purchaser's fill characteristic curves / equation / arrangement, the cooling tower contractor (fill	Reply as at Sl. No. 35.

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			manufacturer / fill supplier) executing the job based on specified fixed BOQ is not in a position to stand guarantor for the performance of the cooling tower. In view of above, we request you to delete/withdraw the clause no. 8.03.07 & corresponding cl. no. 11.00.00. Please consider & confirm. In case bidder is allowed to design (thermal & structural) NDCT, the thermal design will be guaranteed by us in accordance with CTI norms and we will rectify shortfall in capacity, if any, free of cost.	
40.	Sec I, Sub-Section IA, Technical Specification Clause No 14.00.00	Tests at site / Performance curves	For cooling tower already designed by Purchaser / 3rd Party Cooling Tower Designer, preparation of performance curves should be their responsibility.	Reply as at Sl. No. 38
41.	Volume IIB, Section D1 Clause No 5.3	External walkway platform	We do not recommend providing walkway platform around the circumference at top of a natural draught cooling tower. Instead we prefer thickening of shell diameter at exit.	Thickening of shell is not allowed. Drawing shall be followed.
42.	PE-V1-415-165-N003 (Annexure 2) Clause No 1.2	Type of fill	Please note that film fill of C.10.19 model has been considered in the cooling tower thermal design. The film fill of C.10.19 model is a specific model of fill manufactured by a specific vendor / fill manufacturer. Hence we request Purchaser to issue film fill block as per the fill arrangement drawing on free of cost basis to NDCT contractor near cooling tower location. However, in case thermal design is entrusted on us, we will be in a position to offer a much cost-effective cooling tower on lumsum basis considering high performance film type fill in cross-corrugated design and	Reply as at Sl. No. 35. Please note that the film fill adopted is not proprietary to any specific contractor or manufacturer. It is a generic model manufactured by many companies in India. Umpteen number of towers are in operation with this fill in India. Hence, contractor is required to procure this fill as per tender conditions.

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			with sheet spacing of 19 mm (similar to C.10.19 fill).	
43.	PE-V1-415-165-N003 (Annexure 2) Clause No 2.1.1	High exit air temperature	Please note as per the thermal design document the difference between hot water temperature (42°C) and the exit air temperature (40.43°C) works out to be 1.57°C only. It is generally preferrable to have the difference between hot water temperature and exit air temperature as more than 2.0 deg C and hence we request Purchaser to re-design the tower suitably.	This was before the advent of high performance fills and numerical calculation methods. The exit air temp used to be an average of HWT & CWT in the olden days. This changed based on works carried out by Chilton when the concept of Duty Coefficient (Dt), being approximately constant over the range of normal operating conditions and related to the tower size by an efficiency factor called the Perf Coefficient (C) was introduced. It was shown that C varies with the type of fill used, i.e. high or low efficiency or dense or loose packing, etc. C is higher for low performing fills and lower for high performing fills, which means that C for film fill will be lower tha that for splash fill, indicating superior performance. The L/G, NTU, exit air temp, Merkel Factor, Dt and C are all interlinked and this is why C is used for evaluation of designs and generation of performance curves. In this particular case the data presented is for 1.8 m fill height that is the max used for C.10.19 based on tests. The C value is still above 3 for this fill height and hence, all related/interlinked parameters are bona fide.
44.	PE-V1-415-TS-101 / Section A Clause No 4.0	Terminal points	Bidder / Contractor's scope will be limited to BOQ quantities only. Terminal points are for information purpose only. Please confirm.	It is Confirmed.
45.	PE-V1-415-TS-101 / Section C	Approved vendor list	Please furnish approved vendor list for electrical and C&I items, applicable within our scope.	For items where no vendor names are furnished, bidders are required to submit vendor names for approval by BHEL/ customer before initiating procurement during detail engg.
46.	PE-V1-415-TS-101 /	Procedure for performance test	Since the cooling tower is already designed and cooling	Reply as at Sl. No. 35. Bidders are required to follow

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	Schedule-II		tower dimensions including fill quantities have been already freezed based on Purchaser's fill characteristic curves / equation / arrangement, the cooling tower contractor (fill manufacturer / fill supplier) executing the job based on specified fixed BOQ is not in a position to stand guarantor for the performance of the cooling tower. In view of above, we request you to delete/withdraw this schedule.	tender conditions.
47.	Volume VIA	Civil, Structural and Architectural Works	Since thermal and structural design has been already done by Purchaser and BOQ has been prepared, we understand that all design considerations are in line with this document and hence we are ignoring the same.	Civil works shall be carried out by the bidder based on specification requirements and construction drwgs to be provided by BHEL
48.	PE-V1-415-TS-101A / Section III	Civil specification	Since thermal and structural design has been already done by Purchaser and BOQ has been prepared, we understand that all design considerations are in line with this document and hence we are ignoring the same.	Reply as at Sl. No. 47. Civil specifications should be thoroughly read by the bidders from construction, erection and commissioning point of view for completion of scope of work.
49.	Chapter XI - 2123 (Bill of Quantities) BOQ Ref B.3	Providing & fixing handling Facilities on top of cooling tower	This item is not applicable for NDCT. Please review.	Bidders shall follow specifications and BOQ in their entirety.
50.	Chapter XI - 2123 (Bill of Quantities) BOQ Ref C.5.4	Pitot tube	Please confirm that pitot tube may be procured from any reputed Indian manufacturer and it is not mandatory to buy the same from IIT Delhi only.	It is necessary to procure it from IIT, Delhi as a minimum. Alternatively, Simplex make pitot tube used by CTI agencies can also be supplied, if feasible. Simplex equivalent pitot tube from other manufacturers, if any may be proposed by bidders to BHEL for approval along with references, drawings, write-up, sample calibration reports, etc.
51.	Vol. IE (Part 1 of 4), Cl. 4.7.20.18.y of MSPGCL specs	Technical Specs : The PVC film fills made from virgin PVC shall be UV stabilized	Both the clauses are contradictory regarding colour of PVC Film Fill.	The Colour of Fill shall be Black as per Customer specification requirement. Further the flute size shall be 19 mm as the

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Sl No	Reference clause of Tender Document	Existing provision	Bidder's query	BHEL's clarification
	(page no. 109 of 571 of pdf file, "Volume-IE-Technical Specification and Plot Plan-Part-01 of 04" And BOQ, Sr. no. B.6.1	and of approved make in black colour having 17/19 mm cross flutes with 0.25 mm uniform thickness and double edge folding to meet the requirements of CTI code STD-136. BOQ : Providing & fixing UV stabilized PVC Film Fill of height as shown in GA drawing and manufactured from virgin material of approved make in light grey/white/cream colour with 0.25 mm minimum uniform thickness	Please confirm us the colour and flute size of PVC film fill.	thermal design is carried out considering the flute size of 19 mm.
52.	Vol. IA, TCC, Part I, Chapter XI, BOQ, Sr. no. A.0.1	Mobilization and Installation of Tower Crane of required capacity. Note – One time payment shall be made for Mobilization and Installation of Tower Crane for facilitating execution of Cooling Tower.	We presume the Tower Crane shall be property of bidder and after execution of civil work of cooling tower/completion of tower crane's work, it shall be demobilized by bidder. We presume one time payment shall be released after mobilization and initial installation of tower crane. Please confirm.	BHEL Confirms that the Tower Crane shall be property of bidder and after execution of civil work of cooling tower/completion of tower crane's work, it shall be demobilized by bidder duly consent by the BHEL/Customer.
53.	Vol. IA, TCC, Part I, Chapter XI, BOQ, Sr. no. A.0.2	Mobilization and Installation of Passenger Hoist/Lift of suitable capacity. Note - One time payment shall be made for Mobilization and Installation of Passenger Hoist/Lift for facilitating execution of Cooling Tower.	We presume the Passenger Hoist/Lift shall be property of bidder and after execution of civil work of cooling tower, it shall be demobilized by bidder. We presume one time payment shall be released after mobilization and initial installation of Passenger Hoist/Lift. Please confirm.	BHEL confirms that the Passenger Hoist/Lift shall be property of bidder and after execution of civil work of cooling tower, it shall be demobilized by bidder duly consent by the BHEL/Customer.

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
(सार्वजनिक क्षेत्र का उपक्रम)
Bharat Heavy Electricals Limited
(A Public Sector Undertaking)

पावर सेक्टर- पश्चिमी क्षेत्र Power Sector-Western Region
श्रीमोहिनी काम्पलेक्स, 345 किंग्सवे, नागपुर Shreemohini complex, 345 Kingsway Nagpur - 440 001
फोन / Phone 0712- 3048600, फैक्स FAX: 0712- 3048699 www.bhelpswr.co.in

Ref: BHE/PW/PUR/BWT6-CVL-MECH-ELE-NDCT/2123/Corg-03 Date: 01/08/2019

BB) **Amendment of Document: Bidders are requested to refer (Page No 6 and 7 of 573) Annexure-A of Corrigendum-01 ref. BHE/PW/PUR/BWT6-CVL-MECH-ELE-NDCT/2123/Corg-01 dated 12/07/2019":**

The document referred at Page Nos. 6 & 7 of 573 Annexure-A of Corrigendum-01 ref. BHE/PW/PUR/BWT6-CVL-MECH-ELE-NDCT/2123/Corg-01 dated 12/07/2019 is hereby amended as per following details:

Present Document Description				Amended as
S. No.	Description of Documents	Pages of Vol-I E Technical Specifications and Plot Plan-Part-01 of 04 (Revision-01 dated 12/07/2019)		
		From	To	
01	VOLUME : II, SECTION: IA Rev. No. 00 dated 17/06/2019 Sheet 1 of 2 & 2 of 2	6	7	VOLUME: II, SECTION: IA Rev. No. 01 dated 22/07/2019 Sheet 1 of 2, Sheet 2 of 2 and Annexure-1 (Annexed with this corrigendum as "**Annexure-A**")

Note: The above referred documents shall only form part of the tender documents.

CC) **ISSUANCE OF REVISED CHAPTER-XI-BOQ AND % WEIGHTAGES:**

CHAPTER XI – BILL OF QUANTITIES AND % WEIGHTAGE OF INDIVIDUAL ITEMS of Vol-I Technical Conditions of Contract (TCC) has been revised and issued along with this corrigendum titled as **Annexure-B**, "CHAPTER XI – BILL OF QUANTITIES AND % WEIGHTAGE OF INDIVIDUAL ITEMS (Revision-01 dated 01/08/2019)"

Bidders to note that Total Lump-sum Price for the entire scope of work should be submitted in line with revised CHAPTER XI – BILL OF QUANTITIES AND % WEIGHTAGE OF INDIVIDUAL ITEMS Rev-01 dated 01/08/2019 of Vol-I TCC.

In case any bidder who has submitted their offer prior to issuance of this corrigendum, such bidder should submit their offer according to the revised Chapter-XI Rev-01 of Vol-I TCC as detailed above within scheduled date of offer submission.

Further, Revised calculation sheet in excel format also has been issued along with this corrigendum as file titled "Excel sheet for calculation purpose only- Rev-01 dated 01/08/2019".

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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 their offer, a copy of this corrigendum duly Digitally countersigned by the authorized signatory as a token of Bidder's unqualified acceptance of this corrigendum.

BIDDERS MAY PLEASE NOTE THAT SUBJECT TENDER IS E-TENDER AND THE OFFER IS TO BE SUBMITTED ONLY IN E-PROCUREMENT PORTAL→ **www.bhel.abcprocure.com**

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 faithfully,

AGM (Purchase)

Enclosure:

1) **Annexure-A:** VOLUME: II, SECTION: IA Rev. No. 01 dated 22/07/2019 Sheet 1 of 2, Sheet 2 of 2 and Annexure-1
2) **Annexure-B:** CHAPTER XI–Bill of Quantities and % Weightage of Individual Items (Revision-01 dated 01/08/2019)

	TITLE:	VOLUME : **II**
	TECHNICAL SPECIFICATION **NATURAL DRAFT COOLING TOWERS** **1 X 660 MW BHUSAWAL TPS**	SECTION: **IA**
		SUB-SECTION:
		REV. NO. **01** DATE 22.07.2019
		SHEET **1** of **2**

1.00	**INTENT OF SPECIFICATION:**
1.01	This specification is intended to cover the vetting of thermal design undertaken by BHEL Consultant, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-contractors works, proper packing, delivery at site, transportation, unloading/handling at site, storage at site, site fabrication, site painting, erection including all civil works/ testing/ commissioning at site and performance testing of Natural draft type cooling tower for 1 X 660 MW BHUSAWAL TPS including complete Electrical, C&I and Civil Works as specified and as necessary. BHEL intends to get this NDCTs package executed by qualified contractors on an item rate basis. BHEL has done the thermal sizing of the NDCTs through its design Consultant and the same is approved by the owner. The owner approved thermal design is enclosed at Section IA along with the General Arrangement Drawing. The Cement, Structural and reinforced Steels for Cooling tower are excluded from Bidder's scope as they shall be free issue by BHEL. Terms and conditions for free issue items being given along with NIT. The NDCT contractor is required to own the owner approved thermal design and GA drawing such that the responsibility of cooling tower performance shall remain with the bidder in all manners. Any questions or clarifications regarding thermal design may be sought by the NDCT contractor to satisfy himself of its veracity. The tentative quantities for thermo-hydraulic components (Fills and distribution system) listed for S.Nos. 24.1 to 24.3 and 25.1 to 25.5 of BOQ as per BHEL's Design are indicated in Annexure-1 of section IA and the same is calculated based on the area inside the NDCT at respective levels shown in the GA drawing. If found necessary ''the NDCT contractor may suggest modifications to the thermo-hydraulic components (listed at S.Nos. 24.1 to 24.3 and 25.1 to 25.5 in the BOQ) with technical reasoning/analysis/calculations to justify the measures to improve the thermal performance of the NDCT which will be guaranteed by the bidder''. And as such the responsibility of cooling tower performance shall remain with the bidder in all manners. While suggesting justifiable reasons for changes as above the NDCT contractor shall abide by the following constraints. Also, the NDCT contractor shall guarantee the NDCT performance considering these constraints that are inviolable. 1) Civil Design of NDCT Shell, Shell Profile and Shell dimensions at various heights 2) Foundation of NDCT 3) Air Inlet Height 4) Basin & Internal Structure Column-Beam Grid Dimensions and Elevations 5) Water Distribution Ducts 6) Layout of CW Hot water inlet header to Cooling Tower 7) Height and Diameter of NDCT. Once the changes with justifiable reasons/analyses/calculations provided by the NDCT Contractor are accepted by BHEL/Consultant and duly incorporated, the NDCT contractor will vet the final thermal design & GA of NDCT and furnish the Performance guarantee. The thermal design and GA vetted by the NDCT contractor shall be furnished to Customer for approval. The NDCT contractor shall vet the thermal design as above within two weeks of award of contract, for further approval by BHEL/customer. The GA drawing already approved by owner may be required to be approved again depending on changes to the thermo-hydraulic components, if any and therefore the NDCT contractor shall furnish the relevant modifications agreed to by BHEL/Consultant to these items (only) keeping the other dimensions frozen for further approval from BHEL/Customer. The complete design and engineering of NDCT shall remain in the scope of BHEL's Consultant. All Mechanical/Electrical/C&I drawings prepared by BHEL Consultant will be reviewed by the NDCT

contractor before submission to customer for approval.

The NDCT contractor is required to estimate the “lump sum” cost of the thermo-hydraulic components based on his modified arrangement (if any) or as per Annexure-1. This lump sum cost shall be added to the cost of other BOQ items quoted by the NDCT contractor on item-rate basis to arrive at the total cost of evaluation.

No price implication in the cost of thermo-hydraulic components shall be allowed during execution due to any reason whatsoever from that quoted during tender stage.

ANNEXURE-1 (Approximate quantities of Thermo-hydraullic components based on BHEL design)			
ST. No.	**Description of item**	**Unit**	**Qty**
24	**Fills and Supporting Arrangement**		
24.1	Providing & fixing UV stabilized PVC Film Fill of height as shown in GA drwg and manufactured from virgin material of approved make in light greay/white/cream/black colour with 0.25 mm minimum uniform thickness and double edge folding, meeting the requirements of CTI code STD-136, including cutting, hoisiting, erection, etc. complete as per specification, data sheet and as directed by engineer	Cum	19325
24.2	Providing & applying Cyclohexanone to fill sheets to make Fill modules, including cutting, hoisiting, erection, etc. complete as per specification , data sheet and as directed by engineer	Kg	57975
24.3	20 mm wide x 0.75 mm thk SS Straps with Clips for fixing Pipes to RCC Beams	MT	4.2
25	**Distribution System and Supporting Arrangement**	**-**	**-**
25.1	Providing & fixing OD 250, 200, 180 PVC pipes of 6 kg/cm2 (Class 3) Pr. Rating as per IS 4950 with spigot end including drilling of holes for fixing nozzles, hoisting, grouting in RCC ducts, erecting, jointing with required accessories, testing, etc. complete as per specification and as directed for the full functionality of the system	RM	13040
25.2	Providing & fixing PVC Puddle Pipes suitable for OD 250, 200, 180 pipes, in RCC Ducts. The puddle pipes shall be of same class as of the pipes. Accessories as required for jointing as per manufacturer's recommondation and as directed by engineer shall be included	Set	513
25.3	Providing & fixing End caps with glue and additional rivets, if necessary for OD 250, 200, 180 PVC pipes of same class rating as of the pipes, including accessories required for jointing as per manufacturer's recommondation and as directed by engineer	Set	513
25.4	Providing & fixing Polypropylene Nozzles of down-spray type with solid-conical or solid-square spray pattern and of capacity and pressure head as per specifications, complete with all the necessary hardware required for fastening the nozzles to the PVC pipes including accessories, hardware, etc. as per specification & as directed. Several nozzle discharge diameters as per drawing shall be included	Set	14489
25.5	Providing & fixing PVC drift eliminators (wave shaped - 3 pass type (SPECTRA MODEL or equivalent with 77 mm pitch for low pressure drop) with necessary spacers, etc., to meet drift loss stipulation of 0.01% as per specification & as directed by engineer	Sqm	8500

Note : Serial nos. indicated above are corresponding sl. nos of BOQ items.

E-Tender Specification No: BHE/PW/PUR/BWT6-CVL-MECH-ELE-NDCT/2123

PART B (Rev-01 dated 01/08/2019): % weightage for amount of individual items of Schedule of quantity w.r.t. the total price (as quoted by the bidder in the E-Procurement Portal titled as "Part-C of Vol-II Price Bid".)

Scope of Work: CIVIL, ARCHITECTURAL, MECHANICAL, ELECTRICAL, CONTROL & INSTRUMENTATION WORKS FOR NATURAL DRAUGHT COOLING TOWER (NDCT) AT MSPGCL, 1X660 MW BHUSAWAL THERMAL POWER STATION, UNIT-06, MAHARASHTRA.

ST. No.	Description of item	Unit	Qty	Weightage in % (Rounded up to 10 Decimal)
Part-A	**Civil Works:**	-	-	
A.0.1	Mobilization and Installation of Tower Crane of required capacity. **Note - One time payment shall be made for Mobilization and Installation of Tower Crane for facilitating execution of Cooling Tower.**	LS	1	1.2505467307
A.0.2	Mobilization and Installation of Passenger Hoist/Lift of suitable capacity. **Note - One time payment shall be made for Mobilization and Installation of Passenger Hoist/Lift for facilitating execution of Cooling Tower.**	LS	1	0.2501093461
A.1	**EARTH WORK:** Earth work in excavation, backfilling and disposal including all labour, equipments (unless otherwise specified in BOQ/contract specification) etc complete as per specification, drawing and as directed by engineer- in-charge for the following.	-	-	
A.1.1	Earth work in **excavation in all types of soil** including 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 for following depths below ground level.	-	-	
a	Depth from ground level but not exceeding 2 m	Cum	100	0.0017080801
A.1.2	Earth work in **excavation 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** including setting out, levelling, dewatering (wherever required), 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 1 Km**, spreading / levelling of disposed materials etc all complete for following depths below ground level.	-	-	
a	Depth from ground level but not exceeding 2 m	Cum	26602	0.6728369932
b	Depth exceeding 2 m but not exceeding 4 m	Cum	12638	0.3835835335
c	Depth exceeding 4 m but not exceeding 6 m	Cum	545	0.0198493447
d	Depth exceeding 6 m but not exceeding 8 m	Cum	50	0.0021854555
A.1.3	Earth work in excavation below ground level in **hard rock requiring blasting (but excluding controlled blasting)** including wedging, line drilling, pre shearing etc 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 material within a lead upto 1 Km**, spreading / levelling of disposed materials etc all complete as per specification, drawing and as directed by the engineer-in-charge.	-	-	
a	Depth from ground level but not exceeding 2 m	Cum	50	0.0027016812
b	Depth exceeding 2 m but not exceeding 4 m	Cum	50	0.0032437515
c	Depth exceeding 4 m but not exceeding 6 m	Cum	50	0.0038925351
d	Depth exceeding 6 m but not exceeding 8 m	Cum	50	0.0046725428
A.1.4	Earth work in excavation in **hard rock requiring controlled blasting** including wedging, line drilling, pre shearing etc as required, setting out, levelling, dewatering (wherever required), shoring & strutting (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 material within a lead upto 1Km**, spreading / levelling of disposed materials etc all complete for following depths below ground level.	-	-	
a	Depth from ground level but not exceeding 2 m	Cum	4695	0.2536879107
b	Depth exceeding 2 m but not exceeding 4 m	Cum	6319	0.4099347207
c	Depth exceeding 4 m but not exceeding 6 m	Cum	2370	0.1845021631
d	Depth exceeding 6 m but not exceeding 8 m	Cum	50	0.0046725428
A.1.5	Earth work in excavation in hard rock **requiring chiselling including** wedging, line drilling, pre shearing etc as required for grading, setting out, levelling, dewatering (wherever required), dressing the sides & bottom, all lifts, **stacking/disposal of surplus excavated material within a lead upto 1Km**, spreading / levelling of disposed materials etc all complete for following depths below ground level.	-	-	
a	Depth exceeding 2 m but not exceeding 4 m	Cum	100	0.0262943290
b	Depth exceeding 4 m but not exceeding 6 m	Cum	2107	0.6647576276
c	Depth exceeding 6 m but not exceeding 8 m	Cum	730	0.2763539868
A.1.6	Earthwork in Back filling upto any depth below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding 250mm thickness using/with **selected materials from compulsorily excavated earth available within a lead upto 1 Km** and compacted as specified including re-excavation of stacked earth, watering, ramming/compaction by manual/mechanical means, dressing etc all complete for the following.	-	-	
a	Each layer compacted so as to achieve at **least 95%** maximum dry density as per IS-2720 (Part-VII)	Cum	100	0.0016258775
A.1.7	**Extra over ST No. A.1.1 to A.1.6** for carriage of material/earth for every 500m or part there of beyond an initial lead of 1km.	-	-	
a	Carriage for stacking/ backfilling of serviceable material/ earth	Cum	5000	0.0082119235
b	Carriage for disposal of serviceable/unserviceable material/ earth	Cum	36970	0.0607190460
A.1.8	Earth work in backfilling upto any depth below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding **250 mm** thickness so as to achieve required compaction with **approved borrowed soil** (borrowed soil to be arranged by the bidder) and compacted as specified including supplying borrowed earth, royalty / seignorage fee (if any), sorting, spreading, breaking clods, watering, ramming/compaction by manual/mechanical means, dressing, finishing to required lines, grades and slopes, testing, all lead and lifts etc all complete as per specification, drawing and as directed by the engineer for the following:	-	-	
a	Each layer compacted so as to achieve at **least 95% maximum dry density** as per IS-2720 (Part-VII)	Cum	1400	0.1025505011
A.1.9	Supplying and filling sand upto any depth under floors, around foundations, plinths,surrounding pipe and in pipe beds etc. in layers not exceeding **250 mm thickness** and compacted so as to achieve at least **80 %** relative density as per IS-2720 (Part-XIV) including spreading, watering, ramming/compaction by manual / mechanical means, dressing, royalty (if any) etc. all complete.	Cum	300	0.0913489371
A.2	**CONCRETE WORK**: Providing and placing concrete work including cost of labour, materials (unless otherwise specified in BOQ/contract specification) 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, tower cranes of suitable capacity and all accessories, including demobilisation of the same after completion of works etc and passenger lift to be installed at outer shell with all accessories & safety arrangement required for safe movement of labourers. the scope inclusive of transportation of the equipments, mobilization, demobilization, maintenance, operator charges, and necessary foundations etc. all complete as per drawing, specifications and as per direction of engineer in charge **(Cement shall be supplied by BHEL free of cost)**	-	-	

E-Tender Specification No: BHE/PW/PUR/BWT6-CVL-MECH-ELE-NDCT/2123

PART B (Rev-01 dated 01/08/2019): % weightage for amount of individual items of Schedule of quantity w.r.t. the total price (as quoted by the bidder in the E-Procurement Portal titled as "Part-C of Vol-II Price Bid".)

Scope of Work: CIVIL, ARCHITECTURAL, MECHANICAL, ELECTRICAL, CONTROL & INSTRUMENTATION WORKS FOR NATURAL DRAUGHT COOLING TOWER (NDCT) AT MSPGCL, 1X660 MW BHUSAWAL THERMAL POWER STATION, UNIT-06, MAHARASHTRA.

ST. No.	Description of item	Unit	Qty	Weightage in % (Rounded up to 10 Decimal)
A.2.1	Concrete of grade **M7.5 (1 part cement, 4 part sand, 8 parts of 40 mm graded aggregate by volume)** as mass filling course, lean concrete, levelling course, mud mat under and around foundations/ floors, at any depth below finished floor level etc.	Cum	50	0.0259905296
A.2.2	Concrete of grade **M10 (1 part cement, 3 part sand, 6 parts of 20 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.	Cum	50	0.0259905296
A.2.3	Concrete of grade **M15 (1 part cement, 2 part sand, 4 parts of 20 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.	Cum	1900	0.9876401230
A.2.4	**Screed** concrete conforming to IS 456 with coarse sand and graded hard stone aggregate 12.5mm/6 mm nominal size of any thickness over basin floor, drains etc. complete as per following.	-	-	
a	1:2:4 (1 part cement, 2 part sand, 4 parts of aggregate by volume)	Cum	50	0.0259905296
A.2.5	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 in foundations/substructure, grade slab, paving, drains, under floors etc at all level below basin wall top 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.	-	-	
a	M 20 Grade	Cum	50	0.0307205975
b	M 25 Grade	Cum	50	0.0310080565
c	M 30 Grade	Cum	4500	2.8195451864
d	M 35 Grade	Cum	50	0.0316568402
A.2.6	Providing and laying Design Mix cement concrete of grade conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in superstructure at all level above finished floor level (all structures above top of basin wall), 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.	-	-	
a	M 25 Grade	Cum	50	0.0312708381
b	M 30 Grade	Cum	50	0.0315993150
c	M 35 Grade	Cum	4400	2.8096383552
d	M 40 Grade (except shell, ring beam, corbel, platform, walkway, raker column)	Cum	50	0.0323137940
e	M 40 Grade (For shell, raker column, ring beam, corbel, platform, walkway etc.)	Cum	18760	15.2795712934
f	M 45 Grade	Cum	50	0.0417409155
A.2.7	Providing and laying **Design Mix cement concrete** as per IS:456 & IS 10262-2009 for reinforced concrete works using graded aggregate for Concrete **in precast works** like roof slabs/trench covers, fins, lintels, chajjas, beams, columns, bracings, wall panels, facias etc. at all levels in all kinds of work including formwork/moulds, curing, rendering the top exposed surface with cement sand mortar (1:3), handling, storing, transporting, all leads, erection without damage, setting in position with cement sand mortar (1:3), filling the gaps between adjacent pre-cast units with M30 grade concrete or cement sand mortar (1:3) and including making of holes for bolts for fixing, welding etc. complete with graded aggregate (20/12.5/10 mm) and as per specification and drawing for following grades. **Payment Terms: (i) Completion of Pre-cast Work - 60% and (ii) Completion of Erection Work - 40% for BOQ Item No. A.2.7 (b) & A.2.7 (c)**	-	-	
a	M 20 Grade (For Pre-cast of Concrete Sleeper of specified dimension as per instruction of Engineer-in-Charge and Handed over to BHEL at BHEL's Store)	Cum	720	0.5012659835
b	M 30 Grade	Cum	740	0.6917806085
c	M 35 Grade	Cum	50	0.0470704122
A.2.8	Providing and laying **Design Mix cement concrete** as per IS:456, IS 3370 & IS 10262-2009 for reinforced concrete works using graded aggregate for **Concrete in water retaining/conveying structures** (such as basin floor slab, basin wall, partition wall, CW outlet, sumps, hot water ducts etc.) including addition of suitable plastisizer cum waterproofing cement additives confirming to IS 9103 latest to achieve a slump more than 125 mm in concrete as per manufacturers recommendation and conforming to limits of permeability as per IS 2545 and specification with 20 mm nominal size graded aggregate for following grades. Watertightness is to be ensured including structural grouting if required.	-	-	
a	M 30	Cum	6010	4.5947906452
b	M 35	Cum	950	0.7394042626
A.2.9	Dismantling concrete work for all types of structures at all levels including stacking of serviceable material to a lead of 500 m and disposal of unserviceable material upto a lead of 2 km, cutting of reinforcement, labour, equipment, safety precautions etc all complete as per drawings, specification and instructions of engineer in charge.	-	-	
a	Plain cement concrete of all grades	Cum	20	0.0033274547
b	Reinforced cement concrete of all grades	Cum	20	0.0048319458
A.2.10	Chipping of concrete in reinforced concrete work, cutting pockets, making openings at all levels and according to shapes, disposal of waste materials upto a lead of 2 km as directed by engineer including equipment, safety precautions, making good the broken surface etc all complete as per specification, drawing, instructions of engineer in charge but excluding cutting of reinforcement .	CUDM	100	0.0007061421
A.2.11	Extra over and above ST No A.2.10 for cutting of reinforcement, all sizes and types including labour, equipment, return of cut reinforcement to store etc all complete as per specification, drawings and instructions of engineer in charge. Measurement shall be on the cross sectional area of reinforcement cut.	SQCM	100	0.0000656954
A.2.12	Cutting Reinforced concrete with mechanised tools like Core drilling machine etc. for cutting pockets, holes, cores in slab, beam, column or foundation as per direction of engineer in charge.	CUDM	50	0.0014371283
A.2.13	Providing and applying curing compound (water based) of approved make whereever required as per manufacturer's specification.	Sqm	25	0.0003284769
A.3	**FORMWORK**: Providing, fixing and removing formwork at all elevations for all structures, as per specifications and including all labour, material, scaffoldings and centering etc. complete as per drawing, specifications and as per direction of engineer in charge for the following:	-	-	
A.3.1	Fairface form work with good quality water proof ply wood of minimum 12mm thickness and smooth surface **below basin wall top level** for foundations, footings, base of columns, walls, columns, pilasters, beams, mass concrete, trenches etc.including chamfering of edges as per drawing, specification and instruction of engineer in charge..	Sqm	4370	0.3165118769
A.3.2	Fairface form work with good quality water proof ply wood of minimum 12mm thickness and smooth surface **above top of basin wall** for columns, beams, suspended floors, roofs, lintels, cantilevers, staircases, landings, balconies, etc. **except BOQ for Item No. A.3.3** including chamfering of edges as per drawing for all heights as per specification, drawing and instruction of engineer in charge.	Sqm	71470	6.4324917425
A.3.3	Fairface Formwork for smooth surface for **Raker columns and Manual lift of shell for fixing of Jump Form** including preparation of scheme, designing, submission and approval of staging drawing with sufficient props, braces and ties for all heights complete including chamfering of edges, deshuttering as per drawing, specification, and instruction of engineer in charge.	Sqm	3130	0.9505010527

E-Tender Specification No: BHE/PW/PUR/BWT6-CVL-MECH-ELE-NDCT/2123

PART B (Rev-01 dated 01/08/2019): % weightage for amount of individual items of Schedule of quantity w.r.t. the total price (as quoted by the bidder in the E-Procurement Portal titled as "Part-C of Vol-II Price Bid".)

Scope of Work: CIVIL, ARCHITECTURAL, MECHANICAL, ELECTRICAL, CONTROL & INSTRUMENTATION WORKS FOR NATURAL DRAUGHT COOLING TOWER (NDCT) AT MSPGCL, 1X660 MW BHUSAWAL THERMAL POWER STATION, UNIT-06, MAHARASHTRA.

ST. No.	Description of item	Unit	Qty	Weightage in % (Rounded up to 10 Decimal)
A.3.4	Fairface formwork for smooth surface of **shell by providing and using jump form shuttering** of approved quality with plastic coated plywood shuttering and minimum three working platforms internally and minimum two working platforms externally, with continuous spray curing arrangement with automatic system including lifting arrangement, adjustment as per shell profile, access system, hoisting, strutting, propping, adequate illumination and safety arrangements etc. and other temporary supports/structures as required including dismantling and removal of formwork for tower shell, peripheral top platform, peripheral inner walkway etc. as per specifications and as directed by engineer-in-charge including all plant and machinery, accessories etc. tie rod holes & holes due to jumpform arrangement are to be plugged/filled up with mortar and shuttering impression are to be made good.	Sqm	94100	15.0374809531
A.3.5	Providing, fixing and removing formwork in block-outs/pockets and openings (below 0.1 sqm plan area) at all elevations including cutting, formation of all shapes and all other operations required for making the required shape and size all complete as per specification, drawing and instruction of engineer in charge.	-	-	
a	Upto 150 mm depth	Each	100	0.0031697191
b	Pockets of depths more than 150mm and upto 300 mm depth	Each	100	0.0055184126
c	Pockets of depths more than 300mm and upto 600 mm depth	Each	100	0.0101005826
d	Pockets of depths more than 600mm and upto 1000 mm depth	Each	10	0.0016062022
e	Pockets of depths more than 1000mm and upto 1500 mm depth	Each	10	0.0023420239
f	Pockets of depths more than 1500mm and upto 2000 mm depth	Each	10	0.0030991883
A.4	**REINFORCEMENT WORK:** Reinforcement work including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling including cleaning, derusting, straightening, cutting, bending, binding in position with soft drawn annealed binding wire or tack welding, providing concrete cover blocks, pins, separators, chairs, supports for reinforcement etc. at all level as per specification, drawings and as directed by engineer - in - charge including all plant and machinery, accessories etc.	-	-	
A.4.1	Transportation from BHEL stores, straightening, cutting, bending, placing in position at all level, binding in position of CRS/HCRM reinforcements of grade Fe-500 confirming to IS:1786 including cost of binding wire, labour, scaffolding, transportation to & from stores etc complete all as per specifications, drawings and as directed by Engineer. **(BHEL to supply HCRM/CR steel free of cost)**	-	-	
a	For all works except shell	MT	2676	4.1282146613
b	For all works in shell	MT	2570	3.9646905029
c	Mild steel reinforcement bars (including supply of mild steel bars by bidder)	MT	50	0.4772985051
A.5	**Roof Treatment works:** Roof treatment works including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling, curing, sampling, testing etc at all level as per specification, drawings and as directed by engineer - in - charge.	-	-	
A.5.1	Providing and applying two coats of **bitumen grade 85/25** as per IS 702 (@ 1.7kg/sqm)with 1% antistripping compound conforming to IS 6241 in foundation, wall, column etc on concrete surfaces exposed to soil / ash including surface preparation etc. all complete.	Sqm	5418	0.0818656244
A.6	**JOINTS AND FILLERS:** Joints & fillers including all labour, material, equipment, transportation, handling etc at all level as per specification, drawings and as directed by engineer - in - charge.	-	-	
A.6.1	Supplying & installation of bitumen impregnated fibre board confirming to IS 1838 as joint filler at joints in concrete including nailing, coating of both faces with coal tar pitch/bitumen etc. all complete.	-	-	
a	25 mm wide joints	Sqm	180	0.0229405294
A.6.2	Providing and applying polysulphide based sealant conforming to IS:12118 in joints in concrete including cleaning of joints, raking out groove, application of primer, scaffolding etc. all complete for following size grooves:	-	-	
a	25mmX25mm	RM	2900	0.0962108961
A.6.3	Providing and fixing PVC water stops in joints conforming to IS 12200 & IS 15058 all complete for the following: (Bulb type)	-	-	
a	230 mm wide and 6 mm thick	RM	50	0.0013796032
b	230 mm wide and 8 mm thick	RM	50	0.0018394709
c	230 mm wide and 10 mm thick	RM	2900	0.1333616382
A.7	**MS EMBEDMENTS:** Embedments including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling etc. at all level as per specification, drawings and as directed by engineer - in - charge.	-	-	
A.7.1	Supply, fabricating and fixing of **steel embedments, inserts, pipe sleeves, angle pieces, rungs of various diameters, plates of dimensions** as required etc. including welding, bolting, cutting, drilling, scaffolding, setting etc. all complete.	MT	3	0.0352845929
A.7.2	Supply, Fabrication, transportation, delivery at site and erection, installation and alignment of **steel foundation bolt assembly** conforming to IS:2062 and grade 1 of IS:432 in concrete along with nuts, lock nuts (as per IS:1363, 1364 and IS:3138), washers, anchor plates, stiffener plates, protective tape, pipe sleeves, templates etc. including welding, cutting, grinding, threading, drilling etc. all complete.	MT	1	0.0137790241
A.7.3	Same as above items A.7.1 **with BHEL supplied material (scrap) free of cost** including **Fabrication**,loading, transportation, unloading and Erection etc. all complete from BHEL store to plant site.	-	-	
a	Steel embedments, inserts, pipe sleeves, angle pieces, rungs of various diameters, plates of dimensions as required etc.	MT	1	0.0027258584
A.7.4	Supplying, fabricating, erecting and installing following items in concrete/brickwall for all kind of works, including setting material in concrete, layout, scaffolding, cutting, forming, grinding, drilling, bolting, welding, jointing, testing etc. all complete.	-	-	
a	Steel pipes of all diameters	Kg	100	0.0004433605
b	PVC pipes / conduits of all diameters	Kg	25	0.0012111962
c	UPVC and/or GRP pipes / conduits of all diameters	Kg	25	0.0012111962
d	Mechanical expansion fasteners, cold formed stud type having 3 way expansion sleeve of SS 316 grade approved for use in cracked concrete and seismic design with ETA C1/C2 approval or equivalent of safe tensile capacity as specified below for concrete work.	-	-	
i	(SS.316) Candorr M6*100 M.A.F. (Mechanical Anchor Fastener with nut & washer, HSN: 73181900)	Each	200	0.0036132464
ii	(SS.316) Candorr M8*100 M.A.F. (Mechanical Anchor Fastener with nut & washer, HSN: 73181900)	Each	200	0.0051899357
iii	(SS.316) Candorr M10*100 M.A.F. (Mechanical Anchor Fastener with nut & washer, HSN: 73181900)	Each	200	0.0080805328
iv	(SS.316) Candorr M12*125 M.A.F. (Mechanical Anchor Fastener with nut & washer, HSN: 73181900)	Each	100	0.0079654825
A.8	**GROUTING:** Grouting including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, roughening surface, cleaning, ramming, curing etc. at all level , drawings and as directed by engineer - in - charge.	-	-	
A.8.1	Providing & grouting of pocket holes, pipe sleeves and under base plates of structural steel work/ machinery/ pipe supporting structures including roughening of surface, cleaning, ramming, curing etc. all complete **with Conbextra GP-1 or equivalent** as per specification, drawing and direction of engineer-in-charge. (Cost of all material and cleaning of the pockets by compressed air shall be in the scope of the contractor).	Cum	7	0.0439388765

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Scope of Work: CIVIL, ARCHITECTURAL, MECHANICAL, ELECTRICAL, CONTROL & INSTRUMENTATION WORKS FOR NATURAL DRAUGHT COOLING TOWER (NDCT) AT MSPGCL, 1X660 MW BHUSAWAL THERMAL POWER STATION, UNIT-06, MAHARASHTRA.

ST. No.	Description of item	Unit	Qty	Weightage in % (Rounded up to 10 Decimal)
A.9	**FINISHES TO CONCRETE / PLASTERED SURFACES:** Finishes, painting to concrete, plastered surfaces including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, surface preparation, scaffolding etc. at all level as per specification, drawings and as directed by engineer - in - charge.	-	-	
A.9.1	Providing and applying **three coats of bituminous paint per IS:3384 & IS:9862** on all surfaces in contact with water/moisture, including required scaffolding, cleaning and preparing the surface, etc complete as per specifications and as directed by the engineer	-	-	
a	For all internal and external surfaces of internal structure (except shell) and raker columns	Sqm	85300	1.7371831516
b	For all internal suraces of shell	Sqm	46780	1.4290521054
A.9.2	Providing and applying **waterproof cement paint** of approved make and color on complete exterior surface of shell at all heights including cleaning and preparing the surface, material, labour, scaffolding, curing etc including primer coat complete as per specification and as directed by engineer-in-charge to give an even shade.	Sqm	47180	1.0848279462
A.10	**MISCELLANEOUS:** Miscellaneous works including all labour, material (unless otherwise specified in BOQ/contract specification), equipment etc. at all level unless otherwise specified as per specification, drawings and as directed by engineer - in - charge.	-	-	
A.10.1	Providing and Filling in trenches, plinths, area paving and other underground structures with **graded stone aggregate of size range 63 mm to 45 mm** in layers not exceeding 250 mm in thickness including breaking of stone boulders to required sizes, filling the interstices with selected sand and compacting to 85 % of original volume of stone stack for all lifts etc. all complete. Payment shall be made for the measurement of the volume of the compacted fill.	Cum	350	0.0873171745
A.10.2	Providing and fixing **GI rungs in concrete/brick walls** having zinc coating of minimum 610 g/sqm etc. all complete.	Kg	500	0.0050913926
A.10.3	Providing and installing **FRP access door**, in shell with clear opening size of 1.2m x 2.1m, complete with all fittings and fixtures, locking arrangements, frames, fasteners, auto door closure, including the cost all labour, material and equipment, setting in place, grouting etc. complete as per drawing and specifications.	Each	2	0.0024635771
A.10.4	Lettering with approved colour synthetic enamel paint including preparation of surface and painting work of base area for lettering on external face of NDCT at any height. Item includes for all tools & plants, staging, supporting, hanging platforms, safety arrangements, labours, materials etc. to complete the work in all respect.	-	-	
a	Lettering "MAHAGENCO" and/or "BHEL" or similar (Letter size: height approx. 2M and distance between two letter shall be approx. 13M. lettering width, location and pattern (i.e horizontal or vertical) shall be as decided at site by Engineer in charge.	LS	1	0.0164236803
A.11	**STRUCTURAL WORKS:** Structural steel works including all labour, material (unless otherwise specified in BOQ/contract specification), equipments unless otherwise specified, transportation, handling etc. at all level as per specification, drawings and as directed by engineer - in - charge.	-	-	
A.11.1	Taking delivery of steel from BHEL stores / store yard, loading, Transportation, unloading, **Fabrication, erection and alignment of structural steel with mild steel rolled section / built up section / combination of both** conforming to IS:2062, chequered plate conforming to IS: 3052, mild steel rounds, monorails, stays, safety chains, ladders, MS grating etc. in columns, beams, portals, hangers, struts, monorails, stiffeners, brackets, stub columns, bracings, cleats, base plates, splice plates, chequered plate flooring, walkway platforms, ladders, stairs, stringers, treads, landings, hand-rails etc, fabrication, straightening, cutting, bending, rolling, grinding, machining, drilling, welding, electrodes and other consumables, alignment, erection bolts & nuts (weight of erection bolts, nuts and welds not payable), assembly, edge preparation, preheating (min preheat and interpass temperature of 20^{o} C for welding over 20 mm and upto 40 mm & 66^{o} C for welding over 40 mm and upto 63 mm & 110^{o} C for thickness over 63 mm & use of low hydrogen/ radiogenic electrodes), post heating, testing of welders, inspection of welds, visual inspection, non destructive and special testing, rectification and correction of defective welding works, production test plate, inspection and testing, erection scheme, protection against damage in transit, stability of structures, installation of temporary structures, setting column bases, rectification, dismantling and removal of all temporary structures (weight of temporary structures not payable), return of surplus / waste steel materials to store etc all complete. **(Structural steel for the above shall be supplied by BHEL free of cost as per the terms and conditions specified elsewhere in the contract)**	MT	2	0.0062722422
A.11.2	Extra over ST No. A.11.1 for surface preparation by **blast cleaning** of steel structures as per IS:1477 (Part 1 and 2) and **applying epoxy resin based zinc rich primer as per IS:14589** in 2 coats, **one at shop and second coat after erection**, including touch-up painting etc all complete.	MT	2	0.0015936968
A.11.3	Providing and applying **two coats of epoxy paint with minimum 25 micron total dry film thickness (DFT) per coat** of approved make and shade to achieve an even shade over steel sections already having primer coats and keeping overall DFT with primer not less than 115 microns including protection and cleaning, scaffolding etc. all complete.	MT	2	0.0005505740
A.11.4	Supplying, fabrication, erection and alignment of **factory made electroforged galvanised grating units with mild steel** having minimum galvanisation conforming to IS:2062 in flooring, platforms, drain and trench covers, walk-ways, passages, staircases with edge binding strips and anti-skid nosing in treads etc. including fixing clamps, fittings, fixtures, all taxes, duties, packing, grinding, drilling, welding, edge preparation, etc. all complete.	-	-	
a	Minimum galvanisation of 610 g/sqm	MT	0.25	0.0030725099
A.11.5	Supply, fabrication and fixing of **MS hot double dip galvanized pipe hand railing** (1300 mm high with two intermediate horizontal rails at 450 mm and 900 mm heights) of 32 mm dia (Medium/Heavy Grade) including transportation, loading/unloading, application of etching primer, epoxy painting etc. all complete..	MT	33	0.4687831155
A.11.6	Extra over above ST NO. A.11.1 for **finishing** the structural steels, chequered plate, bolts, inserts etc. with hot double dipped galvanisation @ 610 gm/sqm all complete.	MT	1	0.0032317462
A.11.7	Supply, fabrication and fixing of MSHDG Cage Ladders conforming to IS: 3696 with Width - 600mm, ladder side flats - 60mm x 10 thk., Rungs - 20mm dia @ 300mm c/c., ladder stays @ 2.25m c/c, Circumferential cage rings @ 800c/c - 50mm x 6thk, Cage vertical flat - 50mm x 6 thk x 5 nos. The cage ladders shall be with hot double dipped galvanisation @ 610 gm/sqm all complete. complete with all the necessary accessories, embedded parts, hardware, etc. as directed engineer and as per drawings including transportation, loading/unloading, painting etc. all complete..	MT	38	0.5398108350
Part-A	**Total Part-A : Civil Works**	-	-	**70.64941545**
Part-B	**Mechanical Works:**	-	-	
B.1	**Screen & Gate:**	-	-	

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Scope of Work: CIVIL, ARCHITECTURAL, MECHANICAL, ELECTRICAL, CONTROL & INSTRUMENTATION WORKS FOR NATURAL DRAUGHT COOLING TOWER (NDCT) AT MSPGCL, 1X660 MW BHUSAWAL THERMAL POWER STATION, UNIT-06, MAHARASHTRA.

ST. No.	Description of item	Unit	Qty	Weightage in % (Rounded up to 10 Decimal)
B.1.1	Design, supply, fabrication, erection of **stoplog gates, Sluice gates etc.** with embedments required, lifting beams, special tools & plants, spare parts for three years, machining, casting, all materials such as structural steel, cast steel, stainless steel, brass used for seals, rubber seals, gears, ball and roller bearing, branch bushings, greasing, bolts, nuts, lugs, threaded fastners etc., cleaning, sand blasting, hot double dip galvanised with minimum coating of zinc 750 gms/sqm., following by an application of etching primer and dipping in black bitumen as per B.S. 3416, erection along with a second stage concreting to true plumb and levels, submission of drawings/ fabrication drawings for engineers approval etc. all complete. The leakage through rubber seal shall not be more than 5 lit/min/metre length of seal under maximum head. **(Stoplog gate shall be designed as per IS:5620 and shall be of clear size 3m wide x 4m deep approx., minimum 8mm thk skin plate in HDGS, SS316L seal plate, SS316L guide frame, EPDM side seal and SS 304 hardware)** **(supply of structural steel is in the scope of bidder only)** **Payment Terms: (a) On completion of Fabrication - 60% & (b) On completion of Erection - 40%**	Set	2	0.2824883354
B.1.2	Design, Supplying, fabricating, erecting in position and testing / examining bolted and / or welded structural steel work for **stationary screens** made out of rolled sections and / or plates including cutting, straightening if required, edge preparation, bolting / welding of joints, cleaning, sand blasting, hot double dip galvanised with minimum coating of zinc as 900 gms./sqm. followed by application of an etching primer and dipping in black bitumen as per BS 3416, etc all complete. **(SS304L Coarse screen of 4m x 4m approximate clear opening size fabricated out of minimum 6mm thick wire mesh of 16mm x 16mm apertures including SS316L guide frame and SS 304 hardware)** **(supply of structural steel is in the scope of bidder only)** **Payment Terms: (a) On completion of Fabrication - 60% & (b) On completion of Erection - 40%**	Set	3	0.3251900042
B.1.3	Design, Supplying, fabricating, erecting in position and testing / examining bolted and / or welded structural steel work for **stationary screens** made out of rolled sections and / or plates including cutting, straightening if required, edge preparation, bolting / welding of joints, cleaning, sand blasting, hot double dip galvanised with minimum coating of zinc as 900 gms./sqm. followed by application of an etching primer and dipping in black bitumen as per BS 3416, etc all complete. **(SS304L Fine Screen of 4m x 4m approximate clear opening size fabricated out of minimum 6mm thick wire mesh of 12mm x 12mm apertures, including SS316L guide frame and SS 304 hardware)** **(supply of structural steel is in the scope of bidder only)** **Payment Terms: (a) On completion of Fabrication - 60% & (b) On completion of Erection - 40%**	Set	3	0.3793883661
B.2	**Chain pulley block with trolley** conforming to IS:3832 with load chain conforming to IS: 3109 complete with necessary accessories such as hooks, slings etc with corrosion resistant hardware as per specifications and as directed or as per drawings	-	-	
B.2.1	3 Ton capacity with 15 m chain for Stop Log Gates as per specifications, drawings and as directed by engineer	Set	1	0.0051570880
B.2.2	2 Ton capacity with 15 m chain for Coarse Screens as per specifications, drawings and as directed by engineer	Set	1	0.0047135607
B.2.3	2 Ton capacity with 15 m chain for Fine Screens as per specifications, drawings and as directed by engineer	Set	1	0.0047135607
B.3	Providing & fixing **handling Facilities on top of cooling tower** including fabrication, erection complete with all the necessary accessories, ~~embedded parts~~, hardware, etc. as per specifications, as directed by engineer and as per drawings	-	-	
B.3.1	**Swivelling type lifting arm** complete with swivelling brackets, pins, etc. along with 250 mm diameter CS pulleys, and all the necessary ~~embedded parts, inserts,~~ hardware, etc. as per specifications, drawings and as directed by engineer	Set	1	0.0050913926
B.3.2	**75 NB pipe inserts** for top platform slab as per specifications, drawings and as directed by engineer	Set	10	0.0036132464
B.4	**Piping and Valves:**	-	-	
B.4.1	Providing & fixing **300 NB flanged CI pipe of Class 'A' type** confirming IS: 1536 or MS Corrosion protected pipe in Sludge Pit as per specifications, drawings and as directed by engineer	RM	20	0.0344997497
B.4.2	Providing & fixing **300 NB double flanged Knife Edged Gate Valve in Sludge Pit** as per specifications, drawings and as directed by engineer	Set	2	0.0194440008
B.4.3	Providing & fixing **Fabricated MS piping** (20 thk of dia 3.6 m header and 2.5 m riser for hot water supply) conforming to IS: 3589 and MS plates as per IS: 2062 including bends, Ts, elbows, reducers, etc. complete with all the necessary HDGS hardware, gaskets, etc. including fabrication, cutting, aligning, welding, lowering, laying, hydro-testing, etc. as per specifications, drawings and as directed by engineer **Payment Terms: (a) On completion of Fabrication - 60% & (b) On completion of Erection - 40%**	MT	197	2.8593520897
B.4.4	Providing & fixing **2500 NB Double Flanged Moto Actuated Butterfly valves** of approved make conforming to AWWA C-504 / BS: 5155 in CI construction with mating flanges, and complete accessories and SS Shaft and SS hardware as per specifications and data sheets including aligning, erecting, testing etc complete as per specifications, drawings and as directed by engineer	Set	2	1.6489432403
B.4.5	Providing & fixing **Fabricated MS piping** (12 thk of dia 1.2 m for by-pass line during commissioning) conforming to IS: 3589 and MS plates as per IS: 2062 including bends, Ts, elbows, reducers, etc. complete with all the necessary HDGS hardware, gaskets, etc. including fabrication, cutting, aligning, welding, lowering, laying, hydro-testing, etc. as per specifications, drawings and as directed by engineer. **Payment Terms: (a) On completion of Fabrication - 60% & (b) On completion of Erection - 40%**	MT	11	0.1596593020
B.4.6	Providing & fixing **150 NB SS 304 drain nipple with suitable drain plug** for flushing of HW ducts and complete with accessories and hardware as per specifications and data sheets including aligning, erecting, testing etc.	Set	4	0.0054198695
B.4.7	Fixtures on Piping	-	-	
a	Providing & fixing **100 NB x 200 long MS heavy duty Stub connections** as per IS: 1289 with isolating CI Ball Valves as per IS:9890 of flanged type for flow measurement in HW pipe and complete with accessories & HDGS hardware as per specifications and data sheets including aligning, erecting etc.	Set	3	0.0025867976
b	Providing & fixing **Dial type pressure guage of 150 mm dial size in GI material** as per IS:3624 including stub connection with isolation CI Ball Valve as per IS:9890 and complete accessories, HDGS hardware as per specifications and data sheets including erecting, testing etc necessary for installing & operating the system	Set	2	0.0029491227
B.5	**Painting/Protective Coating on Piping:**	-	-	
B.5.1	Surface preparation, providing & applying **coating and wrapping of underground HW pipe with epoxy and fibre glass 'RP' tissue** (4 mm thk anti-corrosive tape as per AWWA C 203-93) as per specifications and as directed by engineer	Sqm	250	0.0651201368
B.5.2	Surface preparation, providing & applying painting on outside surface of above-ground HW pipe as per specifications **(2 coats of 70 micron DFT each coal tar Primer followed by 2 finish coats of 70 micron DFT each synthetic enamel Paint to achive a total DFT of 200 to 250 microns)** and as directed with approved make and type of paints	Sqm	1100	0.1456119939
B.5.3	Surface preparation, providing & applying painting on inside surface of above-ground HW pipe as per specifications **(2 coats of 70 micron DFT each Epoxy resin based red oxide Primer followed by 2 finish coats of 70 micron DFT each High Build Epoxy Paint to achive a total DFT of 250 microns)** and as directed with approved make and type of paints	Sqm	1100	0.1835510806
B.5.4	Surface preparation, providing & applying painting of steel surfaces as per specification with approved make and type of paints	Sqm	800	0.0643814805

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Scope of Work: CIVIL, ARCHITECTURAL, MECHANICAL, ELECTRICAL, CONTROL & INSTRUMENTATION WORKS FOR NATURAL DRAUGHT COOLING TOWER (NDCT) AT MSPGCL, 1X660 MW BHUSAWAL THERMAL POWER STATION, UNIT-06, MAHARASHTRA.

ST. No.	Description of item	Unit	Qty	Weightage in % (Rounded up to 10 Decimal)
24	**Fills and Supporting Arrangement**			
24.1	Providing & fixing UV stabilized PVC Film Fill of height as shown in GA drwg and manufactured from virgin material of approved make in light greay/white/cream/**black** colour with 0.25 mm minimum uniform thickness and double edge folding, meeting the requirements of CTI code STD-136, including cutting, hoisiting, erection, etc. complete as per specification, data sheet and as directed by engineer	LS	1	14.522700728
24.2	Providing & applying Cyclohexanone to fill sheets to make Fill modules, including cutting, hoisiting, erection, etc. complete as per specification, data sheet and as directed by engineer			
24.3	20 mm wide x 0.75 mm thk SS Straps with Clips for fixing Pipes to RCC Beams			
25	**Distribution System and Supporting Arrangement**			
25.1	Providing & fixing OD 250, 200, 180 PVC pipes of 6 kg/cm2 (Class 3) Pr. Rating as per IS 4950 with spigot end including drilling of holes for fixing nozzles, hoisting, grouting in RCC ducts, erecting, jointing with required accessories, testing, etc. complete as per specification and as directed for the full functionality of the system			
25.2	Providing & fixing PVC Puddle Pipes suitable for OD 250, 200, 180 pipes, in RCC Ducts. The puddle pipes shall be of same class as of the pipes. Accessories as required for jointing as per manufacturer's recommondation and as directed by engineer shall be included			
25.3	Providing & fixing End caps with glue and additional rivets, if necessary for OD 250, 200, 180 PVC pipes of same class rating as of the pipes, including accessories required for jointing as per manufacturer's recommondation and as directed by engineer	LS	1	6.3225746875
25.4	Providing & fixing Polypropylene Nozzles of down-spray type with solid-conical or solid-square spray pattern and of capacity and pressure head as per specifications, complete with all the necessary hardware required for fastening the nozzles to the PVC pipes including accessories, hardware, etc. as per specification & as directed. Several nozzle discharge diameters as per drawing shall be included			
25.5	Providing & fixing PVC drift eliminators (wave shaped - 3 pass type (SPECTRA MODEL or equivalent with 77 mm pitch for low pressure drop) with necessary spacers, etc., to meet drift loss stipulation of 0.01% as per specification & as directed by engineer			
B.8	**Pumps:**	-	-	
B.8.1	Providing & fixing Submersible Sludge Pumps of minimum 200 Cu.M/hr capacity @30MWC head, complete with associated 100m long discharge piping, valves and accessories up to nearest plant drain, including control panel as per specification & as directed	Set	2	0.1412440843
B.8.2	Providing and fixing tripod for handling sludge pump including 2T capacity chain pulley block with minimum 8m chain length along with pipe inserts as per sludge pit drawing for mounting the system	Set	1	0.0028249017
B.9	**Tests:**	-	-	
B.9.1	Thermal Performance Guarantee Test as per ATC-105 by Contractor (Class B Test with data collection system and logger)	LS	1	0.1108603007
Part-B	**Total Part-B : Mechanical Works**	-	-	**27.30207912**
Part-C	**Electrical & Instrumentation Works:**	-	-	
C.1	**Aviation Warning Light System:**	-	-	
C.1.1	Providing & fixing Hi Intensity LED twin-type (double fixtures) white flashing Aviation Obstruction Lights as per ICAO, FAA and DGCA, India specifications. The fixtures shall be in corrosion resistant aluminum casting finished in stove enameled control gear suitable for 200/240V, 50Hz supply, complete as per specifications with all the necessary fixing accessories. Expected life is required to be more than 10 years.	Set	8	0.3993450910
C.1.2	Providing & fixing 1.5 m long SS 316 ISMC 100 with brackets/clamps, nuts and bolts for mounting the light fixtures as per drawings and/or manufacturer recommendations and as directed by engineer	Set	8	0.0045986772
C.1.3	Providing & fixing JBs with necessary brackets, bolts & nuts for cabling to the fixtures	Set	12	0.0083761620
C.1.4	Providing & fixing Aviation Lighting Panel cum Controller with Photoelectric light detectors to monitor north sky to control the aviation warning lights. The lights should be switched on when the ambient light goes below 35 candelas and should be swithced off when the intensity is more than 58 candelas. The AOLs should not swith off due to short time increase in sky light due to lightning flashes or any other short bursts of light. The detectors should be complete with all the accessories, hardware, etc. necessary for installation. The provision for Auto manual operation shall also be provided	Set	1	0.0183932081
C.1.5	Providing & fixing 150W LED well glass fixture (to achieve 70 lux) with IP:55 protection, built in driver with surge protection, etc along with 3 m pole for platform and staircase lighting as per specification and/or as directed by engineer	Set	140	0.7564083634
C.1.6	**Cables:** All Cables shall be 1.1 KV GR, AL/ CU Conductor, XLPE Insulation, HRPVC FRLS type -ST2 innersheath, GS Round Steel Wire Armour, FRLSH HRPVC type ST2 outersheath and conforming to IS:7098 PART-I, including lugs etc. and subject to BHEL approval. The cables shall be clamped to Cage Ladders at every 750 c/c along its run and will include all the hard ware requied for its fixing and terminations, etc. The Junction/Terminal boxes should be provided as and where required during erection and/or as directed by engineer	-	-	
i	Providing & fixing power Cable for Receptacless: 4Cx10sq.mm AL	RM	460	0.0324863695
ii	Providing & fixing 4C x 6 sq.mm Copper cable for power supply from AOLP to AOL JBs & Staircase Lighting	RM	817	0.0923178608
iii	Providing & fixing 3C x 2.5 Sq.mm copper cable for local connection from local Junction box to aviation warning lights	RM	40	0.0027328615
iv	40 dia PVC Conduits for cables	RM	700	0.0118410101
v	Routine/Type tests on Cables	Lot	1	0.0541983618
C.1.7	Providing & fixing 240V x 15 & 63A single phase 3-pin outdoor, weather proof, industrial type switch- -socket outlets with inter lock switches and fitted with metal cap as per specifications, drawings and as directed by engineer	Set	5	0.0032847694
C.1.8	Providing & fixing weather & dust proof (IP-55) 200 mm x 150mm x 100mm deep junction box (2/3/4 way) made out of 2mm thk G.S. with ELMEX type terminals, glands etc. complete as per specifications, drawings and as directed by engineer	Set	143	0.0325045441
C.1.9	Providing & fixing 415 V Normal AC Lighting Distribution Board fabricated from 3 thk sheet steel, dust and vermin proof (IP54) and removable gland plates at top and bottom with ELMEX type connectors and with suitable earthing including 2 nos. 63A TPN incomers, HRC fuses and 2 nos. 63A, 8 nos. 16 A outgoing connections with HRC fuses. The DB shall be designed for 50 KVA Fault Level and must also include a lighting transformer of 100 KVA rating. The lightning transformer shall be cast resin dry type delta/star with Z=5% and off circuit taps for variation from -5% to 5% in steps of 2.5% on the primary side. The star point of the secondar side shall be solidly grounded to get 3 ph 4 wire supply	Set	1	0.0205296421

E-Tender Specification No: BHE/PW/PUR/BWT6-CVL-MECH-ELE-NDCT/2123

PART B (Rev-01 dated 01/08/2019): % weightage for amount of individual items of Schedule of quantity w.r.t. the total price (as quoted by the bidder in the E-Procurement Portal titled as "Part-C of Vol-II Price Bid".)

Scope of Work: CIVIL, ARCHITECTURAL, MECHANICAL, ELECTRICAL, CONTROL & INSTRUMENTATION WORKS FOR NATURAL DRAUGHT COOLING TOWER (NDCT) AT MSPGCL, 1X660 MW BHUSAWAL THERMAL POWER STATION, UNIT-06, MAHARASHTRA.

ST. No.	Description of item	Unit	Qty	Weightage in % (Rounded up to 10 Decimal)
C.1.10	Providing & fixing 415 V Emergency AC Lighting Distribution Board fabricated from 3 thk sheet steel, dust and vermin proof (IP54) and removable gland plates at top and bottom with ELMEX type connectors and with suitable earthing including 2 nos. 63A TPN incomers, HRC fuses and 2 nos. 63A, 4 nos. 16 A outgoing connections with HRC fuses. Two incomers from CWPH will have to be connected to this LDB by the contractor. Automatic change over with suitable delay timers with Auto/Manual operation will have to be provided The DB shall be designed for 50 KVA Fault Level and must also include a transformer of 100 KVA rating. The lightning transformer shall be cast resin dry type delta/star with Z=5% and off circuit taps for variation from -5% to 5% in steps of 2.5% on the primary side. The star point of the secondar side shall be solidly grounded to get 3 ph 4 wire supply	Set	1	0.0492712077
C.1.11	Providing & fixing Temporary aviation warning lights as per specifications, during construction, once the costruction reaches beyond 50m level from general ground level as per specifications, drawings and as directed by engineer	LS	1	0.0073907312
C.1.12	Providing & fixing 1100 V GR, PVC insulated 1C x 2.5 Sq.mm stranded copper wire for local connection from local Junction box to staircase lights	RM	280	0.0055184126
C.2	**Lightning Protection System conforming to IS: 2309**	-	-	
C.2.1	Providing & fixing Air terminator / Lightning arrestor made of 20mm dia. x 2.0m ht Lead coated Cu rod with pointed end and welded to base plate for fixing on top platform complete as per specifications and as directed by Engineer	Set	14	0.0154054018
C.2.2	Providing & fixing of 75 x 10 thk GI flat Coronal band connecting all air terminator on one side and to the down conductor on the lower side as per specifcation complete with all the necessary fixtures, hardware, etc. required for installation. The clamps used shall be GI and heavy duty and shall be fixed approx 1m below the top of the cooling tower and clamped at the spacing not more than 750 mm C/C	RM	301	0.0249647478
C.2.3	Providing & fixing of 75 x 10 thk GI flat Down conductor complete with all the necessary fixtures, hardware, etc. required for installation. The down conductors on the top shall be connected to the coronal band and on the lower side they shall be connected to the test links. The clamping shall be at 750 mm C/C with heavy duty GI clamps. The down conductors shall be in one piece as far as possible. The necessary joints shall be of fully welded type and not bolted type exept at the test link. These conductors shall be laid over the concrete surface so that visual inspection and repair, if necessary during maintenace is possible	RM	2695	0.2235222224
C.2.4	Providing & fixing 75x10 thk GS flat Test links (complete assembly) with enclosure anchored to Raker column as directed by engineer	Set	14	0.0074727670
C.2.5	Providing & fixing 4.5 m long, Dia. 40mm MS rod buried down conductor as per specifications and as directed by engineer	Set	14	0.0077073696
C.2.6	Providing & fixing 100 dia. x 1.5m Class-1 grade PVC pipe to be filled with PCC after enclosing down conductor below test link (approx. 10m length) as per specifications, drawings and as directed by engineer	Set	14	0.0112667591
C.3	**Earthing conforming to IS :3043**	-	-	
C.3.1	Providing & fixing of Earth conductor made out of 40 mm Dia. MS round bar complete with all the necessary fixtures, hardware, etc. required for installation shall be supplied and installed between test link on one side and to the earth mat on the other side as per specifications, drawings and as directed by engineer	RM	100	0.0096900698
C.3.2	Providing & fixing 70x10 thk GS flat coronal band on top platform cleated at 750mm c/c complete with all the necessary fixtures, hardware, etc. required for installation as per specifications, drawings and as directed by engineer	RM	301	0.0249647478
C.3.3	Providing & fixing 70x10 thk GS flat down conductors from top platform to earth mat, cleated at 750mm c/c complete with all the necessary fixtures, hardware, etc. required for installation as per specifications, drawings and as directed by engineer	Set	386	0.0288449442
C.3.4	Laying of Earthing Mat (Main Grounding Conductor @ 1m below FGL approx. at about 6 m outside the NDCT periphery), transportation from yard stores, loading, unloading, cutting to length, welding, protective painting of joints etc. all complete. (Excavation & Back filling shall be paid separately under respective item of earth work. Earthing mats/rods shall be supplied by BHEL free of cost)	RM	460	0.0380011138
C.3.5	Construction of Treated Earthing pit as per drawing with charcoal & salt, GI pipes (40 dia, 3 m long) as per IS- 3043, earth electrodes, GI wire, GI strips, brick chamber with covers including associated earthwork etc. all complete. (Material for GI pipes, earth electrodes, GI wire, GI strips shall be supplied by BHEL free of cost).	Set	5	0.0080065004
C.3.6	Providing & fixing Dia. 40mm MS rod buried grounding inter connector between cooling towers and to nearest main plant grounding mat as per specifications, drawings and as directed by engineer	RM	200	0.0202011651
C.3.7	Providing & fixing 25x6mm thk GS flat for cage ladders, hand rails and all non-current carrying metal parts as per specifications, drawings and as directed by engineer	RM	65	0.0010247814
C.3.8	Providing & fixing 50x6 thk GS flat for non-metal parts such as basin, CWC, drain box etc. and cable trays as per specifications, drawings and as directed by engineer	RM	100	0.0034325007
C.3.9	Providing & fixing 25x3mm thk. GS flat for control panels (AWL) as per specifications, drawings and as directed by engineer	RM	10	0.0000985431
C.3.10	Providing & fixing 8 SWG GI wire for Junction boxes / pull boxes, receptacles, conduits etc. as per specifications, drawings and as directed by engineer	RM	25	0.0005502406
C.4	**Others**	-	-	
C.4.1	Providing & fixing of Temporary lightning protection system during construction as per specifications, complete with all the necessary fixtures, hardware, etc. required for installation as per specifications, drawings and as directed by engineer	LS	1	0.0114966929
C.4.2	Conducting tests on circuit as per specifications, drawings and as directed by engineer	LS	1	0.0036952822
C.5	**Instrumentation:**	-	-	
C.5.1	Providing & fixing SS Thermowells complete with all the necessary fixtures, hardware, etc. required for installation as per specifications, drawings and as directed by engineer	Set	4	0.0144528187
C.5.2	Providing & fixing SS Temperature Guages complete with all the necessary fixtures, hardware, etc. required for installation as per specifications, drawings and as directed by engineer	Set	2	0.0031825581
C.5.3	Providing & fixing SS Pressure Gauges complete with all the necessary fixtures, hardware, etc. required for installation as per specifications, drawings and as directed by engineer	Set	2	0.0019410153
C.5.4	Providing & fixing of 3-hole type Pitot Tube procured from IIT Delhi, complete with all the necessary fixtures, hardware, etc. required for installation as per specifications, drawings and as directed by engineer	Set	1	0.0648736957
C.5.5	Providing & fixing SS Level Switches in Sludge Pit complete with all the necessary fixtures, hardware, etc. required for installation as per specifications, drawings and as directed by engineer	Set	1	0.0022089657
C.5.6	Providing & fixing rotating type Anemometer for wind speed measurement as per specifications, drawings and as directed by engineer	Set	1	0.0021020857
C.5.7	Providing & fixing Mechanically Aspirated Psychrometer for wetbulb temparature measurement as per specifications, drawings and as directed by engineer	Set	1	0.0202011651
Part-C	**Total Part-C : Electrical & Instrumentation Works**	-	-	**2.048505427**
	Total Estimated Value : Part-A + Part-B + Part-C)	-	-	**100**