Pre Bid Technical Clrification No.2 dated 02.05.2025 to NIB No.477 dated 26.02 2025 for EPC execution of EM Works of Heo HEP

Sl. No.	Volume	Page No.	Clause No.	Tender Provision	Bidders Queries	NEEPCO Replies
1	Vol-II_Tech Specfication- Particular Technical Specifications-Mechanical Volume II Section-II ; M-1 Turbine and MIV	Page 39 of 83	1.28 Rotating parts, guide bearings and seals	While the turbine is operating in water having silt concentration and the maximum leakage shall be guaranteed by the Contractor.	Kindly confirm whether HVOF coating is required on Turbine components due to presence of silt in water. If Yes, Kindly clearly specify the Turbine parts on which HVOF is required i.e. runner, Guide Vanes, Labyrinth etc., as well as its extent, as this shall directly impact the overall price of the project.	HVOF Coating is not envisaged at present. Based on the silt data, the requirement of HVOF or other coating maybe discussed during detail engineering.
2	Vol-II_Tech Specfication- Particular Technical Specifications-Mechanical Volume II Section-II ; M-1 Turbine and MIV	Page 17 of 83	1.19 Cavitation pitting guarantee	In case of excessive cavitation the Contractor shall, at his cost, correct the condition by reshaping or resurfacing, grinding, polishing, building up by welding or by any other means and rectify/ replace the parts thus affected and carry out such modifications in design and such improvement in the manufacture and finish as may be required to minimize and contain cavitation pitting within permissible limit. The replacement shall be subject to the same guarantees as per the original equipment	"Kindly allow bidders to offer all the cavitation guarantees shall be as per IEC 60609. Also, we offer to undertake maximum 2 number of repair/replacement within guarantee period, as restoration to original guarantee conditions after repair/replacement will lead to an unending process. Please accept & confirm. "	Bid stipulations shall prevail.
3	General			Regarding transport limitation	Kindly furnish the transport limitation of road in terms of allowable weight & dimension i.e. L X W X H.	The project road from Kamba-Mechuka road to Heo Power House is being built as per the following specifications: i) Single lane carriage way width: 3.75M (ii) Minimum Formation width: 7.75M (iii) Maximum vertical gradient: 1 in 15 (iv) Vertical Ruling gradient: 1 in 20 (v) Minimum Radius of curvature: 20.0M Detail Geometric design shall be done as per IRC manual for hills road. The bailey bridge over yarjep river shall be of 40R specifications, having a clear width of 4.25 Metres (from truss to truss). Therefore, the maximum width of the largest consignment shall be computed accordingly. The maximum weight of the consignment shall also be finalized as per the bailey bridge specifications. THe bidder is requested to visit site and carryout detail survey to ascertain transportation constraints, if any, in the Kamba Mechuka Road as well as the project roads to Power House and Valve House.
4	Vol-II_Tech Specfication Vol-II Sec-III_Tender Drawings	Page 13 of 18	Vol-II Sec-III_Tender Drawings	Draft Tube Dimensions	Draft tube dimensions are completely governed by the model selected for the subject project to achieve required WAE and performance guarantees. Therefore , bidder should be allowed to offer most optimum dimensions of Draft Tube. Considering this fact the bottom most depth of Draft tube wrt turbine centreline may increase by 500mm approx wrt as specified in tender drawings. Kindly accept	Any major changes must be justified based on Model Test and informed well in advance for the required civil work modifications.
5	Vol-II_Tech Specfication- Particular Technical Specifications-Mechanical Volume II Section-II ; M-1 Turbine and MIV	Page 82 of 83	1.47 PRESSURE OIL SYSTEM FOR TURBINE INLET VALVES	Separate nitrogen bottle battery back up shall be provided for the oil pressure accumulators for the MIV operation.	Kindly clarify , whether Nitrogen Bottle bank OR HP CAS is required for OPU of turbine and MIV .	Nitrogen Bottle Bank shall be preferred for OPUs for Turbine and MIV.
6	Vol- II Sec I-G-1_GTS_ Annexes General Technical Specifications Volume II Section-I : G-1; Annexure Electro-Mechanical Equipment	Page 20 of 28	4.4 Specific Documents for Mechanical Plant and Installations	4.4.1 Documents for all Mechanical Plants as Applicable	The list of drawings / documents as required in tender specification which need to be submitted to customer for approval , shall be finalized mutually during detailed design stage. This is the regular practice which has been followed in almost all the tenders. Kindly accept.	Accepted.

Pre Bid Technical Clrification No.2 dated 02.05.2025 to NIB No.477 dated 26.02 2025 for EPC execution of EM Works of Heo HEP

Sl. No.	Volume	Page No.	Clause No.	Tender Provision	Bidders Queries	NEEPCO Replies
7	Vol-II Sec-II_PTS_Mechanical Particular Technical Specifications-Mechanical Volume II Section-II ; M-11 Cooling Water System	PTS::M-11::Page 4	COOLING WATER SYSTEM- -11.4.4 Cyclone Separator:	Double pass Cyclone separator shall preferably be capable of removing of all material as small as 100 microns in cooling water circuit with the efficiency of 85%.	The requirement of filtration of 100 micron for cyclone separator is very high, which may result in drastic increase in overall cost of equipment and unavailabilty in market. Since this cyclone separator is fulfilling the requirement of complete unit, so its filtration rating should be in range of 500 to 1000 microns. Kindly review and accept.	Bid stipulations shall prevail.
8	Vol-II Sec-II_PTS_Mechanical Particular Technical Specifications-Mechanical Volume II Section-II ; M-11 Cooling Water System	PTS::M-11::Page 4	COOLING WATER SYSTEM- 11.4.3 Automatic Backwash Duplex Strainer	The strainer should have filtration capacity to remove 100 micron and above size of particles at an efficiency of 98% and should be automatic self-cleaning.	The requirement of filtration of 100 micron for duplex strainer is very high, which may result in drastic increase in overall cost of equipment and it may be unavailable in market. Since this duplex strainer is fulfilling the requirement of complete unit, so its filtration rating should be around 500 microns. Kindly review and accept.	Bid stipulations shall prevail.
9	Vol-II_Tech Specfication- Particular Technical Specifications-Mechanical Volume II Section-II ; M-1 Turbine and MIV	Page 71 of 83	4 - MIV – MATERIALS OF CONSTRUCTION OF COMPONENTS	Valve Rotor, Valve Body ,Rotor trunnion	The spherical valve body , door and trunion are always manufactured by Carbon Steel Casting. Kindly accept and confirm.	As per Clause no. 1.44 "Contruction Details" in PTS, *the Valve Body shall be made out of either cast carbon steel or Weld Fabricated from Steel Plates…..The Trunnions shall preferably be integrally cast with the rotor or made as forgings…..* Therefore, both Weld Fabricated Steel Plates and Carbon Steel Castings shall be acceptable. In case of Steel Plates, the material standard shall be ASTM A537 and in case of Carbon Steel Casting, the material standard shall be ASTM A148 or better.
10	Particular Technical Specifications-Mechanical,Volume II Section-II ; M-1,Turbine and MIV	Page 19 of 83	1.21 Turbine Model Test "Model Details, Drawing, Homology "	The Clauses states "The test head shall not be more than 40.0 m and not less than 30 m."	Model Test head will be above 10m as per IEC 60193-2019. Please confirm & modify the clause accordingly.	Detail technical justification to be provided during detail engineering.
11	Particular Technical Specifications-Mechanical,Volume II Section-II ; M-1,Turbine and MIV	Page 19 of 83	1.21 Turbine Model Test "Place of model test "	The Clauses states "Nevertheless the Engineer Of-Contract reserves the right to get the model test repeated (with same model runner) in presence of both the parties in an internationally recognised independent laboratory at his own cost."	Our Model Test Laboratory is a NABL accredited and Department of Science & Industrial Research (DSIR), Govt. Of India recongnised laboratory and has conducted many successful Francis, Pelton, Kaplan turbine model tests. Turbine design is proprietary of nature and cannot be shared with external agencies. Therefore Model test will have to be done at our Laboratory only. Please confirm & modify the clause accordingly.	Bid stipulations shall prevail.
12	Vol-II Section-II; E1	Page 9 of 67	1.4.2.1	**Stator Core:** Core lamination sheets with a loss coefficient of not more than 1.1 W/kg at 1 T and 50 Hz shall be used.	Considering the non-availability of 50C270 grade Stator Core lamination sheets in India, having a loss coefficient of not more than 1.1 W/kg at 1 T and 50 Hz , 50C290 grade should also be considered. 50C290 grade Core lamination sheets have a loss coefficient of not more than 1.15 W/kg at 1 T and 50 Hz. The proposal is in line with Make in India policy of Govt. of India. Kindly review & confirm.	Bid stipulations shall prevail.
13	Vol-II Section-II; E1	Page 17 of 67	1.4.10.3.1	**Moisture Detector:** "A solid state type instrument based on **resistance principle……..**" has been mentioned.	Nowadys Capacitive sensors are being used by Moisture Detector manufacturers'. Kindly consider Capacitive sensors also.	Moisture Detectors based on resistance principle and Capacitive sensor type Moisture detectors both are acceptable.
14	Vol-II Section-II; E1	Page 25 of 67	1.4.12.3.3	**RTDs, DTTs & Other Instruments** The Mercury-in-steel dial type thermometers (DTTs) shall have indication and high temperature alarm and shutdown contacts	Being hazardous in nature, mercury in steel DTTs are presently not in use. We propose gas filled DTT for the same. Kindly consider & accept.	Bid stipulations shall prevail. However, same can be discussed during detailed engineering.
15	Vol-II Section-II; E1	Page 39 of 67	1.10.1.6 (v)	**Tests on Generators:** Static flux test on unwound stator frame and core assembly will be carried out at site.	The tests shall be performed at our works/ site considering the transport limitation of assembled parts. Therefore,test at site/shop is proposed. Kindly consider & accept.	Agreed.

Pre Bid Technical Clrification No.2 dated 02.05.2025 to NIB No.477 dated 26.02 2025 for EPC execution of EM Works of Heo HEP

Sl. No.	Volume	Page No.	Clause No.	Tender Provision	Bidders Queries	NEEPCO Replies
16	Vol-II Section-II; E1	Page 40 of 67	1.10.2 (iii) a,b,c,d,e (vi)	**Type tests:** a)*Direct axis, open circuit and short circuit transient time constants. b) *Direct axis, transient reactance at rated current and rated voltage. c) Direct axis and quadrature axis, saturated and unsaturated synchronous reactance. d) *Direct and quadrature axis sub-transient reactance. e) Negative phase sequence reactance.	For determination of specified parameters , we need to conduct Sudden short-circuit test. In our opinion this test is an detrimental test; hence we do not recommend this test. The same may be deleted. Calculated value of reactance's and time-constants will be furnished. Please review and confirm the same.	Bid stipulation shall prevail. However, the requirement may be reviewed during detailed engineering.
17	Vol-II Section-II; E1	Page 40 of 67	1.10.2 (iii) (iv)	**Type tests:** (iii) g) V-curves. J)Moment of Inertia (WR2) for rotating parts by load rejection (iv) Measurement of leakage reactances and Potier reactances	It is not feasible to conduct these test at site. Kindly consider & accept. Design values /curves shall be furnished during detailed engineering. Kindly consider & accept.	Bid stipulation shall prevail. However, the requirement may be reviewed during detailed engineering.
18	Vol-II Section-II; E1	Page 40 of 67	1.10.2 (xvi)	**Type tests:** (xvi) Calibration & accuracy test of RTD's/DTT's.	Calibration & accuracy test of RTD's/DTT's is not feasible to be conducted at site.The test shall be performed at vendor works & test certificates shall be furnished for review. Kindly consider & accept.	Agreed.
19	VOLUME IV-B, SECTION:E9 PROTECTION SYSTEM	7 OF 41	9.4.3	PROTETCION FOR EXCITATION TRANSFORMER	We understand that the Excitation transformer protection shall be part of Static excitation equipment . Kindly confirm.	Since the entire EM works are under the scope of EM Package, the protection of Excitation Transformer shall be in the scope of the bidder.
20	VOLUME IV-B, SECTION:E9 PROTECTION SYSTEM	7 OF 41	9.4.3	PROTECTION FOR 245 kV GIS & FEEDERS	Line overvoltage and Autoreclose shall be built in function of Main-1 & Main-2 distance protection relay.	Agreed.
21	VOLUME IV-B, SECTION:E9 PROTECTION SYSTEM	9 OF 41	9.6.1.1	There shall be two RS 232 ports one on front and the other on rear.	The Numerical relay shall have one RS-232 port in front for relay setting and one Ethernet port in rear.	Shall be finalised during detailed engineering.
22	VOLUME IV-B, SECTION:E9 PROTECTION SYSTEM	9 OF 41	9.6.2	Digital Fault and Disturbance Recorder (DFDR)	Disturbance recorder shal be provided as built in feature of Numerical relays. Kindly confirm.	Bid stipulation shall prevail.
23	VOLUME IV-B, SECTION:E9 PROTECTION SYSTEM	25 OF 41	9.12.5	Bus bar Differential Protection (87 A Main 1 & 87 B Main 2)	Duplicated Centralised Busbar protection shall be provided. Kindly confirm.	Please refer Clause no. 9.12.5 which states that "The busbar differential protection scheme shall be centralised or distributed type and have provision for future expansion".
24	VOLUME IV-B, SECTION:E9 PROTECTION SYSTEM	27 OF 41	9.12.5	For the purpose of the Transmission line protection Differential Protection for Feeder-I and Distance protection for Feeder-II shall be given.	We understand that for Feeder-I, Current differential relay to be provided and remote End relay/panels for this feeder is not in scope of bidder.	Bid specification shall prevail. Please refer Clause no. 9.12.5 for detail.
25	VOLUME IV-B, SECTION:E9 PROTECTION SYSTEM	41 OF 41	ANNEX-I	LIST OF MANDATORY SPARE PARTS.	We understand that for mandatory spares, Set means Nos. i.e. 01 set means 01 no., 02 set means and 02 nos. and so on. Kindly confirm. Also kindly note the following: Sl. No. 2 : Input/output unit - Not applicable Sl. No. 3: Trip matrix unit - Not applicable Sl. No. 6, 7, 10, 11, 12 - Not applicable for offered Generator and Switchyard protection panel Sl. No. 14: Not applicable Sl. No. 20: Not applicable Also kindly clarify the requirement against Sl. No. 16 of Ann-1, Relay testing set complete with timers etc. for distance relay	Please refer Clause 9.25 of PTS- Protection (Vol-II, Sec-II E-9). The clause referred by the bidder is from earlier cancelled tender of Heo HEP.
26				Drawing No.: 1275-ED-2001: Powerhouse and Substation Mian Single Line Diagram	We understand that Protection panel for Future Line bays is not in present scope of tender.	Agreed.

Pre Bid Technical Clrification No.2 dated 02.05.2025 to NIB No.477 dated 26.02 2025 for EPC execution of EM Works of Heo HEP

Sl. No.	Volume	Page No.	Clause No.	Tender Provision	Bidders Queries	NEEPCO Replies
27	Sec-II, Vol-II, Electrical, Section-E1: Generator and Excitation system	1.7.6.1	31 of 730	The excitation system shall be provided with two autochannels (Auto-I & Auto-2) and one manual channel for automatic voltage regulation, excitation control and indication. Each channel shall be equipped for auto operation with facility of selecting either channel in “Auto” or “Manual” mode.	As per the specification Excitation system channels need to be as follows: Two Auto Channels with inbuilt manual and One independent Manual Channel. Please note that the above is non standarad requirement. As per the all other projects executed by the bidder we propose Two auto Channels with Inbuilt Manual Channel. Please confirm.	Bid specification shall prevail.
28	Sec-II, Vol-II, Electrical, Section-E1: Generator and Excitation system	1.8.2.8	37 of 730	The personal computers system shall be distributed within the power house and remote offices for monitoring the plant data for management information system.	We understand that the remote offices are within the Power House area. Please confirm. We understand that communication media for remote offices computers will be provided by the employer. Please confirm.	Confirmed.
29	Sec-II, Vol-II, Electrical,Section-E4 : SCADA System	4.2	172 of 730	The communication between remote locations will be made through OPGW running along.	We understand that OPGW will be provided by the Employer. Please confirm.	Agreed. However, OFC link between Powerhouse and Barrage site and Valve house site shall be in the scope of the bidder.
30	Sec-II, Vol-II, Electrical,Section-E4 : SCADA System	4.2 4.5.3/xxv	172 of 730 191 of 730	Further, The Heo HEP and The Tato-I HEP (The Tato-I HEP is located at the downstream of the Heo HEP) will operate in Tandem operation. • The D/S plant shall be a follower station with U/S plant being a lead station. Hence the D/S plant to be remote controlled from U/S plant. • Duel Fibre link to be established (2 separate FO cable). For achieving tandem operational control of Tato –I HEP, redundant communication with SCADA network through RTU at intake gate of Tato I HEP shall be provided. For details of SCADA at Tato I authorities can be consulted.	1) Please furnish the cable route length between HEO HEP and TatoI HEP. 2) Whether OFC between HEO HEP and Tato-I HEP will be laid over groung , underground or alongside the tail race tunnel? Please clarify. 3) Please provide the details/ make of SCADA/ DCS system installed at Tato-I HEP. 4) Tanden operation requires logic modification, additional hardwares etc. in the existing DCS/SCADA system of Tato-I HEP. The same can only be done by the OEM of the above SCADA system. Employer need to assign this work to OEM during execution.Please confirm.	1) Since Site survey is under the scope of the bidder, the required cable route length shall be assessed the by bidder. However, the distance between the two plants shall be approximately 5KM. 2) Shall be provided during detailed engineering. 3) Shall be provided during detailed engineering. 4) Please refer Clause no. 4.2 of PTS of SCADA system.
31	Sec-II, Vol-II, Electrical,Section-E4 : SCADA System	4.2.1.1 4.3.2/ 3rd para	174 of 730 180 of 730	v) Required No. of RTUs for Barrage & BFV. Single mode underground redundant optical fiber link between Barrage and Power House.	1) Please furnish the cable route length between HEO HEP and Barrage. 2)Please furnish the cable route length between HEO HEP and BFV House. 3)Please furnish the cable route length between HEO HEP and Surge Shaft.	Since the Site survey is under the scope of the bidder, the required cable route length shall be assessed the by bidder. However, the distance between power house and barrage shall be approximately 5KM.
32	Sec-II, Vol-II, Electrical,Section-E4 : SCADA System Sec-II, Vol-II, Electrical, Section-E1: Generator and Excitation system	4.3.12 1.8.2.7	185 of 730 36 of 730	All the energy meters used for measurements shall have minimum accuracy of 0.2S and shall be connected to the data acquisition system for automatic meter readings. Energy Metering System (as a part of unit control & monitoring system /SCADA) For monitoring the generation and transmission of power, a energy metering system using digital energy meters of minimum 0.2% accuracy shall be provided for 220kV feeders for export/import of electricity from the plant. Energy meters having minimum accuracy of 0.5% shall be provided for each generator at 11 kV level, unit &station auxiliary transformers, DG sets etc.	These two clauses are contradictory in nature. However, we understand that energy meters for 220KV feeders are having 0.2% acuracy and other applicable energy meters are having 0.5% accuracy. Please confirm.	Please refer Clause no. 1.8.2.7 of PTS of Generator & Excitation system which states that Energy meters shall have minimum accuracy of 0.2s class for both 220KV feeders and generator at 11KV level.
33	Sec-II, Vol-II, Electrical,Section-E4 : SCADA System	4.5.4.1/ Last para	192 of 730	The required license for the up-gradation of software for entire plant life shall be considered in the scope of supply.	Required licenses for the application software will be provided as part of the supply for the entire plant life. However any updates to the hardware and software, if required in the future, will be addressed based on specific needs and subject to applicable terms mutually agreed at that time. This ensures the flexibility to accommodate any advancements or enhancements to the hardware and software during its lifecycle. This is in line with all other projects executed by the bidder. Please confirm.	Bid specificatiion shall prevail.
34	Sec-II, Vol-II, Electrical,Section-E4 : SCADA System	4.5.4.1/viii 4.5.12	193 of 730 204 of 730	viii) provide facilities for interconnection of owner’s VSAT for communication with RLDC i) Powerhouse to Regional Load Dispatch Control Centre (RLDC) through OPGW/ PSTN	Two communication media are specified between Poer House and RLDC. We understand owner’s VSAT for communication with RLDC is applicable for the project. Please confirm.	Shall be discussed during detailed engineering.

Pre Bid Technical Clrification No.2 dated 02.05.2025 to NIB No.477 dated 26.02 2025 for EPC execution of EM Works of Heo HEP

Sl. No.	Volume	Page No.	Clause No.	Tender Provision	Bidders Queries	NEEPCO Replies
35	Sec-II, Vol-II, Electrical,Section-E4 : SCADA System	4.3.7	183 of 240	Portable Engineering workstation…..dockable arrangement	Docable arrangement for Laptop based Portable Engineering workstation is not applicable. Please confirm.	Bid specification shall prevail. However, same can be discussed during detailed engineering stage.
36	Sec-II, Vol-II, Electrical,Section-E4 : SCADA System	4.5.6	202 of 240	The 'Penstock Rupture Detection Logic' for penstock protection shall also be implemented in this LCB, apart from the same being implemented in the BFV house RTU panel.	We understand that Penstock Rupture Detection Logic, their field instruments, field cables, Cable trays/ conduits, trenches etc. will be provided by the employer. Please confirm.	Shall be in the scope of the bidder. Please refer Clause 3.2 of PTS Pressure Shaft Valve (BFV) for detail.
37	Sec-II, Vol-II, Electrical,Section-E4 : SCADA System	4.5.8	203 of 240	4.5.8 LCBs for reservoir regulation and barrage control	As per clause no. 4.5.6 of Section-E4 : SCADA System, page no. 33 of 51, reservoir regulation and barrage control are part of "LCB for Unit Common Services & all other Station Auxiliary Services and Barrage Monitoring (Common Auxiliary Control Board)". Hence, separate LCB for the same is not required. Please confirm.	The bidder shall provide LCB as per system requirement. The same shall be reviewed during detailed engineering.
38	Sec-II, Vol-II, Electrical,Section-E4 : SCADA System	4.5.9	203 of 240	4.5.9 LCB for Common and Station Services	As per clause no. 4.5.6 of Section-E4 : SCADA System, page no. 33 of 51, Common and Station Services are part of "LCB for Unit Common Services & all other Station Auxiliary Services and Barrage Monitoring (Common Auxiliary Control Board)". Hence, separate LCB for the same is not required. Please confirm.	The bidder shall provide LCB as per system requirement. The same shall be reviewed during detailed engineering.
39	Sec-II, Vol-II, Electrical,Section-E4 : SCADA System	4.5.13.13.1	211 of 240	A centralized database shall be implemented using latest version of Oracle based dedicated Relational Database Management System, with necessary network user licenses covering all the computers of the control room and Powerhouse LAN, for database requirements of the control system, inventory management, historian/ trending functions, intranet etc.	Please allow Oracle based or similar type of dedicated Relational Database Management System with necessary network user licenses. Please confirm.	Bid specification shall prevail. However, same can be discussed during detailed engineering stage.
40	Volume 2 ,Section-II, M5	1	Note of Clause 4.1	The capacity of the cranes may be finalized with the Electro-Mechanical Equipment Manufacturer and should be in accordance with the maximum load to be lifted.	These two clauses are contradictory to each other. Kindly confirm the actual technical input.	The Crane Ratings given in BoQ are tentative. The ratings of the cranes shal be decided as given in the Note of Clause no. 4.1
	BOQ_256324 Item Rate BoQ	BoQ1	28	210/32/5 T - 1 set for Power House , 200/32 T -1 Set for Penstock valve house		
41	Volume 2 ,Section-II, M5	4	Note of Clause 4.3	Point hooks with shanks for general engineering purpose.	As IS:3815 is withdrawn the applicable standard shall be IS 15560.	The latest edition of IS standards relevant for the crane capacity/rating shall be applicable.
42	Volume 2 ,Section-II, M5	2	4.2.2	The general arrangement of the crane shall be in accordance with the BF Valve House layout drawings enclosed and as described in the specification at various places	BF Valve House layout drawings is not available in tender drawings. Kindly furnish tender drawing.	The ratings and other details of the BF Valve House Crane is already given in the PTS and the same appears to be sufficient for tender estimate purpose. The Civil Drawings shall be provided when finlaized by the Civil Contractor. However, the drawing as per the DPR is enclosed for reference as Annexure-I.
43	Volume 2 ,Section-II, M5	17	4.13	The permanent AC illumination system on the crane shall consist of four 1000 watt highway beamed flood lighting units to illuminate uniformly the area under the crane.	160W LED type higher efficiency lamps shall be provided as an alternative as per latest industrial practice. Please confirm.	Shall be reviewed during detailed engineering.

Pre Bid Technical Clrification No.2 dated 02.05.2025 to NIB No.477 dated 26.02 2025 for EPC execution of EM Works of Heo HEP

Sl. No.	Volume	Page No.	Clause No.	Tender Provision	Bidders Queries	NEEPCO Replies
44	Vol-II, Section-II, M7 HVAC system	1	7.1.1 Air handling units	7.1.1 Air Handling Units: i) Three (3), sets of Air handling units (AHU's), each of them be of 50 % of the required capacity, one unit serves as standby, for Power house floors, Transformer area, Service bay, drainage gallery etc. If required, additional fresh air blowers of the required capacity / rating against each AHU shall be provided.	Bidder envisage as following: 1.0 Location of the AHU rooms is not avaliable in the drawing. Bidder has envisaged that AHU of ventilation system of power house bldgs, shall be placed in open at roof of the control tower bay and AHU fans shall take suction air suction directly from the ambient in line with general practice followed in the surface type Plant. Hence, no seperate fresh air blower fan shall be applicable. 2.0 Since there will be no wall on the transformer withdrawal side of tranformer hall and same shall be naturally ventilated, hence, bidder shall not envisage ventilation system for transformer hall located below GIS room. Customer is requested to review and confirm.	1.0 Location of AHU shall be finalized during detail engineering in discussion with civil design. 2.0 Agreed.
45	Vol-II, Section-II, M7 HVAC system	1	7.1.1 Air handling units	ii) Required no. of Split type Air Conditioners of the required capacity for Power house Control room, relay/panel rooms, PLCC room areas, staff room, Conference Room, Office Rooms etc. The no. of the Split type air conditioning units provided in each closed space shall be (N+1), where N is the number of air conditioning units of equal rating/capacity required for the said closed space.	**A.** Since relative humidity control is not feasible / possible in case AC machine as window/ Split Air Conditioners, hence relative humidity (RH 55± 5%) shall not be arrived/ maintained for areas being cattered by window / split air conditioners type. Further in view of the above, bidder proposes type of the air conditioning system as per the following for Control room, panel rooms: 1. 25-60TR, D-X type Air cooled Condensing Unit along with AHU shall be provided with 3 x 50% redundancy. 2. 11-25 TR, Air cooled Ductable Split AC/ Air cooled Package AC shall be provided with 3 x 50% redundancy. 3. Upto-10TR, with Hi-wall Split AC/ Cassette AC shall be provided with N+1 redundancy configuration. Where N is number of working unit. **B.**Rest of the air conditioned space specified in Cl. No.-ii), type of the AC system shall be envisaged as window/ Split Air Conditioners only. Customer is requested to review type of AC system and accept type of AC system mentioned above..	The temperature and relative humidity control shall be required as specified in the PTS. The requirement / installation of Condensing units shall be examined during detail engineering.
	Vol-II, Section-II, M7 HVAC system	2	7.2.1 Layout and General Arrangement	All air-conditioned areas will be maintained at 24 ± 1 deg C and RH 55 ± 5% with split/ window type air-cooled air conditioners		
46	Vol-II, Section-II, M7 HVAC system	2	7.1.4	**Auxiliary system and miscellaneous items** .... iv) Local control panels for air handling units, Air cooled packaged Air conditioner units, circulation/cooling water pumps & automatic filters (If required), supply fans, exhaust fans, FCU etc.	As per technical specification, air condioned areas are to be cattered by the Window / Split Air Conditioners but in reffered clause Air cooled package Air conditioners are specified. Customer is to review and confirm applicability of the Air cooled package Air conditioners	Air Cooled Package Air Conditioners are not envisaged. Hence not applicable.
47	Vol-II, Section-II, M7 HVAC system	1	7.1.2 Exhaust air fans	i) Required nos. of exhaust air fans for exhaust of air from the Power house with 100% stand by capacity.	1. Since exhaust air fan for exhaust of air from the power house with 100% stand by capacity is already envisaged hence separate exhaust air fan for exhaust of smoke/ air from all ventilated areas as specified in cl. No.-iii) is not to be envisaged. Exhaust fan for exhaust from power house with 100% stand by capacity may be used as exhaust air fan for smoke / air exhaust with connection of the emergency power supply.	1. Agreed
	Vol-IV B, Section-M7 HVAC system	3 of 15	7.2 Detailed scope of supply Exhaust air fans	iii) Required nos. of exhaust air fans for exhaust of smoke/air from all ventilated areas including Powerhouse floors, service bay, Transformer area, bus duct areas, DG Room, GIS Hall etc. with 100% stand by capacity & ducting report.	2. Further bidder understand that exhaust fan shall be wall mounted axial exhaust type fan and no centralized ducted exhaust system is applicable. In view of the above customer is requested to review and accept above.	2. Agreed.

Pre Bid Technical Clrification No.2 dated 02.05.2025 to NIB No.477 dated 26.02 2025 for EPC execution of EM Works of Heo HEP

Sl. No.	Volume	Page No.	Clause No.	Tender Provision	Bidders Queries	NEEPCO Replies
48	Vol-IV B, Section-M7 HVAC system	2	7.2.1	……..All ventilation and air-conditioned areas will be designed to maintain a positive pressure. Air changes in accordance to IS-4720, applicable for Surface Hydel Stations, will also be applicable for this Power House……	Inside temperature condition which are to be maintain for ventilated area, are not specified in technical specification. Minimum inside temperature for ventilation areas which can be arrived with CW water (temperature as 20.0^0 C) , shall be approxmately 35.0^0 C only. Bidder shall envisage maximum inside temperature to be maintained as 35.0^0 C only for AHU capacity calculation depending upon air requirement as per Air change and Heat dessipation rate whichever is maximum. Customer is requested to review and confirm the inside temperature condition to be maintained and raw water temperature parameters.	The raw water temperature as given in the clause no. 7.3.1 of the PTS for HVAC System is confirmed. The requirement of additional cooler in the AHU shall be examined during detail engineering for arriving at a desirable/comfortable working environment/ ambient temperature in the various floors of Power House.
	Vol-IV B, Section-M7 HVAC system	3	7.3 Basic Dimensions and Ratings	**7.3.1 Design condition** The maximum and minimum ambient temperature and relative humidity for the design of the HVAC system in summer and winter shall tentatively considered as follows: Summer: 40° C & 100% max. Relative Humidity Winter: 1° C & 39% min. Relative Humidity. The maximum and minimum river water temperatures during the year shall tentatively be considered as 20° C and 8°C respectively.		
49	Vol-IV B, Section-M7 HVAC system	7	7.4.6	**Ducts** All ducts for the …….. …… **The sheet thickness shall not be less than the thickness indicated in IS 655.**	Galvanization of the duct sheet shall be conforming to Class 275 of IS: 277 Customer is to review and confirm.	Bid stipulations shall prevail.
50	Volume- II, Section-II, E11	Page 10 of 20	11.6.3	The Contractor shall ensure compatibility of the control room lighting with the control and monitoring facilities to be provided, i.e. Large Screen Display and other facilities.	Lighting system is controlled at MLDB level (manual only). Large screen monitoring facility is not being envisaged.	Bid specification shall prevail.
51	Volume- II, Section-II, E11	Page 10 of 20	11.6.3	The control room lighting system shall also include a control panel to enable the lighting levels in different parts of the room to be independently adjusted to take account of: i) Control room operator preference, ii) Night-time conditions and daylight conditions.	1) Grouping of fixtures in control room (CCR / CER) shall be arranged to enable control room operator to switch ON/OFF as per preference. 2) For night time and daylight conditions, timer shall be used.	Bid specification shall prevail.
52	Volume- II, Section-II, E11	Page 19 of 20	11.10	Bidder shall mention all components make along with the bid.	Make of all components shall be submitted during contract stage after ordering of illumination package.	Agreed.
53	Volume- II, Section-III	---	---	Tender Drawings	Customer is requested to provide road length & width for which illumination is to be considered. It is also requested to provide overall plant layout .	Bidder to assess based on information given in the tender documents and subsequent site survey.
54	Volume II Sec- II Sub-Sec- E10	46	10.5	Disc Insulator	Bidder request to allow Polymer Long rod insulators also. Please confirm.	Bid specification shall prevail. However, same shall be reviewed during detailed engineering stage.
55	Volume II Sec- II Sub-Sec- E20	3	20.1	Power Line Carrier Communication (PLCC) equipment along with cubical for housing and all other accessories, complete for speech communication in dialing mode and / or through 4 wire Express Telephone, data communication and transmission line protections including coupling equipment, Line traps etc. for 220kV Transmission Lines as indicated in SLD. The compatibility of PLCC equipment at potheadyard end and grid end shall be ensured.	A) Bidder understand there is no scope of Supply erection & commissiong of PLCC equipments , Line Traps, Coupling devices at the GRID end.Please confirm. B) Please provide distance of the GRID end. C) Please provide make of the PLCC equipment at the GRID end.	A) PLCC panels including coupling devices at the grid end are in the scope of the bidder. However, Line Traps at the other end is not included in the scope of the bidder. B) Please refer Clause no. 9.12.5 of Volume-II, Section-2, E-9 C) Shall be provided during detailed engineering stage.
56	Volume II Sec- III			Drg No. WAP/HEO/E&M/TD/08 Pothead Yard	POT Head yard area requirement for outdoor equipments such as wave trap, LA, CVT, SF6 to Air bushing, Isolator seems to be insufficient, Bidder request to review the same as per actual requirement keeping in view of clearances and ACF for altitude more tha 1000mtr for 220kv Voltage level.	Please refer PTS (Pot head yard equipment) for detail requirement.

Pre Bid Technical Clrification No.2 dated 02.05.2025 to NIB No.477 dated 26.02 2025 for EPC execution of EM Works of Heo HEP

Sl. No.	Volume	Page No.	Clause No.	Tender Provision	Bidders Queries	NEEPCO Replies
57				General	Bidder understand there is no vendor restriction in procurement of equipments under current scope. Please confirm.	List of Vendors should be approved from the Purchaser prior to commencement of procurement activity.
58	Volume II Sec- III			Drg no. WAP/HEO/E&M/TD/12 Main Single Line Diagram	Bidder understand provision for future bay extention is envisaged at one side only for 220kV Transmission Line 3 & 4	Confirmed.
59	Volume II Sec- II Sub-Sec- E14	1	14.2 i)	i) Underground earthing network The underground earthing network shall consist of underground earth mat in power house, transformer area, tailrace, pothead yard area	A) Bidder understand there will be concrete flooring in the Pothead Yard area. Please confirm. B) Earth mat consist of 40mm dia MS rods will be laid 600mm below concrete flooring. Please confirm. C)Auxiliary earthing mat will be provided for Disconnectors only in the pothead yard area. Same practice is followd in all Powergrid proejcts.Please confirm. D) In case of concere flooring in Pothead Yard, Bentonite backfill/3mtr long vertical electrodes are not applicable. Please confirm. E) Please provide referance drawings for earthing philosophy	A) Agreed. B) The contract being EPC in nature, the contractor shall design the earthing system so as to attain earth resistance of less than 1.0 ohm. For power house earthing mat minimum size of conductor shall be 40 mm MS. C) Confirmed. D) Bentonite back fill / 3 mtr long vertical electrodes in the pot head yard will not be required. However, the same may be required as per design to achieve overall earth resistance less than 1.0 ohms, as per clause 14.11 E) Earthing Philosophy shall be as per standards at clause 14.4
	Volume II Sec- II Sub-Sec- E14	7	14.10	Earth mat shall be placed at a depth of 600mm from the gravel level to ensure stability and resistance to external disturbances like soil erosion Auxiliary earthing mat comprising of closely spaced (300mmx300mm) conductors may be provided at depth of 300mm from ground level if the design of earth mat so requires.		
	Volume II Sec- II Sub-Sec- E14	7	14.11	1) bentonite backfill or similar conductive materials or 2) increasing grid size or adding vertical electrode shall be used.		
60	Section-E5-245kV GIS	34	5.3.10	Each GIS bay shall be equipped with a Local Control Cubicle (LCC) installed opposite to the related bay. The LCC shall include the programmable microprocessor-based bay control unit (BCU) with display/HMI, digital and analogue terminals, key selector switches, interface switches for communication with other LCC and the CCS, redundant DC auxiliary supply units with MCB for each circuit, auxiliary contactors, relays and terminal blocks. It is the responsibility of the vendor to ensure that proper coordination is establish between GIS bay control cubicle LCC and the station SCADA system for smooth control & monitoring of the project.	Generally BCU is mounted in Control and relay panel. At LCC level hardwired control with Mimic diagram is provided by all the GIS manufactures. Bidder proposes to mount BCUs at Control & Relay panel level instead of LCC. It does not provide superior benefit to have BCU at LCC.	Shall be discussed during detailed engineering.
61	Section-E5-245kV GIS	38	5.3.10 Local Control Cubicles	The connections between the LCC and the GIS bay shall be carried out with fibre-optic bus and/or prefabricated multi-core cables with plug terminations at both ends	Intra bay cable shall be prefabricated multi-core with plug terminations at both ends, however cabling between GIS bay and LCC is dependent on indivisual site, hence multicore control cables and power cable are without prefabricated plug terminations used for the same. Bidder proposes to accept same.	Shall be discussed during detailed engineering.
62	Volume II Section-II	8	7.5 GENERAL	Motor Control Centers	Standalone starter panel shall be provided for Unit & Common auxiliaries of Generator and Turbine. Direct on-line starter shall be used for Pump/Motor ratings below 50kW and Star-delta starter shall be used for Pump/Motor having rating more than 50kW. Any soft starters shall not be in the scope of bidder. Please confirm.	Accepted.
63	Volume II Section-II ; E-8 DC System	Page 6 of 38		The batteries shall be made of lead acid cells with plante type/Ni-Cd type of positive plates and pasted negative plates as per IS 1652 No. of cells 108	Please note that Nickel-Cadmium batteries are completely different from Lead Acid batteries & are governed by IS 10918. No. of cells (usually 169) & ECV (usually 1.0V). Also, distilledwater plant is npot required as per manufacturer's recommendations. In case oif supply of Ni-Cd batteries, same shall be supplied as per IS 10918 & reputed manufacturer's standard.	Latest edition of IS 10918 shall be followed for Ni Cd type batteries.
64	Volume II Section-II, Section E-12 SECURITY & SURVEILLANCE SYSTEM	5 of 19	12.5.2	Access control system shall ensure maintenance of attendance records of all employees, entry and exit of visitors along with means for tracking.	Please specify the number of gates and proximity cards required for price bid purposes.	Power house plan and section tender drawings may be referred.

Pre Bid Technical Clrification No.2 dated 02.05.2025 to NIB No.477 dated 26.02 2025 for EPC execution of EM Works of Heo HEP

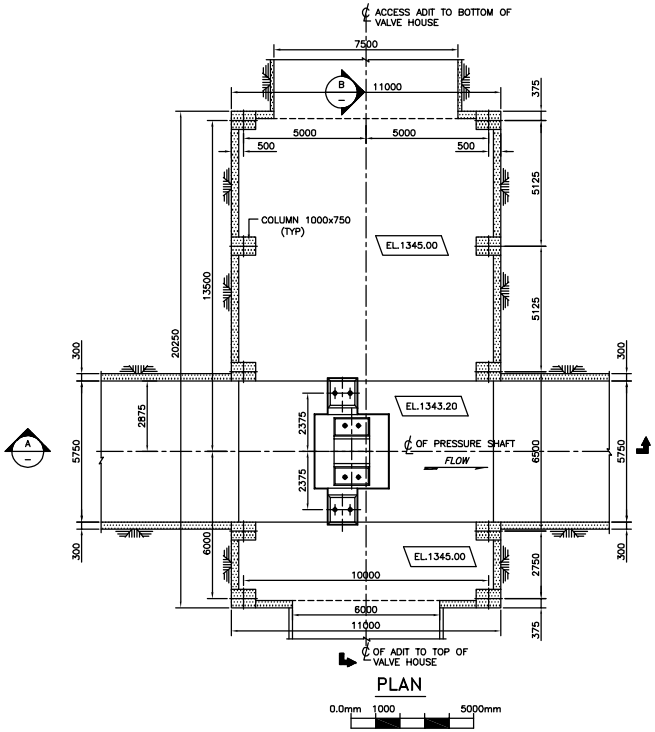
Sl. No.	Volume	Page No.	Clause No.	Tender Provision	Bidders Queries	NEEPCO Replies
65	Volume II Section-II, Section E-12 SECURITY & SURVEILLANCE SYSTEM	7 of 19	12.6	The number of cameras and their locations shall be such that all critical areas are under surveillance and can be viewed in control room or other monitored point.	Please specify the number of cameras required for price bid purposes.	No. of Cameras to be assessed based on areas specified in Clause no. 12.6.1 of Volume II Section II, Section E-12. Design & engineering is in the bidder's scope.
66	Volume II Section-II, Section E-12 SECURITY & SURVEILLANCE SYSTEM	13 of 19	12.8	Common items	Please provide the quantity and detailed specification of keyboards, personal computers and printers required for price bid purposes.	Entire work is in bidder's scope. As such, same may be assessed as per requirement.
67	Volume II Section-II E13 - Communication System	7 of 11	13.5.2.5	Field handset stations & Loudspeaker	Plant Communication System: Customer may please provide the following details: i. Location, type and number of loudspeakers required ii. Exact Quantity of Field Handsets & Loud Speakers shall be restricted to quantities offered during tender stage, as specified during tender stage. Only locations of Field Handsets & Loud Speakers in the layout drawings shall be finalized during detailed engineering. Any further addition in the quantity shall not be admissible.	The major areas covered are specified in the T.S. The bidder may propose the appropriate number of field handsets, loudspeakers, etc., at different locations to ensure complete area coverage.
68	Volume II Section-II E13 - Communication System	10 of 11	13.5.6	Cables	Please clarify in whose scope is the OFC for integration of all zones of PA & communication system between Dam and Power house. If it is bidders's scope, kindly specify the type, distance, method of laying etc. for preparation of offer.	Supply of OFC shall be in bidder's scope. Please refer Clause no. 15.3.5 & 15.3.6 of Volume-II, Section-II E15 (Cable & Cabling System) for scope & detail specification.
69	Volume II Section-II, Section E-14 EARTHING & LIGHTENING PROTECTION SYSTEM	5 of 10	14.7	After placing the earth mat conductors, the trenches and electrode pits shall be back filled with bentonite clay.	Excavation/ backfilling is not possible for E&M contractor and shall be in the scope of the civil contractor. Customer may please confirm the same.	Bid specification shall prevail.
70	Volume II Section-II E15: CABLING SYSTEM	03 OF 22	15.1.4	OFC: These shall include optical fibre cables between the supplied equipments and between the patch panels of pothead yard, power house & dam site.	1. Please provide Tentative route distance Power House to Dam Building. 2. Please inform the Method of laying (i.e. buried underground/ overhead by pole) OFC between Power House to Dam Building.	Please refer Clause 15.3.5 (Optical Fibre Cables) of Volume-II Section-II E-15 (Cables & Cabling System)
71	Volume II Section-II E15: CABLING SYSTEM	09 OF 22	15.3.5	OFC: : Cable can also be direct buried and can thus be used also for underground application such as for the remote sites.	We understand that the OFC cable between Power House to Barrage /Dam Building shall be direct buried & steel pole for Overhead OFC cable is not applicable & not required. Kindly confirm acceptance.	Please refer Clause no. 15.3.5 which states the following: "The scope of OFC supply, laying and integration shall be in bidder's scope. Method of laying proposed at present for OFC between powerhouse and barrage site is on overhead poles with tentative distance 5KM, which may undergo changes during detailed engineering, depending on prevalent site conditions."
72	Volume II Section-II E15: CABLING SYSTEM	--	--	**Section E7: Clause No 7.5 (page 8 of 30):** The 415/240V auxiliary power for operation of gates at Barrage area & Valve house will be fed through medium voltage aerial distribution line from the 33 kV switchboards located in Powerhouse	We understand that the LT power supply for Barrage area & Valve house will be fed through medium voltage aerial distribution line (i.e. **overhead bare conductor** line supported on Pole structure) from the 33 kV switchboard (MVSSB) located in Powerhouse. **As such no 33KV Cable is required. Please confirm.** In case the same are to be feed by 33KV HT Cable (buried underground), the following cables shall be provided & tentative **Cable route distance is requested.** 1. 33kV Power Supply Board (MVSSB) to 33 / 0.433 kV, 160 kVA step-down transformer located at Barrage/DAM site -1 No. Please provide the route distance. 2. 33kV Power Supply Board (MVSSB) to 33 / 0.433 kV, 160 kVA step-down transformer located at Valve House area,-1 No.Please provide the route distance.	Bid stipulation shall prevail. Please refer Clause no. 7.5 of Volume-II, Section-II E-7 for detail.scope.
73	Volume II Section-II E15: CABLING SYSTEM	---	---	Cabling System for DAM area	As per tender no Electro mechanical (EM) equipment is required at DAM area,Cabling System for DAM area shall not be under EM contractor scope of supply. Kindly confirm acceptance.	Bid specification shall prevail.

Pre Bid Technical Clrification No.2 dated 02.05.2025 to NIB No.477 dated 26.02 2025 for EPC execution of EM Works of Heo HEP

Sl. No.	Volume	Page No.	Clause No.	Tender Provision	Bidders Queries	NEEPCO Replies
74	Volume II Section-II E16: 415V DG SETS	2 OF 27	16.1.1	1No. diesel engine suitable to give alternator output of 800 kVA outside the GIS hall at the same level and One(1) no. 250 kVA at Barrage site	Only 01 (one) no of 800KVA,415V DG set seems on **lower side** for the Power house. **Customer may review the same.**	Bid specification shall prevail.
75	Volume II Section-II E16: 415V DG SETS	2 OF 27	16.1	The DG sets shall be silent type meeting the statutory requirements of gazette notification of Pollution Control Board, Ministry of Environment and Forest & guidelines (MoEF), CEA as on date of issue of this specification.	All approval/clearance from CPCB/State pollution control board/Local bodies/Chief controller of Explosives (CCOE)/ CEA/other licensing authorities etc. of the complete installation & opertaion of DG set shall not be in bidder's scope. However complete technical support shall be provided to customer wherever required & deemed necessary. Kindly confirm acceptance.	Bid stipulation shall prevail.
76	Volume II Section-II E16: 415V DG SETS	2 OF 27	16.1.1	1No. diesel engine suitable to give alternator output of 800 kVA outside the GIS hall at the same level and One(1) no. 250 kVA at Barrage site	The 800KVA DG set shall be placed inside a pucca room or under a shed? Please clarify. In case of shed, please share tentative room dimension. The 250KVA DG set shall be placed inside a pucca room or under a shed? Please clarify. In case of shed, please share tentative room dimension.	Shall be finalised during detailed engineering.
77	Volume II Section-II E16: 415V DG SETS	10 OF 27	16.6.1.5	A mechanical over speed trip mechanism shall be provided to automatically shut off the supply of fuel in case the engine speed reaches overspeed limit.	Feasibility of provision for overspeed trip mechanism shall be strictly as per standard design of manufacturer. Kindly confirm acceptance.	Bid stipulation shall prevail. However, same can be discussed during detailed engineering.
78	Volume II Section-II E16: 415V DG SETS	15 OF 27	16.6.2.2	The AVR for each generator shall be panel mounted where a control knob will be provided for control of voltage for synchronization and voltage raise/lower feature should be compatible with auto synchronizer for parallel operation.	Feasibility of provision for Control Knob for the purpose of Voltage raise/lower setting shall be strictly as per standard design of manufacturer. Kindly confirm acceptance.	Agreed.
79	Volume II Section-II E17 Electrical Workshop	4 of 16	17.4.1.1 (v)	Digital Multimeters for AC and DC	Standard Current range for multimeter is up to 20 Amp and available with various reputed makes. We request to accept the maximum up to 20 Amp instead of 30A. Kindly Confirm.	Bid stipulation shall prevail. However, same can be discussed during detailed engineering.
80	Volume II Section-II E17 Electrical Workshop	9 of 16	17.4.1.2 (iii)	DC rectifier of suitable rating for drying out generator winding completely	Please provide details specification / technical particulars like DC current rating and voltage rating.	DC rectifier kit is deleted from the scope.
81	Volume II Section-II E17 Electrical Workshop	11 of 16	17.4.1.3 (ii, iii, iv)	Resistivity measurement kit, device for measurement of neutralization value Karl Fischer type moisture measurement kit	Please provide details specification / technical particulars.	Please note: 1) Annexure- II attached for technical specification of Resistivity measurement kit 2) Device for measurement of neutralization value is deleted from the scope. 3) Annexure- III attached for technical specification of Karl Fischer type moisture measurement kit
82	Volume II Section-II E17 Electrical Workshop	11 of 16	17.4.1.4 (i, ii)	Pressure transmitters, Differential pressure transmitter	Please inform range of the pressure (bar) & other technical particulars.	Shall be finalised during detailed engineering.
83	Volume II Section-II E17 Electrical Workshop	12 of 16	17.4.1.4 (iii, iv)	Ammeters with standard range class 0.5. Voltmeters with standard ranges class 0.5.	Please provide Type (portable/ panel mounted) & rang of Current/ Voltage.	Shall be finalised during detailed engineering.
84	Volume II Section-II E17 Electrical Workshop	13 of 16	17.4.1.6 (i)	Universal laboratory work bench	Please provide dimension (length, Width & height) of workbench & other technical parameters.	Shall be finalised during detailed engineering.
85	Volume II Section-II E17 Electrical Workshop	14 of 16	17.4.1.6 (iii)	Workbench with test & repair facilities for hydraulic/pneumatic devices	Please provide dimension (length, Width & height) of workbench, material (steel/MS), sheet thickness & other technical parameters.	Shall be finalised during detailed engineering.
86	Volume II Section-II E17 Electrical Workshop	14 of 16	17.4.1.6 (iv)	Workbench with test & repair facilities for electronic measurement control & communication devices	Please provide dimension (length, Width & height) of workbench, material (steel/MS), sheet thickness & other technical parameters.	Shall be finalised during detailed engineering.
87	Volume II Section-II E17 Electrical Workshop	15 of 16	17.4.1.6 (vii)	Storage locker lockers	Please provide material, sheet thickness.	Shall be discussed during detailed engineering.
88	Volume II Section-II E17 Electrical Workshop	15 of 16	17.4.1.6 (vi)	Tools Storage Cabinets	Please provide material, sheet thickness.	Shall be discussed during detailed engineering.
89	Volume II Section-II E17 Electrical Workshop	15 of 16	17.4.1.6 (viii)	Chairs suitable for Workshop	Please provide dimension of chair.	Shall be discussed during detailed engineering.

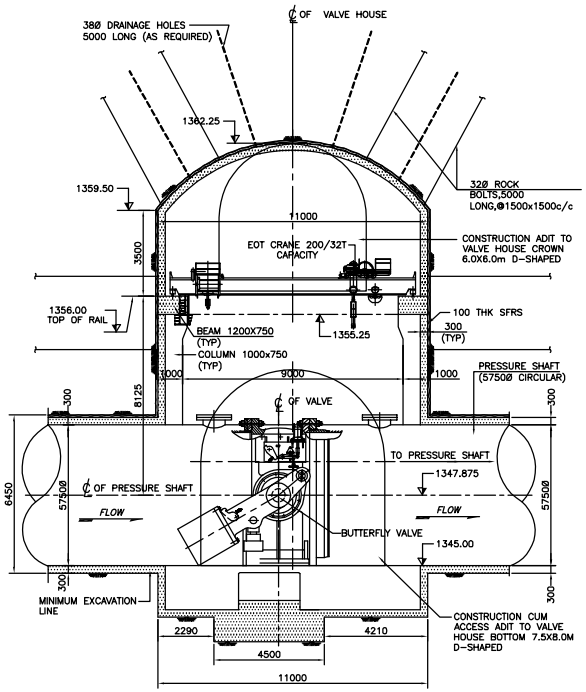
Pre Bid Technical Clrification No.2 dated 02.05.2025 to NIB No.477 dated 26.02 2025 for EPC execution of EM Works of Heo HEP

Sl. No.	Volume	Page No.	Clause No.	Tender Provision	Bidders Queries	NEEPCO Replies
90	Volume II Section-II E17 Electrical Workshop	15 of 16	17.4.1.6 (ix), (x)	Rack & shelves	Please provide width of shelves, material, sheet thickness of rack.	Shall be discussed during detailed engineering.
91	Volume II Section-II E17 Electrical Workshop			LIST OF APPROVED SUB CONTRACTORS/ VENDORS	1. The List of approved sub contractors / vendors to be provided. 2. During procurement of the items through GeM (Govt. E-marketplace) , if offers received from additional vendors (other than List of approved vendors mentioned in tender documents) and complying to the relevant technical specification, the same shall be submitted to Customer along with credential for approval during Detailed engineering. 3. In view of above kindly keep a provision for approval of additional vendors on submission and review of valid credentials. Kindly confirm.	Contractor shall obtain Vendor approval from NEEPCO prior to initial procurement activity.
	Volume II Section-II E17 Electrical Workshop			Specific Qualification Criteria for Sub vendor for Electrical Workshop items as per tender		



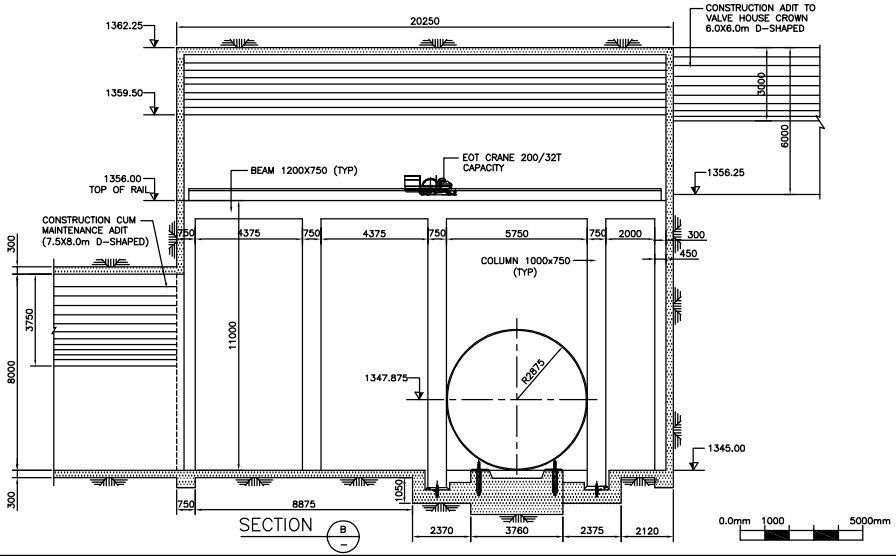
PLAN

0.0mm 1000 5000mm



SECTION A

0.0mm 1000 5000mm



SECTION B

0.0mm 1000 5000mm

No	Notes or references
1	ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES.
2	NO DIMENSION SHALL BE MEASURED FROM THIS DRAWING ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.
3	CONCRETE FOR ALL RCC WORKS SHALL BE OF GRADE M-25 CONFORMING TO IS:456-2000 UNLESS OTHERWISE SPECIFIED.
4	ALL REINFORCEMENT INCLUDING ROCK BOLT SHALL BE HIGH YIELD STRENFTH DEFORMED BARS GRADE Fe-500 CONFORMING TO IS:1786-2000.
5	FOR DETAILS OF SUPPORT SYSTEM REFER SEPARATE DRAWING.

LEGEND:

P.C.C. M-10

CONCRETE M-25

No	Date	Revisions	Designed	Approved
1	13.06.2014	REVISED AS PER CWC COMMENTS DATED 06/06/2014		
0	20.06.2013	ISSUED FOR DPR PURPOSE		

FOR DETAIL PROJECT REPORT

Developer:
HEO HYDRO POWER PVT. LTD.

VELCAN

INDO CANADIAN CONSULTANCY SERVICES LTD.

Project:
HEO H.E.P. (3X80MW)
ARUNACHAL PRADESH, INDIA

Title:
VALVE HOUSE
PLAN AND SECTIONS

Scale 1:
Dimensions in mm

Project no
ICCS-1276

Drawing no
Customer

Drawing no
1275-CD-0408

Rev.
1

A1 841 x 594

Annexure- II

TECHNICAL SPECIFICATION OF FULLY AUTOMATIC TAN DELTA RESISTIVITY TEST SET USED FOR TESTING OF TRANSFORMER OIL

- Automatic microprocessor controlled Test Set.
- Optional manual test feature to carryout AC & DC (+/-) testing separately.
- Internal AC voltage source synchronized with line frequency and sinusoidal wave shape.
- Internal DC voltage sources for Resistivity measurements.
- RS232 / USB option for Computer interface for downloading data or control from a PC.
- Front panel driven user friendly software operation.
- Large inbuilt data storage. Option to transfer stored result to USB and PC.
- Measures Resistivity by applying both polarities DC (+/-) test voltages.
  Open GND and interlock protection for safety of Instrument as well as the operator.
- Highly precise induction heating of the Cell with accurate temperature control.
- Auto Drain Test Cell integrated with Fully Automatic Oil Cell heater
- 3 Terminal Oil Test Cell using Teflon spacers designed is according to IEC-60247
  & suitable for operation at 30V/mm to 1100V/mm AC – line frequency.
- Direct temperature measurement by placing the sensor in the electrode.
- Interfacing of the instrument with PC through Software (supports windows platform only).

Applicable Standards:

Unless otherwise specified separately in this specification, the equipment shall comply with the requirements of IS 6103, IS 6262 , IEC-60247 , ASTM –D1169 , ASTM D924, ASTM D-150 (solids).

Operating Conditions:

Voltage (Mains)	:	230V AC (–10% to +10%)
Frequency (Mains)	:	50Hz±5%
Environment	:	Laboratory use. Indoor

Essential Features:

Fully automatic or manual measurement In-built AC/DC voltage sources • RS232 computer interface & USB printer interface provided • Menu-driven operation • Data storage facility

Dielectric Constant & Tan Delta

Test Voltage : 50 - 2400 V AC in 1 volt steps at line frequency.
Accuracy : ± 1% of output
Capacitance : 50 to 1600 pF
Accuracy : ± 0.1% of reading ± 0.1pF
Best Resolution : 0.01 pF
Dielectric Constant : 1 to 25 when using a typical oil test cell (C = 55-60pF)
Accuracy : ± 0.1%
Resolution : 0.001

Dissipation Factor (DF) : 0 - 4.0
Accuracy : ± 1% of reading ± 0.0001
Best Resolution : 0.000001 (10^{-6})
Dielectric Loss : 0 - 10.00 watts
Accuracy : ± 1% of reading ±(10^{-5})
Best Resolution : 0.001 milli watts (10^{-6} watts)

Resistance - Resistivity
Test voltage : 100 - 1000 V DC in 1 volt steps
Accuracy : ±1% of setting
Resistance Range & Resolution
Range : 10 x10^{6} Ω to 3 x 10^{13} Ω -(10 megaΩ - 30 TeraΩ)
Resolution : 3 digits
Resistance Range : 1 MegaΩ to 10TeraΩ
Accuracy : : 2% from 10 MegaΩ - 10 GigaΩ
5% from 10 GigaΩ - 1 TeraΩ
10% from 1 TeraΩ - 10 TeraΩ
15% from 10 TeraΩ - 30 TeraΩ
Resistivity Range & Resolution
Range : 10,000MΩ cm – 30,000 TeraΩcm
Accuracy 2% from 10 MegaΩ - 10 GigaΩ
5% from 10 GigaΩ - 1 TeraΩ
10% from 1 TeraΩ - 10 TeraΩ
15% from 10 TeraΩ - 30 TeraΩ

Manual Measurements : Separate and continuous measurements of C, DF and Resistivity can be made at a selected voltage.

Automated Measurements : The test set will conduct one set of C, DF and Resistivity Measurements automatically and display the results.

Display : 800 / 480 TFT LCD display.

Keyboard : Front panel soft touch Keypad providing numeric entries.

OUTPUTS

RS-232 Serial Port : Opto-isolated serial port for controlling the instrument from a PC and for outputting data to a PC.

USB Port : Opto-isolated serial port for USB/centronics compatible printer.

Data Storage : Inbuilt data storage facility of approx. 10,000 readings. USB data transfer facility.

<u>Oil Test Cell Specification with Auto Drain Facility:</u>

The 3 Terminal Oil Test Cell should be as per IEC. The Test Cell should have integrated auto drain facility. Empting of the hot oil is possible without removing the Oil Cell. The Oil Cell should have minimum number of parts – which facilitates easy dis-mantling, cleaning, drying & re-assembly.
Suitable funnel to be provided to fill the oil.

Construction : 3 terminal configuration.
Material : Stainless Steel 316 with Teflon spacers.
Cell Capacitance : 55 - 60pF – ideal for Optimum performance.
Cell Electrode Spacing : 2mm.
Cell operating voltage: As per IEC - 60V to 2.2KV AC and 500V to 1kV DC.
Volume : 45ml.

AUTOMATIC OIL TEST CELL HEATER

The temperature settings & all other test parameters/ sequences can be entered & controlled from the main Test Set. Power ON, HV ON & Heater ON indicators to be provided. Highly precise induction heating with accurate temperature control. Quick fast heating of the transformer oil to 90 deg. The drain out Cell is part of Automatic Oil Cell Heater.

Temperature control of 0.25 deg as per IEC. Calibration certificate for Temperature sensor to be provided. Total Heater control to be provided from the main Test Set. All necessary cables to be provided.

Specification

Power Supply : 230 VAC ± 10%, 50 Hz, 215VA
Temperature Range : 20°C - 110°C
Volume of Oil : 45 ml. approx
Accuracy of Temperature Control : ±0.2°C
Protection: Safety micro switch for HV cut off when top cover is opened.

Check Box / Standard Box :

A suitable Check Box with standard values of Capacitance , Tan Delta and Resistivity shall be provided to cross verify the proper operation of the Test Set. This should be provided with NABL certificate.
Max. operating voltage is 500 VAC and 500VDC.

The bidder shall also provide:
Operation and maintenance manual in English language.
Software in a CD in English language.
Training to personnel on all aspects of operation, maintenance and calibration.
Continued technical support during guarantee period.

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Annexure-III

Sl. No.	Description	Specification
01	General Requirement	The water content measuring test equipment shall be based on Columetric Karl Fisher titration and shall be suitable for the water content determination of insulating oil in laboratory.
02	Titration rate	Max. 2.24 mg H2O/min.
03	Determination range	10 µg to 200 mg H2O.
04	Resolution	0.1 µg H2O
05	Reproducibility	Sample: water standard from a reagent manufacturer. 10 µg ≤ m (H2O) ≤ 1000 µg ±3 µg m (H2O) > 1000 µg H2O ±0,3 % or better.
06	Drift Compensation	Automatic and manual
07	Screen	LCD
08	Printer	Built-in thermal printer.
09	Memory	Built in Method/data/results storage
10	Stirrer Control	Switching on/off either manually or coordinated with the titration process.
11	PC interface	Suitable interfaces configurable for printer balance or computer connection
12	Ambient temperature	Nominal operation range: 5 - 40°C Storage: -20 - 0°C Transport: -40…60°C
13	Safety specification	As per IEC standard
14	Power connection	Voltage 230 V AC ±10 % Frequency 50 Hz
15	Accessories	Should include all accessories for measuring water content in the insulating oil
16	Standards and reagents	Standards, reagents and other consumables required for demonstration should be supplied along with the kit