PROJECT

NTPC FEROZ GANDHI UNCHAHR
1X500MW THERMAL POWER STATION, STAGE-IV

TECHNICAL SPECIFICATION FOR MISC. TANKS-SITE FABRICATED (CONDENSATE STORAGE TANKS)

SPECIFICATION NO.: PE-TS-401-167-A001

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERIING MANAGEMENT
PPEI, NOIDA-INDIA

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PREAMBLE

1.0 The Tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.

1.1 **Volume –I CONDITIONS OF CONTRACT**

This consists of four parts as below:

Volume - I A	:	This part contains instructions to bidders for making bids to BHEL.
Volume - I B	:	This part contains general commercial conditions of the tender and include provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.
Volume - I C	:	This part contains special conditions of contract.
Volume - I D	:	This part contains commercial conditions for erection and commissioning of site work, as applicable.

1.2 **Volume- II - TECHNICAL SPECIFICATIONS**

Technical requirements are stipulated in Volume II which comprises of:

Volume - II A	:	General Technical Requirements - NA
Volume - II B	:	Technical specification including drawings, if any

1.2.1 **Volume - II B:**

This volume is sub-divided into following sections:

Section - A	:	This section outlines the scope of enquiry.
Section - B	:	This section provides “Project Information”
Section - C	:	This section indicates technical requirements specific to the contract, not covered in Section-D.
Section - D	:	This section comprises of technical specifications of equipments complete with their data sheets, if any.

1.2.2 **Volume - III TECHNICAL SCHEDULES**

This volume contains technical schedules which are to be duly filled by the bidder and the same shall be furnished with the technical bid, as applicable.

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SECTION-A
INTENT OF SPECIFICATION

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1.0 SCOPE OF INQUIRY / INTENT OF SPECIFICATION

1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, proper packing, delivery at site including freight, unloading, storage & handling at site, erection & commissioning, hydro test at site, painting, handing over, tools & tackles, commissioning spares etc. for **Misc. Tanks- site fabricated (Condensate storage tank)** as per details in different sections / volumes of this specification.

1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve the contractor of his responsibility of providing such facilities to complete the supply and E&C of the **Misc. tanks (CST)** to customer.

1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgement is not in full accordance herewith.

1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.

1.5 The general term and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification are subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.

1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information , ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification **within 10 days of receipt of tender documents.** In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.

1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.

1.9 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.

1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder /vendor and Customer/ Purchaser/Employer will mean BHEL and /or BHEL's customer including their consultant as interpreted by BHEL in the relevant context.

1.11 The **Datasheet-A** and the technical requirements mentioned in **Section C** shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in Section -D.

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SECTION-B

PROJECT INOFRMATION

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CLAUSE NO.	PROJECT INFORMATION

1.00.00 **BACKGROUND**

Feroze Gandhi Unchahar Thermal Power Station, FGUTPS was conceived as a Load Centre coal based Power Station of 1050 MW capacity by UPSEB. The land for the project was acquired and stage-I (2x210MW) was implemented by UPSEB. The 2x210 MW Unchahar station was taken over by NTPC from Uttar Pradesh Rajya Vidyut Utpadan Nigam of Uttar Pradesh in 1992. Thereafter, NTPC implemented Stage- II (2x210 MW) and Stage-III (1X 210 MW).

The present expansion proposal is to install one additional unit of 500 MW under Stage-IV thus making the ultimate capacity of the FGUTPP 1550 MW.

1.01.00 **LOCATION AND APPROACH**

The plant is located in Raebareli district of Uttar Pradesh, having latitude and longitude of 25°54'50"N and 81°19'50"E respectively. It is bounded by villages Khnapur, Faridpur and Khaliqpur Khurd. Mustafabad town is located at a distance of about 3 Kms from the plant. Unchahar railway station on Allahabad-Raebareli broad gauge (BG) section of Northern Railway (NR) is 2 Kms away. The nearest airport is located at Lucknow a distance of approximately 110 km from the project site.

Vicinity Plan of the project is placed at **Annexure-I**

1.02.00 **LAND REQUIREMENT**

During the implementation of FGUTPS, Stage-I, II & III total area of about 2203 acres of land was acquired. The plant facilities, ash disposal and township for this expansion Stage-IV (1x500 MW) would be accommodated within the available land with dismantling and relocation of some buildings. No additional land has been envisaged to be acquired for this expansion project.

1.03.00 **WATER**

As per agreement between NTPC & Irrigation department, 105 Cusec of water is supplied through S.S Canal to NTPC-Unchahar. The Stage-IV (500MW) consumptive water requirement shall be accommodated within the existing commitment of water to FGUTPP. Sharda sahayak canal and Dalmau Pump House (DPH) on Purwa Branch Canal are available sources of water for the project and therefore, the make up water requirement for the plant is proposed to be drawn from these sources.

1.04.00 **COAL AVAILABILITY AND TRANSPORTATION**

1.04.01 **Coal Availability**

The coal requirement shall be about 2.7 Million tonnes per year.

The matter has been taken up with Ministry of Coal, Govt. of India for Long Term Coal Linkage for Stage-IV (1x500 MW)..Coal requirement for FGUTPP, Stage-I ,II & III is being met from North Karanpura Coal fields of CCL. For FR purposes, coal from North Karanpura Coal fields of CCL has been considered.

1.04.02 **Coal Transportation**

The envisaged mode of coal transportation from the coal mines to the power plant is by Indian Railways rakes. The rakes shall be unloaded at the track hopper.

1.04.03 **Coal Quality Parameters and Fuel Oil Characteristics**

The Coal quality parameters and Fuel Oil Characteristics are enclosed as **Annexures-II-1 and II-2** to this subsection.

1.05.00 **CAPACITY & POWER EVACUATION**

Stage- I	:	2x210 MW	Under Commercial Operation
Stage-II	:	2x210 MW	Under Commercial Operation
Stage-III	:	1x210 MW	Under Commercial Operation
Stage-IV		1x 500 MW	Present proposal

The existing capacity of plant is 1050 MW Step up/ power evacuation voltage for station is 220 KV. Presently 1000 MW is already being evacuated at 220 KV, addition of another 500 MW at 220 KV may cause overloading of 220 KV systems and lead to increase in fault levels at 220 KV system. Considering this 400 KV has been considered as step-up/power evacuation voltage for Stage-IV. Power Generated from FGUTPP- Stage IV, 500 MW unit would be stepped up to the evacuation voltage level through suitably rated Generator Transformer.

The power generated from Stage-IV is envisaged to be absorbed by Northern Region beneficiaries. For finalisation of Associated Transmission System (ATS) of the project, the matter would be taken up with Power Grid Corporation of India Ltd. (PGCIL)/CEA/appropriate authority depending on the various routes/options of power sale envisaged for the project.

1.06.00 **METEOROLOGICAL DATA**

Important meteorological data from nearest observatory at **Allahabad** is placed at **Annexure - III.**

1.07.00 **PLANT WATER SCHEME**

	The Plant water scheme is described below.
1.07.01	**Source of Water** The source of water for the project is normally from the Allahabad branch canal of the Sharda Sahayak link canal. During the canal closure period, water will be drawn from the Dalmau canal.
1.07.02	**Water Requirement** Normal Make up water requirement for this project would be about 2000 Cu.M/hr with ash water re-circulation system in operation. However, whenever ash water system needs to be operated in once thru mode, water drawl shall be of the order of 3300 cum/hr.
1.07.03	**Raw Water System** Raw water shall be drawn from the source by a gravity channel upto raw water pump house located inside the plant. It is envisaged to provide three (3) numbers (3 x 50 % Capacity) of raw water pumps for supplying water to Water PT Plant in the raw water pump house. In addition two (2) numbers (2 x 100% capacity) of pumps shall be provided to supply raw water for ash handling plant which shall be operated as and when required. Separate set of pipelines of carbon steel construction shall be provided from respective raw water pumps to Water treatment plant and Ash Water tanks.
1.07.04	The quality of Raw water and Clarified water is enclosed with this sub-section
1.08.00	**Criteria for Wind Resistant Design of Structures and Equipment** All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given in Sub-Section- D-01, Part-B, Section-VI, i.e. Technical Specification for Civil and Structural Works.
1.09.00	**Criteria for Earthquake Resistant Design of Structures and Equipment** All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in Sub-Section- D-01, Part-B, Section-VI, i.e. Technical Specification for Civil and Structural Works.

PROJECT

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1X500MW THERMAL POWER STATION, STAGE-IV

SECTION-C
SPECIFICT TECHNICAL REQUIREMENT

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1.0 SCOPE OF WORK

The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, proper packing, delivery at site including freight, unloading, storage & handling at site, erection & commissioning, hydro test at site, painting, handing over, tools & tackles, commissioning spares etc. for **Misc. Tanks- site fabricated (Condensate storage tank).**

1.1 SCOPE OF SUPPLY

Scope of supply shall comprise of but not necessarily be limited to the following:

1.1.1 One (1) no. condensate storage tanks (cap.300 cum) complete with all accessories as indicated in **Datasheet –A and sketch of CS**T given at last of this section.

1.1.2 SS valves, nozzles, piping, fittings, flanges, counter flanges, level gauge, vent, Nuts & bolts wherever required, gaskets, Anchor bolts/foundation bolts and painting for tanks in line with specification requirement.

1.1.3 Staircase, platforms, hand railing, knee guard, toe guard, supporting structures, connections & accessories, weir & pad plates, earthing pads as per tanks standard specification and applicable design code.

1.1.4 Commissioning spares (Under **Annex-A** attached along with price schedule)

1.1.5 Relevant requirement as per GCC, ECC & SCC as applicable.

1.1.6 **Any other equipment / material required to make the installation complete in all respects shall be in bidder's scope of work.**

1.2 SCOPE OF SERVICES

Services shall comprise of but not necessarily limited to the followings:

1.2.1 Erection and commissioning of one (1) no. Condensate storage tank.

1.2.2 Inspection & testing at vendor's / sub-vendor's workshop

1.2.3 Engineering support as and when required till the completion of erection & commissioning of tanks

1.2.4 Relevant requirement as per GCC, ECC & SCC as applicable.

1.2.5 Review for correctness of civil drawings prepared by BHEL based on civil input drawing furnished by the successful bidder.

1.2.7 Any other service required to make the installation complete in all respects shall be in bidder's scope of work.

2.0 EXCLUSIONS

Tank foundation & associated civil works, LTs and piping beyond terminal point.

3.0 TERMINAL POINTS

Terminal points for scope of work shall be as given below:

3.1. Counter flanges of all the nozzles and valves (wherever applicable) of tanks
3.2 Drain pipe of seal pot and NaOH breather pots.
3.3 Stubs for mounting level transmitter

4.0 PERFORMANCE / FUNCTIONAL GUARANTEE

The items to be supplied shall be guaranteed for proper functioning for 18 months from the date of supply or as per commercial terms and conditions whichever is later.

5.0 SERVICES TO BE PROVIDED BY THE CUSTOMER / BHEL

Tank foundation, associated civil works and relevant services as per GCC, ECC & SCC.

6.0 PAINTING / CORROSION PROTECTION REQUIREMENT

Painting of tanks and it accessories shall be done in line with **Annexure-I** given at last of this section.

7.0 EQUIPMENT DESIGN CRITERIA & OTHER TECHINCAL DETAILS

The minimum design criteria / technical details to be followed for tanks shall be as per **Datasheet-A, sketches of tank**, other datasheets, design criteria & other details placed under section-D of this specification.

8.0 CODES & STANDARD

API 650 / IS803 and other relevant codes given under section –D.

9.0 QUALITY ASSURANCE, QUALITY PLANS, INSPECTION & TESTING PROCEDURE

a) Bidder should maintain excellent quality of works, all supply items shall meet the relevant quality standards.

b) The successful bidder shall furnish Quality Plans/ Inspection Check Lists for various item for the package in line with minimum requirement indicated in specification during detail engineering for Customer's / BHEL's approval.

c) For other items for which any specific inspection requirement is not indicated in the specification but the same included in scope of work , vendor specific QPs/ CLs shall be furnished by the successful bidder for Customer/Consultant's review and approval. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

11.0.0 SUB-VENDOR ITEMS

The make of Sub-vendor items shall be as per **Annexure-IV** given under sec-D of this specification. For make of unlisted items, bidder to furnish list of sub-vendors during detail engineering stage for BHEL's review and approval. Any delay on account of processing approval of additional sub-vendor shall not be taken as a reason for delay in completion of project. Bidder shall furnish along with his offer the following supporting documentation within 1 month of placement of LOI. Thereafter no request for additional sub-vendor shall be entertained.

a. Documentation to show that the equipment /system has been supplied for a plant of similar or higher capacity.
b. Documentation in the form of certificate from end user, stating that the equipment/system has been operating satisfactorily for two years as on the scheduled date of bid opening.

Bidder to assess the capability of their proposed sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them.

12.0 DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH THE BID

The drawings and documents to be submitted with the bid shall strictly be as per **Annexure-II given under section-D**; any documents other than those indicated in Annexure-II will not be reviewed and will not form part of contract.

13. DRAWINGS AND DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

List of drawings / documents required during detail engineering along with submission schedule is given in **Annexure-III** under section-D of this specification. Any other drawings and documents as required by BHEL / Customer / Consultant shall be furnished by the successful bidder during detail engineering stage for which no commercial and time implication shall be entertained by BHEL.

Note: All drawings & documents should contain complete bill of quantities as applicable. Billing break-up after award of contract to successful bidder shall be based on BOQ mentioned in the GA & fabrication drawings.

14.0 DRAWINGS DISTRIBUTION SCHEDULE

Vendor needs to submit 10 sets of hard copies of each drawing/document during detail engineering along with editable soft copy of the same. However, exact no. of drawings / documents and submission/distribution procedure for the same shall be intimidated to the successful bidder after award of contract and the same shall be complied by the successful bidder without any commercial implication.

15.0 DRAWINGS ENCLOSED WITH SPECIFICATION

The following sketch is enclosed at last of this section, will form part of the specification.

a) Sketch No.PE-DC-401-167-S001 – CONDENSATE STORAGE TANK

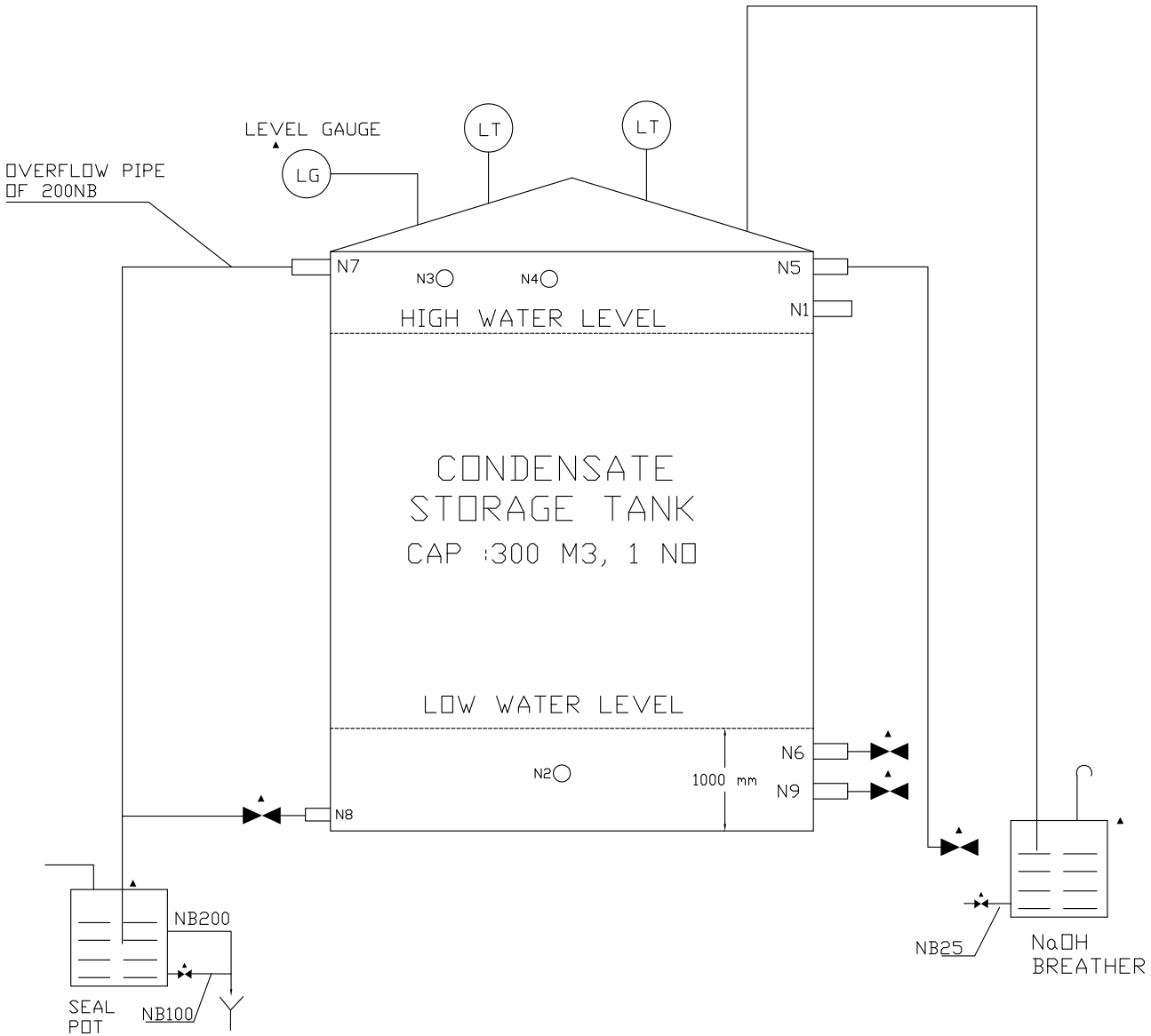
16.0 OTHER POINTS TO BE TAKEN CARE BY BIDDER

a. Incase bidder needs any information for making their offer suitable for the intended service. They must ask for the same within 10 days of receipt of tender documents. It will be bidder's responsibility to ensure that the product/ system offered meets the intended service.
b. Document approval by customer under approval or information category shall not absolve the vendor of their contractual obligations of completing the works as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval of BHEL. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to BHEL for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.

BHEL PEM	DATASHEET - A FOR CONDENSATE STORAGE TANKS	DOC. NO.: PE-DS-401-167-A001
		SHEET NO. 01 OF 01
	PROJECT TITLE : 1X500MW FGUTPP NTPC , STAGE-IV	REV. NO.: 0

1.0	SERVICE IDENTIFICATION	CONDENSATE STORAGE TANK
2.0	NUMBER REQUIRED	ONE (01) NO. FOR STATION
3.0	STORAGE MEDIUM	DM WATER(CONDENSATE)
4.0	SIZE OF TANK	8.0 M. DIA X 7.50 M. HEIGHT
5.0	NET CAPACITY	300 M3
6.0	TYPE OF TANK	VERTICAL CYLINDERICAL SHELL & CONICAL ROOF
7.0	MATERIAL OF CONSTRUCTION	MILD STEEL TO IS : 2062 Gr B
8.0	PLATE THICKNESS	BOTTOM PLATE - Min. 10 MM
		SHELL PLATE - Min. 8 MM
		ROOF PLATE - Min. 8 MM
9.0	CORROSION ALLOWANCE	1.8 MM
10.0	DESIGN TEMPERATURE & PRESSURE CLASS	60 ^{0}C, DESIGN FOR FILLED WATER HEAD / ATMOSPHERE
11.0	LOCATION OF INSTALLATION	OUTDOOR
12.0	DRAIN VALVE FOR TANK	100NB
13.0	DRAIN VALVE FOR NaOH / KOH BREATHER	25NB
14.0	DRAIN VALVE FOR SEAL POT	100NB
15.0	PIPE MATERIAL FOR HAND RAILING	CARBON STEEL, GALVANIZED, MEDIUM GRADE
16.0	NOZZLE CONNECTIONS REQD /	AS PER ENCLOSED SKETCH (PE-DC-401-167-S001) / SOCKET WELDED FOR
	END CONNECTION	SIZE ≤ NB50 & FLANGED FOR SIZE > NB50
17.0	PIPE / NOZZLE MATERIAL	STAINLESS STEEL - SA 312 TP 304
18.0	VALVES END CONNECTION	SOCKET WELDED FOR SIZE ≤ NB50
		FLANGED FOR SIZE > NB50
19.0	VALVES MATERIAL	STAINLESS STEEL
20.0	APPLICABLE CODES / STATUTORY REGULATIONS	IS-803 / API650
21.0	INSTRUMENTS / ACCESSORIES REQUIRED (REFER ENCLOSED SKETCH)	(a) CONSERVATION VENT VALVE / BREATHER (TO BE PLACED ON GROUND) (b) OVERFLOW & DRAIN PIPING WITH DRAIN VALVE (c) SEAL POT WITH DRAIN VALVE ETC. FOR OVERFLOW (d) LEVEL GAUGE - MECHANICAL FLOAT TYPE WITH DIAL INDICATOR (GUIDE WIRE, FLOAT & HOUSING OF SS316) (e) SAMPLING CONNECTION WITH NB 50 VALVE ON TANK. (f) 3 NOS. SPARE INSTRUMENT CONNECTIONS ON TANK ROOF FOR LI (g) 2 NOS SPARE CONNECTIONS WITH VALVES AS INDICATED IN SKETCH.
22.0	INSIDE PROTECTION & EXTERNAL PAINTING	**REFER ANNEXURE-I UNDER SECTION-C REGARDING PAINTING**
23.0	MANHOLE	TWO (2) NOS. ONE ON SHELL & THE OTHER ON ROOF (SIZE MIN. 600 NB)

SKETCH FOR CONDENSATE STORAGE TANK



DIM. OF TANK - 8.0M DIA x 7.5M HT.

NOTES:

1.0 - HIGH WATER LEVEL SHALL BE MIN.150MM BELOW BOTTOM OF OVERFLOW NOZZLE.

2.0 - ALL NOZZLES (ALONG WITH FLANGES & COUNTER FLANGES), OVERFLOW PIPE, NOZZLE FOR MOUNTING LEVEL INDICATOR, STANDPIPE ALONG WITH ISOLATION VALVES AND SPARE VALVES SHALL BE SUPPLIED BY TANK VENDOR.

3.0 - TRANSMITTER SHOWN ARE EXCLUDED FROM TANK VENDOR SCOPE. THESE SHALL BE SUPPLIED SEPARATELY UNDER INSTRUMENTATION PACKAGE. HOWEVER, 25NB TAPINGS ALONG WITH ROOT VALVE SHALL BE PROVIDED BY TANK VENDOR FOR MOUNTING OF LTs.

4.0 - ▲-ITEMS THUS MARKED ARE TO BE SUPPLIED ALONG WITH TANK.

5.0 - THE NET CAPACITY OF TANK I.E 300 CUM IS CAPACITY BETWEEN LOW AND HIGH LEVEL SHOWN IN THIS SKETCH.

6.0 - SEAL POT DRAIN SHALL BE CONNECTED TO NEARBY DRAIN PIT / TRENCH BY BIDDER.

NOZZLE NO.	DESCRIPTION	SIZE (NB)
N1	DM WATER INLET	200
N2	COND OUTLET	300
N3	CT PUMPS RECIR.	100
N4	EXCESS COND. DUMP	200
N5	SPARE WITH VALVE	150
N6	SPARE WITH VALVE	200
N7	OVERFLOW	200
N8	DRAIN WITH VALVE	100
N9	SAMPLING CONNEC. WITH VALVE	50

ANNEXURE-I

Painting specification for Condensate Storage Tank (CST)

	Tank Internal	**Tank External, Structural steel works, piping, stairways & other accessories**	**Tank Underneath**
Surface preparation	Blast clean to SA 2.5	Blast clean to SA 2.5	Wire Brushing/ hand tool cleaning to ST-2.
Primer	Two (2) coats of HB epoxy zinc phosphate primer of 35 micron each.	Two (2) coats of HB epoxy zinc phosphate primer of 35 micron each.	2 coats of high build coal tar epoxy suitably pigmented (2 pack), DFT: 80 – 100 microns each coat.
Intermediate coat	N. A.	One (1) coat of HB epoxy MIO coating of 100 micron.	N. A.
Finish	Solvent free epoxy coating (Min. 2 coats) of DFT 200 Microns each.	Three(3) coats of aliphatic polyurethane 25-35 microns per coat, **color: Sea Green, Shade no :217**	N. A.
Total DFT	470 microns	245-275 microns	160 – 200 microns

Note:-

1. SS pipes shall not be painted.

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SECTION-D
STANDARD TECHNICAL REQUIREMENT

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERIING MANAGEMENT
PPEI, NOIDA-INDIA

1.0 **SCOPE**

The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, proper packing, delivery at site including freight, unloading, storage & handling at site, erection & commissioning, hydro test at site, painting, handing over, tools & tackles, commissioning spares etc. for Misc. Tanks- site fabricated as mentioned in different sections of this specification

2.0 **CODES & STANDARDS**

The design, fabrication & assembly, erection & performance of steel tanks shall comply with all latest statutory regulations and safety codes applicable in the locality where the tanks are to be installed. Tanks shall conform to the latest applicable Indian/British/ USA standards. The vendor shall not be construed to be relieved of his responsibility by virtue of this specification. The tank in general shall conform to the latest editions, as is applicable, out of the following standards.

1 IS-800 Code of practice for use if steel in general building construction

2 IS-803 Code of practice for design, fabrication and erection of vertical mild steel cylindrical welded oil storage tank.

3 IS-804 Specification for rectangular pressed steel tanks

4 IS-805 Code of practice for use of steel in gravity water tank.

5 IS-816 Code of practice for metal arc welding for general construction in MS .

6 IS-817 Code of practice for training and testing for metal arc welder

7 IS-2825 Code of practice for unfired pressure vessel

8 BS-2594 Specification for carbon steel welded horizontal cylindrical storage tank

9 BS-2654 Specification for vertical steel welded storage tanks with butt welded shells for the petroleum industry

10 Indian explosive act and statutory requirements of chief controller of explosives, Nagger. (For oil storage tanks.)

11 Indian Boiler Regulations

12 Indian Factories Act

13 American code for oil tanks API 650

3.0 **DESIGN REQUIREMENT**

3.1 General Requirement

3.1.1 All tanks will be mild steel tanks. The tanks will be of welded construction and will be designed to withstand satisfactorily the internal forces due to the liquid these tanks have to hold as specified

and external forces due to wind and seismic forces without deformation or undue strain. The plates will be cold rolled through plate bending machines by several no. of passes to the curvature.

3.1.2 All tanks will be designed for the capacities ,dimensions and working conditions as specified in **DATA SHEET -A** . These tanks will be provided with all necessary connections as specified. The design of tanks will be such as to allow easy inspection, cleaning and repair. Due consideration will be given to wind loading and adequate stiffening will be provided to prevent failure of tank due to buckling when it is empty. A 2.0 mm corrosion allowance until unless specified in **DATASHEET-A** for shells, bottom and roof and beyond the required thickness shall be provided.

3.1.3 Vessel seams shall be so positioned that they do not pass through vessel connections.

3.1.4 The inside seam should be ground smooth, suitable for application of corrosion resistant primer. Except where otherwise indicated in the specification, if the stiffening of shell and/ or roof is necessary, tanks will be stiffened from outside.

3.1.5 Flange faces of all nozzles shall be machined and squared with the vessel center line.

3.1.6 All roofs and supporting structures shall be designed to support dead load plus a uniform live load of not less than 150 kg/m^2 of projected area.

3.1.7 The tanks shall be designed to have all courses truly vertical. Adequate distance between vertical joints in adjacent courses shall be taken so that the distortion is reduced to minimum.

3.1.8 When removing temporary attachments from shell plates, care should be taken that parent plate is not damaged. Holes in plate work to assist in fabrication / erection should be avoided as far as possible. The location of holes and method of filling shall be indicated in the fabrication drawing. Any projection of metal shall be chipped and ground flush with the plate surface .The plate shall not be gouged or torn in process of removing lugs.

3.1.9 In the construction of shell, very care shall be taken to minimize distortion or lack of circularity due to welding or for any other reason.

3.1.10 The successful bidder shall furnish design calculations to BHEL during detailed engineering stage for approval along with the Xerox copies of relevant pages of authentic supporting literature e.g. Code, Hand book, National / international Standards etc. Calculation shall be necessarily done in SI UNITS for the followings: -

a) The tanks shall be designed as per good engineering practice as applicable and referred code shall be of latest edition.

b) Plate thickness calculation (different courses of shell plate, bottom plate and roof plate thickness), roof curb angle, top wind girder, intermediate wind girder, tank internal pressure vis –a-vis. allowable value.

c) Design of roof and roof structures for vertical storage tanks shall be designed based on guidelines given in the book titled “Process equipment design” by Brownell and Young.

d) Tank stability calculation (wind load / seismic / overturning stability) shall be done as per good

engineering practice as applicable and referred code shall be of latest edition. However, factors / coefficients as required for the design of tank shall be obtained from BHEL by the bidder after placement of order.

e) Vent sizing calculation shall be done as per good engineering practice as applicable and referred code shall be of latest edition.

f) Sizing calculation for vent, NaOH / KOH breather, seal pot and breather valve.

g) Weight calculation of plates, appurtenances & structures separately shall be included in the design calculation/GA.

h) Staircase / access ladder and hand railing shall be provided as per the relevant codes and standards.

3.1.11 **Alignment**

3.1.11.1 Plates to be joined by butt welding shall be matched accurately. Misalignment in completed vertical joints shall not exceed 10% of the plate thickness or 1.5 mm for plates of 20 mm thick and under, whichever is larger.

3.1.11.2 In completed horizontal butt joints, the upper plate shall not project beyond the face of the lower plate at any point by more than 20% of the upper plate thickness with a maximum of 3 mm for plate thickness exceeding 8 mm except that for plate thickness 8 mm and under , the maximum shall be 1.5 mm.

3.1.11.3 Each tank shall be properly constructed ensuring perfect vertical alignment within 5 mm and tank circularity within 5 mm on diameter. Local bulging and / or depressions at any location of tank particularly shell shall not be permitted.

3.1.12 **WELDING**

3.1.12.1 Tanks and other attachments shall be welded as per AWS and the qualification of welder should be as specified in ASME.

3.1.12.2 Welding sequence shall be so adopted that distortion due to welding shrinkage shall be minimum. Welding procedure specification shall be shall be submitted for approval of BHEL giving details of material, welding position , sequence , type of electrode used , pre-heat & post weld requirement etc as per the code of construction . Brand name of electrodes to be used with proper classification (e.g. E 6013) shall be as per BHEL's approval.

3.1.12.3 Welding shall not be carried out when the surface is wet and during periods of rain and high winds unless the welder and the work are properly shielded which should meet the approval of the purchaser.

3.1.12.4 Inspection of all welds shall be carried out in accordance with the governing code of construction . All material used by the purchaser such as electrodes, gaskets , bolts, nuts etc shall be conforming to relevant standards of repute and approved by the purchaser prior to use.

3.1.13 Each tank shall be complete with access staircase and fittings like drain connection , overflow connection, tank inlet and outlet covers , level gauge glass, fittings with isolation cocks and

protection covers , tank vent connection etc all complete with needed accessories for the completeness of the tanks and as specified in data sheet -A .

3.1.14 All openings in tank plate shall be well reinforced in approved manner by adding pad plates of adequate size and / or structural sections.

3.1.15 **STAIRCASE / ACCESS LADDER AND HAND RAILING**

3.1.15.1 All cylindrical vertical tanks shall be provided with spiral staircase and shall conform to the requirements specified in API 650 unless specified otherwise. All stair treads shall be 32 mm steel fabricated gratings. Each tread, if needed, shall be housed in individual steel fabricated frame which shall be adequately supported from the tank outer periphery. The staircase shall have minimum 750 mm clear width.

3.1.15.2 Access ladder, one (1) for each horizontal cylindrical / rectangular tank shall be provided for access to the tank roof. It shall be steel fabricated having minimum 450 mm width. Ladder stringers shall be heavy steel flats or angle section. All rungs shall be minimum 20 mm Dia rods spaced at not more than 30 cm center to center. All ladders shall have steel fabricated safety cage to the approved construction. Safety cage shall be provided about 2.5 m clear height of the ladder. Access ladder's stringers shall be widely spaced at top for free access to the tank roof.

3.1.15.3 All staircase and roofs of vertical cylindrical tanks shall be provided with pipe hand railings of 1070 mm effective height throughout. Handrails shall be constructed out of 32 NB medium class galvanized steel pipe conforming to ASTM A 53 Gr.B. Handrail posts shall be arranged at spacing not greater than 1850 mm. Two (2) sets of pipes horizontal runners all along the length shall be provided. All welds joints in the handrails shall be ground flush to protect any person getting injured. Steel toe plates of 100 mm flats shall be used. Hand railing shall be fabricated installed in an approved manner as directed by purchaser in accordance with approved drawings.

3.1.16 Unless otherwise specified, for all flanged connections vendor shall furnish suitable counter flanges and necessary nuts, bolts and gaskets materials.

3.1.17 Unless otherwise specified bolts and nuts shall be hexagonal head conforming to ISO -898-1:1999.

3.1.18 Gaskets shall be 3 mm thick full face rubber or CAF. On completion of hydraulic test / water fill test, contractor shall replace the gaskets used during testing at his own cost.

3.1.19 Float level indicators of approved make, as specified in data sheet-A shall be provided.

3.1.20 During erection of tank, shell plates shall be suitably supported both for outside and inside to avoid buckling / collapsing of tank due to high speed wind , gust or severe storm ,if any, occurring during erection.

3.1.21 The contractor shall furnish two (2) grounding pads for each vertical tank. Each pad shall be stainless steel plate 100 mm x 100 mm x 6 mm thick, with two 15 mm holes on 45 mm centers. Pads shall be edge welded to tank shell within 450 mm from the tank base. Two grounding lugs shall be provided for each horizontal tank.

3.2 VERTICAL CYLINDRICAL STORAGE TANKS

3.2.1 The vertical cylindrical storage (non- pressure) tanks shall be of mild steel welded construction and shall be designed in accordance with API-650 / AWWA D - 100. The vertical cylindrical storage tanks shall have slightly sloping bottom towards an adequately sized sump inside the tank to enable complete draining of the tank. The tank shall be designed for a wind pressure and seismic coefficient as specified. While worst of these two shall be increased as per API.

3.2.2 Conical roof shall be self-supported over the tank periphery. The roof shall have a slope of not less than 1 in 16 to ensure drainage of rainwater. Needed roof rafters and purlins adequately designed shall be provided.

3.2.3 All plates to be used for fabrication of tank shall be checked and all sides trimmed to make them square.

3.2.4 All bottom plates shall have lap weld joints on all sides with overlap not less than five times the plate thickness.

3.2.5 All shell course plates shall be taken during bending to prevent plate skewing. For butt weld joints, edges shall be prepared which shall be uniform and smooth throughout. To maintain needed root penetration gap at any butt weld joint, sufficient numbers of erection cleats shall be provided on all sides of outer periphery of each shell plate. Plates for tanks shall be straightened by pressing or by other non-injurious methods.

3.2.6 Each shell course shall be of uniform width throughout longitudinal weld in plates. Make up for the course width shall not be permitted. Shell plates in each course width shall be so arranged that all vertical joints are staggered having a minimum of 600 mm stagger. Shell thickness could be reduced in upper courses depending on design requirements but in no case the plate thickness shall be less than 6 mm.

3.2.7 The tank height shall be completed by the provision of top curb/ angle which shall be butt welded to the adjacent tank plate courses. The outstanding leg of the curb angle shall be kept outside the tank periphery. All butt weld joints shall be full strength welds but for design of shell plate thickness adequate weld efficiency as recommended by applicable code(s) shall be used.

3.2.8 Tank roof shall be supported over steel fabricated central column(s). Adequately sized and spaced rafters and purlins shall be provided. All rafters shall have sliding bolted connections at one end and preferably on the tank periphery side. The roof supporting frame shall have needed tie rods or bracing sets.

3.2.9 Roof plates shall have lap joints with lap not less than 25 mm and lap weld over the top surface only. Roof plates shall have continuous fillet welds around the tank curb angle. No joint of roof plate over the supporting frame shall be made.

3.2.10 Needed openings for mounting various specified accessories shall be well reinforced in accordance with application codes and as approved. Manhole shall the bolted and shall have hinged covers unless otherwise specified.

3.2.11 All inlet pipe nozzles located at the top of tanks shall be provided with internal piping up to 500 mm high above the tank's bottom inside with suitable weir plate at bottom. The inside piping shall be adequately supported and shall be provided with adequately sized vent connection at pipe top.

3.2.12 The manhole shall be of hinged & bolted type with nuts, bolts and gaskets with minimum size of 600 mm.

3.2.13 NaOH / KOH breather and seal pot shall be located in the bottom / ground level and necessary connection from tank vent to NaOH / KOH breather shall be provided through 200 NB SS pipe. The sizing of NaOH breather and Seal pot shall be decided based on emptying and filling rate of tanks. A tentative rate of 5 cum/hr may be considered for both emptying and filling of tank. However, the complete information shall be provided to vendor during detail engineering.

3.2.14 Material of construction of all pipes, fittings, valves, nozzles, flanges and counter flanges shall be as per datasheets given at the end of this section.

3.2.15 Material of construction for standpipe (if applicable) shall be stainless steel (SS) and size shall not be less than NB 100 unless otherwise specified in Datasheet-A for tanks given at the end of section.

3.2.16 Two (2) nos NaOH / KOH breather shall be provided by the bidder for each tank, out of which one shall be used for in-breathing purpose and the other shall be used for out-breathing purpose.

3.2.17 The size of the drain and vent valve of standpipes shall be 25 NB and size of the isolating valves (2 nos) for standpipe shall be 50 NB unless otherwise specified in the specification.

3.2.18 The overflow pipe from overflow nozzle shall be connected to seal pot.

3.2.19 All stair treads and platforms shall be made from gratings

3.3.0 RECTANGULAR TANKS

3.3.1 Rectangular tanks shall be fabricated from steel material and shall be designed to withstand internal hydrostatic pressure. In addition these shall be checked for a wind pressure and seismic coefficient as specified wherever applicable. While worst of these two shall be considered, the permissible stress shall be increased as per IS when their effect considered with tank load.

3.3.2 Tank bottom and / or side plates shall be of minimum 6 mm thick plate. Corrosion margin of at least 2 mm shall be provided over the design thickness of bottom and / or side plates.

3.3.3 To support tank plates and to maintain required unsupported plate length, adequately sized and spaced steel structural closed frame shall be provided inside the tank. Longitudinal and / or vertical structural members to connect and adequately support these frames shall be provided at corners. Horizontal diagonal members / sway bracings at corner shall also be provided.

3.3.4 Tank plates cut to size shall be welded on these frames. Plate butt weld joints at other locations shall be eliminated to avoid warping of the plates at free joints. Adequate openings in the structural frames, particularly at the bottom shall be provided to ensure complete unrestricted drainage of tank at one point.

3.3.5 Complete assembled tank shall have at its bottom longitudinal steel fabricated bearer beams welded to it. The tank with bearer will rest over number of concrete blocks to be provided by purchaser. The tank shall be adequately bolted / welded to the concrete blocks. Needed inserts / anchor bolts shall be furnished by the bidders. Grouting of tank over concrete blocks in approved manner shall be included in bidder's scope of work, if erection is also awarded to the bidder.

3.3.6 Where rectangular tanks are flushed in dual compartments the inside partition plate shall be well reinforced to withstand hydrostatic test pressure completely on one side throughout the full height.

3.4 **HORIZONTAL CYLINDRICAL TANK**

3.4.1 The horizontal cylindrical tank with dished ends shall be of mild steel welded construction and shall be designed in accordance with BS- 2594. The tank shall be designed for a wind pressure and seismic coefficient as specified. While worst of these two shall be considered, the permissible stress shall be increased as per IS.

3.4.2 The shell and dished end plate thickness shall be chosen as per design requirement but in no case the dished end and shell plate thickness shall be less than 8 mm.

3.4.3 All seams, longitudinal as well as circumferential, shall be butt welded. Longitudinal seams should not be situated in the lower third of a tank or on the top centre line.

3.4.4 All tank shall be supplied with integral saddle support and shall be designed in accordance with BS- 2594.

4.0 **TESTING AND INSPECTION AT MANUFACTURERER'S WORKS**

4.1 **General**

4.1.1 The supplier shall provide inspection to establish and maintain quality of workmanship in his works and that of his subcontractors to ensure the mechanical accuracy of components, compliance with drawings identity and acceptability of all materials, parts and equipment. He shall conduct all tests required to ensure that the equipment and material furnished shall conform to requirements of the acceptable codes. All tests and test procedure proposed by manufacturer shall be submitted to the purchaser for their prior approval.

4.1.2 All materials used for manufacture of the equipment under this specification shall be of tested quality. Relevant test certificates shall be made available to the purchaser before the final shop inspection. In case the relevant correlating test certificates are not available, the supplier shall arrange to carry out the necessary tests required by codes at his own cost.

4.1.3 Alloy cast iron and cast steel components shall be tested for both physical and chemical properties in absence of purchaser's representatives. Test bears shall be either integral or taken from the same ladle of material as the casting they represent.

4.2 **TESTING AND INSPECTION FOR TANKS**

4.2.1 The scope of testing and inspection for pressure vessel / tanks covered in this specification shall generally comprise of the following:

i) Examination and approval of fabrication drawings to ensure that design, materials and fabrication details meet requirement of code and specifications. Purchaser will review these drawings for interface problems and conformity with the general arrangement drawings and accord their approval.

ii) Examination of materials of construction and identification with material test certificates.

iii) All the plates of thickness 50 mm or more shall be ultrasonically tested to ensure freedom from laminations.

iv) Ensuring the relevant weld procedure and welder qualification tests are in accordance with stipulated code requirements.

v) Inspection of dished end flanges and alloy steel bolting where required.

vi) Inspection during fabrication at appropriate stages including fit ups .

vii) For all butt welds, the root run and final run shall be subjected to dye penetrant or magnetic particle inspection. For all fillet welds the final run shall be subjected to dye penetrant / magnetic particle examination.

viii) Examination of radiographs including radiographic techniques, supervision of other non - destructive tests and heat treatment procedure as required by codes and specifications.

ix) Examination of internal cleanliness before final closure.

x) Dimensional examination of completed vessel including axis marking, proof marking , match marking etc.

xi) Witnessing of hydrostatic, pneumatic or vacuum tests or special tests as required by the code and specification. In case of hydrostatic tests, the test pressure must be kept for a minimum of two hours.

xii) Witnessing cleanliness, preservation, packing and marking.

xiii) Stamping of vessel and issue of certificates.

4.2.2 NON - PRESSURE TANKS

FIELD TESTING

Scope of testing and inspection for non-pressure tanks covered in this specification will comprise of the following:

4.2.2.1 Identification of materials to manufacturer's test certificates.

4.2.2.2 Inspection of plates, edges after edge preparation and checking curvature against template if shell plates sent after rolling.

4.2.2.3 Checking of dimension and match marking.

4.2.2.4 DPT / MPI on all welds (100%).

4.2.2.5 All cross / Tee joints and butt welds to be 10% Radio graphed.

4.2.2.6 For the offered tanks, fill test shall be carried out for at least 24 hours. Atmospheric storage tanks on inside surface shall be leak tested before painting.

4.2.2.7 All quality plans / checklists for various items shall be furnished during detail engineering stage for BHEL / customer's approval and any changes required by BHEL / customer shall be incorporated in the documents and adhered without any price implication. However, minimum requirement of MQP as indicated in the technical specification shall be followed. All necessary items as required for inspection and testing of the tank including instruments shall be arranged by the bidder

.

4.2.3 REPAIR OF LEAKS

4.2.3.1 All leaks detected during testing shall be repaired to the satisfaction of the purchaser and on completion retested for leakages as per approved procedure.

4.2.3.2 In the joints between roof plates only, pin hole leaks may be repaired by mechanical method. However, where there is any indication of considerable porosity, the leaks shall be sealed by laying down an additional layer of weld over the porous sections.

4.2.3.3 In the other joints, whether between shell plates or bottom plates or both, leak shall be repaired by only welding and if necessary, after first cutting out the defective part.

5.0 PAINTING REQUIREMENT

Surface preparation, being a pre-requisite for any paint application, shall be such as to clean the surface thoroughly of any materials which will be conducive to premature failure of the paint substrata. Blast clean type (Grit blasting by copper/ MS/other) shall de decided during detailed engineering for which no commercial implication shall be entertained by BHEL.

All surfaces shall be cleaned of loose substances and foreign materials, such as dirt, rust, scale, oil, grease, welding flux etc. in order that the prime coat is rigidly anchored to virgin metal surface.

Paint shall be applied in accordance with paint manufacturer's recommendation and shall meet the requirement of the exposure condition and specific system of painting thereof.

The above is the minimum requirement to be followed by the successful bidder. Any additional requirement to ensure prevention of atmospheric corrosion shall be provided by the successful bidder without any commercial implication.

6.0 OTHER TECHNICAL REQUIREMENTS

1. All drawings shall be prepared as per BHEL's title block and bear BHEL's drawing No. and customer / consultant's drawing no; which will be forwarded to the successful bidder during detail engineering stage.

2. All possible efforts shall be made by the bidder to get the approval of drawings and documents from BHEL / customer / consultant at the earliest and the documents prepared / generated by them or their sub-vendors shall be checked by their competent authority before submission to BHEL.

3. Bidder to depute competent designer (s) at BHEL's office during detailed engineering stage to discuss drawings and other technical documents as and when required by BHEL.

4. All the drawings which are required to be furnished to BHEL during detailed engineering stage shall include technical parameters, details of paints, BOQ / BOM etc in tabular form indicating all

components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

5. All testing of tanks shall be done in line with testing requirement of this specification and as finalized during detailed engineering and customer approvals.

ANNEXURE-II

DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH THE BID

The bidder must submit the following drawings and documents along with their bid in **4 sets** so as to enable BHEL to evaluate their offer. In absence of any of these documents, BHEL reserves right not to evaluate the offer of the concerned bidder.

a. All the relevant documents and certificates required to establish/meet PQR criteria, If applicable as given in tender documents

b. Deviation schedule, strictly as per enclosed format under Vol-III.

c. Un-priced copy of price format indicating quoted/ not quoted against each row & column.

d. Recommended Foundation drawing of tank along with loading data, anchor bolt details etc.

e. Compliance cum Confirmation certificate duly stamped and signed, attached under VOL-III of this Specification.

In the absence of any one of the documents mentioned above, bidder's offer is liable to be rejected. Further any documents submitted by bidder other than above shall not be taken cognizance of and these shall not form part of contract.

ANNEXURE-III

DRAWINGS/ DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

The successful bidder shall submit the following drawings / documents during detail engineering for approval / information / reference (as the case may be):-

S.N	**DOCUMENT NO.**	**DESCRIPTION**	**Submission schedule from LOI Date**	**Resubmission After incorporating comments**	**Comments approval by BHEL & Customer**
1	PE-V0-402-167-A101	Design Calculation of tank	3 Weeks	Within 1 week	4 Weeks
2	PE-V0-402-167-A201	General arrangement drawing of tank including nozzle orientation & civil input drawing	3 Weeks	Within 1 week	4 Weeks
3	PE-V0-402-167-A203	Fab. drawing :Tank roof structural, staircase details, nozzle connections details, NAOH Breather & Seal pot details	5 Weeks	Within 1 week	4 Weeks
4	PE-V0-402-167-A301	Datasheet & GA for Pipe fittings , plates & structure, Level indicator & Valves	6 Weeks	Within 1 week	4 Weeks
5	PE-V0-402-167-A401	QAP for Plates, structures, Pipes & fittings, Level indicator, valves	6 Weeks	Within 1 week	4 Weeks
6		FQR,WPS,PQR	As per site requirement	Within 1 week	4 Weeks
		Total engineering completed in time		5 months	

Note:

1. Finally approved documents to be provided in Auto CAD format for onward submission to end customer.
2. Drwg/ Document shall be uploaded by the successful bidder on WRENCH / DMS. Procedure for the same will be informed after award of contract.

COMPANY SEAL

SIGNATURE: _____

NAME : _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

ANNEXURE-IV			
LIST OF PROPOSED SUB-VENDORS FOR MISC. TANKS			
S.N	**CATEGORY OF INSPECTION**	**ITEM**	**PROPOSED SUB-VENDORS**
1	III	CS PIPES ERW	TISCO / SAI L/ SURYA ROSHNI / JINDAL / MAHARASTRA SEAMLESS / AJANTA TUBES
2	III	CS Pipes -Seamless	Maharastra Seamless/ISMT
4	III	Level Indicator (Float & tape type)	SBEM/LEVCON/SIGMA/SIEMENS
5	III	Structural steel	SAIL / TISCO / JINDAL STEEL & POWER / ESSAR STEEL
6	III	Paint	ASIAN PAINT / BERGER / GOODLAS NROLAC
7	III*	M.S Plate	SAIL / JINDAL STEEL & POWER LTD / ESSAR / TISCO
8	II	SS Valve	FOURESS / KBL / WEIR BDK / LEADER / AV VALVES
9	III*	SS Pipes	REMI / RATNAMI / CHOKSI / APEX
10	III	SS FITTINGS	GUJRAT ENGINEERING / M.S FITTINGS / OTHER Vendor's approved sources.
	NOTES		
		Inspection Categorisation	
	1	**CAT I** :INSPECTION BY OWNER ,BHEL/BHEL NOMINATED TPIA & VENDOR .MDCC WILL BE ISSUED BASED ON INSPECTION REPORT IN LINE ITH APPROVED QAP.	
	2	**CAT II**:INSPECTION BY BHEL/BHEL NOMINATED TPIA & VENDOR. MDCC WILL BE ISSUED BASED ON INSPECTION REPORT IN LINE ITH APPROVED QAP.	
	3	**CAT III**: MDCC WILL BE ISSUSED BASED ON COC & MTC ISSUSD BY VENDOR AND VERIFICATION BY BHEL/OWNER IN LINE WITH APPROVED QAP/CHECK LIST	
	4	*** In case material is dispatched directly from Approved sub-vendor plant/stockyard or from dealer stocking material from approved make with correlated test certificate, then inspection category will be III & incase material is procurred from dealer stocking material from approved makes without corelated test certifiate, then inspection category will be II and BHEL witness shall be applicable.**	

PROJECT

NTPC FEROZ GANDHI UNCHAHR
1X500MW THERMAL POWER STATION, STAGE-IV

DATASHEET FOR PIPES, FITTINGS, VALVES, PLATES & LEVEL INDICATOR

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERIING MANAGEMENT
PPEI, NOIDA-INDIA

LEVEL INDICATOR

S.NO.	COMPONENT	DESCRIPTION
1	Type	Float and Arrow Type Level Indicator
2	Float Material	SS 316
3	Guide Cable	SS-316
4	Float Cable	SS-316
5	Spring	SS-304
6	Cover	SS-316
7	Roller / Pulley and Pulley Housing	SS
8	Scale Board	Aluminum, P.U. Painted
9	Pointer and Graduations	Aluminum and S.S.
10	Accuracy	± 5 mm
11	Range	To suit tank size
12	Quantity	one(1) number per tank

PLATES & STRUCTURAL STEEL

A.0	MS Plate		
1.0	Material		IS:2062, Gr. B
B.0	Angle, Channel, Beam, Bar and Flat		
1.0	Material		IS:2062, Gr. A/B
C.0	Handrail		
1.0	Size of pipe		32 NB
2.0	Material		ERW pipe as per IS:1239,Part-I
3.0	Dimension standard		ANSI 36.10, plain ends

PIPES, FITTINGS, FLANGES & ACCESSORIES

1.0	SS Pipes	Material Standard	**Dimensional Standard**
1.1	50 NB and below	Stainless steel pipe as per ASTM A-312, Gr. 304 , Seamless, Sch. 40S	As per ANSI B-36.19, socket welded
1.2	65 NB and above	Stainless steel pipe as per ASTM A-312, Gr. TP-304, Seamless, Sch.10S	As per ANSI B-36.19, BW ends as per ANSI B16.25
2.0	SS Fittings(Elbow, Tees & Reducers)		
2.1	50 NB and below	Forged Stainless steel as per ASTM A-182, F-304	ANSI B 16.11, S/W ends
2.2	65 NB and above	Stainless Steel as per ASTM A-403, WP-304	ANSI B 16.9, B/W ends
3.0	**SS Flanges**		
3.1	For SS Pipes up to 50 NB	ASTM A182 F304	ANSI B16.5, RF
3.2	For SS Pipes above 50 NB	ASTM A403 Gr. 304	ANSI B16.5, FF
4.0	**Gasket for SS fittings**		
4.1	Up to 50NB	SS jacketed CAF with superior oil/resistance	ANSI B 16.21
4.2	Above 50NB	PTFE (TEFLON)	ANSI B 16.21
9.0	**Bolts & Nuts**		
9.1	Wherever applicable in all the tanks.	ASTM A-193, Gr. B7 for Bolts ASTM A-194, Gr. 2H for Nuts	ASTM A-193 / A-194

VALVES

S.N	COMPONENT	DESCRIPTION
1.	Body & Bonnet	ASTM A182 Gr.F304 (50NB & below) ASTM A351 Gr.CF8M (50NB above)
2.	Wedge & Seat ring	ASTM A182 Gr.F304 (50NB & below) ASTM A351 Gr.CF8M (50NB above)
3.	Trim	ASTM A182 Gr F304
4.	Rating	Class 800 (50NB & below) Class 150 (50NB above)
5.	Ends	SW to B16.11 (50NB &below) Flanged to B16.5 (50NB above)
6.	Design Standards	B16.34 / API600 for Gate valve B16.34 / BS1873 for Globe valve
7.	Testing standards	API 598 for all valve (All sizes)
8.	Bolts & Nuts	A193 Grb7 & A194 Gr.2H

PROJECT

NTPC FEROZ GANDHI UNCHAHR
1X500MW THERMAL POWER STATION, STAGE-IV

QAP FOR PIPES, FITTINGS, VALVES AND LEVEL INDICATOR

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERIING MANAGEMENT
PPEI, NOIDA-INDIA

QAP OF LEVEL INDICATOR

Manufacturer's Name:	QUALITY ASSURANCE PLAN QAP OF LEVEL INDICATOR	PROJECT: PACKAGE: Misc. Tanks (Site Fabricated) LOI No. : Customer : BHEL	BHEL Doc. No.: Rev. No. : 0 Date: SHEET 1 OF 1

Sl. No.	Components and Operation	Characteristic/ Item	Class	Type of Check	Extent of Check	Reference Document	Acceptance Norm	Format of Record (D*)	Agency			Remarks
									M	B	C	
1	2	3	4	5	6	7	8	9	10			11
1	Level Indicator	Check for Type, Model No., Tag No.	MA	Visual	100%	Approved Data Sheet	Approved Data Sheet	Mfgr. TC	P	V	V	
2		Float Leakage Test	CR	Mechanical	100%	Approved Data Sheet	Approved Data Sheet	Mfgr. TC	P	V	V	
3		Review of TC for Material	CR	Visual	For Lot	MTC	MTC	Mfgr. TC	P	V	V	
		C: BHEL B : Vendor M. : Manufacturer				P - Perform W - Witness V - Verification						
Manufacturer / Contractor / Sub contractor Signature		CR-Critical Characteristics MA - Major Characteristics MI- Minor Characteristics		FOR BHEL				FOR CUSTOMER	APRD. BY			

Manufacturer's Name:			MANUFACTURING QUALITY PLAN FOR VALVES				PROJECT: PACKAGE: Misc. Tanks (Site Fabricated) LOI No. : Customer : BHEL			BHEL Doc. No.: Rev. No. : 0 Date: SHEET 1 OF 1			
Sl. No.	**Components and Operation**	**Characteristic/ Item**	**Class**	**Type of Check**	**Quantum**	**Reference Document**	**Acceptance Norm**	**Format of Record (D*)**	**D**	**Agency**			**Remarks**
										M	**B**	**C**	
1.0	**Material :**												
1.1	Body,Bonnet,forgings/casting	1.Chemical compositon	CR	Chem.test	One \heat	Approved Data Sheet/DRG	Relevant standard.	TC	√	P	V	V	
		2.Mech properties	CR	Tensile test	One \heat HT Batch	Approved Data Sheet/DRG	Relevant standard.	TC	√	P	V	V	
1.2	**Disc & spindle**	1. Mech Properties	MR	Tensile test	1 Test bar /Heat	Approved Datasheet	Relevant standard.	TC	√	P	V	V	
		Chemical properties	MR	Chemical analysis									
2.0	**In Process Inspection :-**												
2.1	Body,Bonnet,Disc,spindle after Machining	Visual	MR	Visual	100%		No visual surface defect	IR	√	P			
		Dimension	MR	Measurements	100%	Component drg	Component drg	compliance report					
2.2	Body,Seat ring ,Disc,spindle after Machining	Surface defects	MR	DPT	100%	ASTM A 165	No significant defects	mfgr.TC	√	P	-		
3.0	**TESTING & FINAL INSPECTION**												
3.1	Complete valve	hydrotesting(pressure & duration as per approved datasheet/std.)	MR	Body/seat	100%	Approved datsheet	No leakage through Body/seat	TC	√	P	W	W	
3.2		Functional test	MR	Full open & full close	100%	Approved Drg/datasheet	Smooth operation	IR	√	P	W	W	
		LEGEND : * RECORDS INDENTIFIED WITH "TICK" SHALL BE INCLUDED											
		C: BHEL B. : VENDOR M:Manufacturer DPT=Dye penetrant test MR-MAJOR.CR-Critical ,CHP-customer Hod, R=review,NDT-non Destructive test,TC-test certificate, IR-inspection Report ,D-Data folder,DPT=Dye penetrant Test				P - Perform W - Witness V - Verification							
Manufacturer / Contractor / Sub contractor		CR-Critical Characteristics MA - Major Characteristics MI-Minor Characteristics		FOR BHEL				FOR CUSTOMER		APRD. BY			
Signature													

QAP OF MS PLATES

Manufacturer's Name: Approved sub vendor	MANUFACTURING QUALITY PLAN ITEM: MS PLATES Sub-system- Misc.tanks	PROJECT: PACKAGE: Misc.Tanks (Site Fabricated) LOI No. : Customer : BHEL	BHEL Doc. No.: Rev. No. : 0 Date: SHEET 1 OF 1

Sl. No.	Components and Operation	Characteristic/ Item	Class	Type of Check	Extent of Check	Reference Document	Acceptance Norm	Format of Record (D*)	D	Agency M	Agency B	Agency C	Remarks
1	2	3	4	5	6	7	8	9		11			12
	RAW MATERIAL												
1	STEEL PLATES	Chemical compostion and Mechnical test	MA	Review of corelated MTC	one/heat	IS:2062	IS:2062	Mfgr. TC	√	P	V	V	Refer Note below
2		Visual and dimensionl check	MA	Visual and measurement	100%	Mfg.TC	Mfg.TC IS1852	Mfgr. TC	√	P	**W	**W	
3		Identification/marking	MA	Corelation establish	100%	As per manufacturing practice	As per manufacturing practice IS 2062	Mfgr. TC	√	P	V	**W	
		LEGEND : * RECORDS INDENTIFIED WITH "TICK" SHALL BE INCLUDED								DOC. NO. : Rev No.0			
		C: BHEL B : VENDOR M.Manufacturer				P - Perform W - Witness V - Verification							
Manufacturer / Contractor / Sub contractor		CR-Critical Characteristics MA - Major Characteristics MI- Minor Characteristics	FOR BHEL					FOR CUSTOMER		APRD. BY			
Signature													

Notes ** In case material is despatced directly from Approved sub-vendor plant/stockyard or procured from dealer against co related TC's witnessing by BHEL is waived off and material will be accepted based on MTC of approved sub vendor. In case material is procured from dealer and co related TC's are not available,check on 100% quantity of plates will be performed on sample drawn from them at NABL certified/approved laboratory for chemical & physical properties,however dimensional check shall be witnessed by BHEL

QAP OF PIPE FITTINGS ,FLANGES & ACCESSORIES

Manufacturer's Name:	QUALITY ASSURANCE PLAN INSPECTION CHECK LIST FOR PIPE FITTINGS ,FLANGES & ACCESSORIES	PROJECT: PACKAGE: Misc.Tanks (Site Fabricated) LOI No. : Customer : BHEL	BHEL Doc. No.: Rev. No. : 0 Date: SHEET 1 OF 1

Sl. No.	Components and Operation	Class	Type of Check	Reference Document/Acceptance Norm	Agency			Remarks
					M	B	C	
1	2	3	4	5		6		7
1	**Pipes Fittings,Flanges & Accessories**	MI	Visual	As per Approved Data Sheet/Tech spec.	P	V	V	
2		MI	Dimensional	As per Approved Data Sheet/Tech spec.	P	V	V	
3		MI	Review of TC	As per MTC	P	V	V	
		MA	Hydro Test	As per MTC	P	V	V	

LEGEND : * RECORDS INDENTIFIED WITH "TICK" SHALL BE INCLUDED

C : CUSTOMER /BHEL
B. : VENDOR
M. : Manufacturer

P - Perform
W - Witness
V - Verification

DOC. NO. :

Manufacturer / Contractor / Sub contractor	CR-Critical Characteristics MA - Major Characteristics MI- Minor Characteristics IR-Inspection Report ,MTC-Material/Manufacturer's Test. Certificate	FOR BHEL	FOR CUSTOMER		APRD. BY	APPROVAL SEAL
Signature						

PROJECT

NTPC FEROZ GANDHI UNCHAHR
1X500MW THERMAL POWER STATION, STAGE-IV

VOLUME-III

TECHNICAL SCHEDULES

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERIING MANAGEMENT
PPEI, NOIDA-INDIA

PRE-BID CLARIFICATION SCHEDULE

S.No.	Section/Clause/ Page No.	Statement of the referred clause	Clarification required

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE:_____

NAME : _____

DESIGNATION:_____

COMPANY: _____

DATE:_____

COMPANY SEAL

DEVIATION SHEET (COST OF WITHDRAWL)

PROJECT:- 1x500MW FGUTPP , STAGE-IV

PACKAGE:- MISC. TANKS-SITE FABRIATED (CST)

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	**DESIGNATIONS**	**SIGN & DATE**	

NOTES:

1. For self manufactured items of bidder, cost of withdrawl of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawl of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawl of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawl of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawl of deviation shall be taken as NIL.
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawl is to be given seperately for each deviation. In no event bidder should club cost of withdrawl of more than one deviation else cost of withdrawl of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawl (positive/negative) is not specified it shall be assumed as positive.
14. In case of descrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificates (every sheet) and furnish the same with offer.

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions other than those mentioned under "exclusion" in section C and those resolved as per 'Schedule of Deviations', if applicable, with regard to same.

b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'.

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This shall be within the contracted price with no extra implications to BHEL after award of the contract.

d) All drawings/ data-sheets/ calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.

e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified/ intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre - bid discussions, otherwise BHEL/ Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.

g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.

h) The tank functional guarantees shall stand valid till at least eighteen (18) months from Hydro test of tank as per technical specification or commercial terms and conditions, whichever is later.

i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities. This clause will apply in case during site commissioning additional requirements emerges due to customer and/ or consultant's comments. No extra claims shall be put on this account.

j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

k) As built drawings shall be submitted as and when required during the project execution.

l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

SIGNATURE:_____

NAME : _____

DESIGNATION:_____

COMPANY: _____

DATE:_____

COMPANY SEAL

SUGGESTIVE PRICE SCHEDULE - MISC. TANKS (CST)							Rev 00
1 X 500 MW FGUTPP NTPC, STAGE-IV							
Sl.No	**DESCRIPTION OF EQUIPMENT / ITEM**	**Ex-works price**	**ED**	**CST**	**FREIGHT**	**E&C Charges**	**Total**
1	**2**	**3**	**4**	**5**	**6**	**7**	**3 to 7**
1.0.0	Total lump sum firm price on FOR site basis for design & engineering, manufacturing, inspection / testing at works as well as at site, duly packed, supply / delivery to site including freight, unloading, storage and handling at site, erection and commissioning, hydro test at site, painting, handing over, tools and tackles, commissioning spares etc. inclusive of all prevailing taxes, duties and other levies, complete with all accessories including instruments required for the total scope defined as per specification (PE-401-167-A001) for 1 No. Condensate Storage tanks of Size as 8.0M dia X 7.5 M Ht.						
2.0.0	**NOTES**						
2.1.0	Bidder to note that total price indicated above at 1.0.0 shall be considered for evaluation and hence should be complete in all respect for the full scope defined and considering all terms and conditions agreed.						
2.2.0	Any item not included in the price quoted above and shown separately will not be taken cognizance of and the offer shall be liable for rejection.						
2.3.0	Bidder shall furnish the price of all the items as indicated in the price schedule. **Bidder's offer shall be liable to be rejected incase bidder does not furnish the same.**						
2.4.0	In case, price indicated above does not match with the total of item wise break-up **given at 3.0.0**, the highest price so calculated shall be considered for evaluation but in case of order, the same shall be placed at the lowest price.						
3.0.0	**Break - up of Prices**						
3.1.0	Lump sum price of total CS plates for the tank						
3.2.0	Lump sum price of all structures including hand-railings, staircase etc. for the tank						
3.3.0	Lump sum price of total number of valves required for the tank						
3.4.0	Lump sum price of total length of the piping for the tank						
3.5.0	Lump sum price of total no. of level gauges required for the tank						

3.6.0	Lump sum price of NaOH breathers for the tank						
3.7.0	Lump sum price of seal pots for the tank						
3.8.0	Total amount for commissioning spares as per **Annexure -A**						
3.9.0	Lump sum price of painting for the tank						
3.10.0	Price for hydro test and handing over etc., of the storage tanks included as per the specification.						
	Total **Note: Total from 3.1.0 to 3.10.0 should match with 1.0.0 above.**						
	Date:_____						
	Bidder's / bidder's representative signature			**Company seal**			

ANNEXURE-A

1 X500 MW FGUTPP NTPC, STAGE-IV, PKG- MISC. TANK-SITE FABRICATED (CST)

LIST OF COMMISSIONING SPARES

S.No.	Item	Quantity	Unit ex-works price	Total ex-works price	ED	CST	FREIGHT	Total
1	2	3	4	5	6	7	8	4 to 8
1.0	CAF Gasket of size 1.5m x 1.5m x 3mm thk	2 No.						
2.0	Nuts , bolts & washers of each size (nos. of bolts, nuts & washers as required for each nozzle) as per approved Drg.	1 Lot						
3.0	Any Other Item required for successful commissioning of the tanks							
NOTE								
	The list of items indicated above under commissioning spares is the minimum required.Any additional item required for commissioning shall be deemed to have been included in bidder's scope & the same shall be suppllied free of cost by the successful bidder.							
								.