PROJECT

2X660 MW ENNORE SEZ COAL BASED STPS

TECHNICAL SPECIFICATION FOR MISC. TANKS-SITE FABRICATED

SPECIFICATION NO.: PE-TS-412-167-A001

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

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PROJECT

2X660 MW ENNORE SEZ COAL BASED STPS

SECTION-A
INTENT OF SPECIFICATION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERIING MANAGEMENT
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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 & DM water 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& DM TANK)** 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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MISC. TANKS- SITE FABRICATED

SECTION – B

(PROJECT INFORMATION)

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

SPECIFICATION
FOR
EPC CUM DEBT FINANCING CONTRACT

VOLUME II – GENERAL & SCHEDULES

CHAPTER 1

PROJECT SYNOPSIS

1.0 GENERAL BACKGROUND AND SALIENT FEATURES

1.1 Introduction

Tamilnadu Generation and Distribution Corporation owns the proposed green-field 1320 MW (2 units of 660 MW each) Coal Based Thermal Power Station at Katupalli. This is an expansion of North Chennai Thermal Power Station (NCTPS) and located on some portion of the ashdyke of NCTPS.

1.2 Location

The proposed site for main power plant is located near Ennore port (approx 5 kms).

The nearest Railway station is at Athipattu Pudunagar (approx 5 kms)

All weather road from Pattamandri on the Thiruvottiyur-Ponneri district highway is the nearest road access.

The nearest airport is at Chennai at a distance of 60 km.

1.3 Type of Plant

The proposed 2x660 MW Super-Critical Power Project consists of coal fired steam generator connected to a reheat type steam turbine generator along with all the required auxiliaries. Circulating cooling water system is envisaged for condenser cooling.

The description and salient technical data of the Steam Generator, Steam Turbine Generator, Auxiliary systems, Electrical, Control & Instrumentation, Civil etc. are explained elsewhere in the specification:

1.4 PROJECT INFORMATION

Project Title : **2 x 660 MW Ennore SEZ Coal Based Supercritical Thermal Power Project at Ash Dyke of NCTPS**

Owner : **TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)**

LOCATION

The site is located near Vayalur Village, Ennore

Latitude	:	$13^0$17' N to $13^0$18' N
Longitude	:	$80^0$18' E to $80^0$19' E
Distance from Chennai City	:	35 km
Nearest Airport is at Chennai at a Distance of	:	60 km
Nearest Seaport is	:	Ennore
Nearest Railway Station is	:	Athipattu Pudunagar (approx 5 kms)

Meteorological Condition

Climate : Tropical ,very dry and hot summer, dry and cold winter and good rain-fall in monsoon accompanied with strong wind.

Climatological data :

Ambient temp. (^{0}C)

Annual Maximum Mean Temp	41.5(^{0}C)
Annual Minimum Mean Temp	24(^{0}C)
Design Ambient temperature	35(^{0}C)

Relative Humidity

Maximum	100%
Minimum	36%
Design	75%

Annual Rainfall

Maximum	2540 mm
Average	1600 mm
Minimum	1175 mm

Prevailing Wind Direction

Nov to Jan – From NW & NE

Feb to Mar – From East & SE

Apr to May – From South & SE

June – From SW

July to Aug – From NW

Sept to Oct – From SE & SW

Wind Speed 11.8 kmph (avg)

50 kmph (max)

Seismic Zone III as per IS:1893-2002

1.5 Access to Site

Site is well connected to all weather road from Pattamandri on the Thiruvottiyur – Ponneri district highway. Site is located adjacent to the Chennai – Howrah broad gauge line and thus well connected by rail also.

1.6 Plant Rating, Capacity, Availability, PLF

Each of the two units shall have a Turbine maximum continuous rating (TMCR) of 660 MW at generator terminals based on the following site conditions.

- Ambient air temperature
- Condenser cooling water inlet temperature of 33°C and 9°C temperature rise across the condenser.
- Generator power factor of 0.85.
- Fuel specification as given elsewhere.
- Design temperature for electrical equipment is 50°C.

The VWO capacity of the steam turbine shall not be less than 105% of TMCR flow at rated parameters. Boiler maximum Continuous Rating (BMCR) will be established to match the steam flow at VWO conditions, but BMCR flow shall not less than 108% of TMCR flow.

The capacity of the unit is selected so as to deliver the rated output even after ageing that will occur between overhauls, as a result of deposition of salts in turbine blades, wear and tear etc.

The plant load factor (PLF) being considered is 85%.

1.7 Power Evacuation

Power will be evacuated from the proposed thermal power station at 400 KV voltage level through 400 KV transmission lines . The power evacuation lines would be double circuit 400 KV lines which will act as Line in & Line out circuit.

1.8 Site Selection

The following factors which influence the project site selection have been found very favourable to establish and operate the project.

a. Availability of fuel.
b. Existing power plant
c. Availability of adequate cooling water.
d. Availability of adequate land for locating the power plant with approach roads.
e. Suitability of land from topographical and geological aspects
f. Proximity of National Highways, Ports & Transport of fuel & heavy equipment.
g. Facility for interconnection with transmission and distribution system for evacuation of power.
h. Environmental aspects.

Total land required for the project is 500 acres which is under the possession of TANGEDCO.

1.9 Fuel

1.9.1 Source of Fuel

Domestic coal requirement for the power plant will be sourced from Kalinga block of Talcher coal fields, Mahanadi and IB valley coal fields in the state of Orissa. Coal will be transported by sea. The port of dispatch and port of receipt for domestic coal would be Paradip port and Ennore port respectively. Imported coal shall be sourced from foreign countries through sea to Ennore port.

Coal can be transported from coal mines to Ennore port by sea and unloaded at proposed coal berth-III. Further the coal can be transported to the proposed power plant through pipe conveyor which shall have a system capacity of 2 x 2000TPH.

The steam generator shall be designed for the following conditions :

- **Best Coal** – 100% Imported Coal
- **Design Coal** – 70% Imported & 30% Domestic Coal
- **Worst Coal** – 50% Imported & 50% Domestic Coal

The analysis of fuel is given below :

1.9.2 Coal Analysis:

Coal Quality Parameters

SL.NO	DESCRIPTION	DOMESTIC COAL	IMPORTED COAL
1.	HIGHER HEATING	2800 (GCV as	6250 (GCV Air

	VALUE -As Fired basis given Kcal/kg	received basis)	dried basis) 5642 (as received basis)
2.	TOTAL MOISTURE %	During rainy season 20% (inherent + surface)	16.5%
3.	HGI Abrasiveness expected YGP Shale and sand stone content Feed coal size	45 to 55 Average 52 50 to 70 mg/kg 20% max. upto 50 mm.	51

DOMESTIC COAL

Sr. No.	Particulars	Units	Parameters
A.	**Proximate Analysis**		
1.	Moisture	%	16.00
2.	Volatile Matter	%	19.00
3.	Ash	%	45.00
4.	Fixed carbon	%	20.00
	Total	%	100
B.	**ULTIMATE ANALYSIS, % (As received)**		
1.	Carbon	%	27.70
2.	Hydrogen	%	2.60
3.	Nitrogen	%	0.52
4.	Oxygen	%	7.26
5.	Sulphur	%	0.50
6.	Ash	%	45.00
7.	Moisture	%	16.00
8.	Carbonates	%	0.38
9.	Phosphorous	%	0.04
10.	Others	%	-
	Total	%	100.00
C.	**Ash fusion temperature**	deg C	
1.	Initial deformation, IT	deg C	1100
2.	Spherical, ST	deg C	1200
3.	Hemispherical, HT	deg C	1300
4.	Fluid, FT	deg C	-
D.	**Ash Analysis, %**		
1.	Sio2	**%**	59.54
2.	Al 2 O3	**%**	29.00
3.	Fe2O3	**%**	6.42
4.	CaO	**%**	1.50
5.	Na2O	**%**	0.08

Sr. No.	Particulars	Units	Parameters
6.	K2O	**%**	-
7.	TiO2	**%**	1.60
8.	SO3	**%**	0.25
9.	P2O5	**%**	0.51
10.	MgO	**%**	0.50
11.	Others	**%**	0.60
12.	Total		100.00
E	**Resistivity of fly ash**	Ohm - cm	1.73x 10^12

IMPORTED COAL

Sr. No.	Particulars	Units	Parameters
A.	**Proximate Analysis (As received)**		
1.	Moisture	%	16.50
2.	Volatile Matter	%	36.45
3.	Ash	%	6.62
4.	Fixed carbon	%	40.43
5	Total	%	100.00
B.	**ULTIMATE ANALYSIS, % (As received)**		
1.	Carbon	%	60.12
2.	Hydrogen	%	4.38
3.	Nitrogen	%	1.48
4.	Oxygen	%	10.37
5.	Sulphur	%	0.53
6.	Ash	%	6.62
7.	Moisture	%	16.5
8.	Carbonates	%	-
9.	Phosphorous	%	-
10.	Others	%	-
	Total	%	100.00
C.	**Ash fusion temperature**	deg C	
1.	Initial deformation, IT	deg C	1230
2.	Spherical, ST	deg C	1270
3.	Hemispherical, HT	deg C	1320
4.	Fluid, FT	deg C	-
D.	**Ash Analysis, %**		
1.	Sio2	**%**	36.00
2.	Al 2 O3	**%**	13.90
3.	Fe2O3	**%**	14.80
4.	CaO	**%**	12.70
5.	Na2O	**%**	0.70
6.	K2O	**%**	1.70
7.	TiO2	**%**	0.80

Sr. No.	Particulars	Units	Parameters
8.	SO3	%	10.60
9.	P2O5	%	0.20
10.	MgO	%	8.60
11.	Others	%	-
12.	Total	%	100.00

The plant should be suitable to accept imported coal sourced from any country. The limiting parameters of imported coal are furnished below :

S. No.	Particulars	Unit	Parameter
1	Total Moisture (ARB)	%	Up to 23 (Max)
2	Ash (ADB)	%	Up to 20 (Max)
3	Gross Calorific Value (ADB)	Kcal / Kg	5800 - 6500
4	Sulphur (ADB)	%	Up to 1 (Max)
5	Fixed Carbon (ADB)	%	30-50
6	Volatile Matter (ADB)	%	25-45
7	HGI		45-60
8	IDT (Under Reducing Atmosphere)	Deg C	1100-1250
9	Size	mm	< 50

Note: ADB stands for “As dried Basis” and ARB for “As Received Basis”

1.9.3 Specification of LDO

Specific gravity @ 15° C	0.8348
Gross calorific value, Kcal/kg	10400
Pour point “°C” max.	12
Flash point “°C” min.	66
Sulphur % “T” max.	0.5
K. Viscosity in Centistokes @ 50° C max.	7.5
Ash by wt. %	0.01
Water & sediment Vol. Max. %	0.25

1.9.4 Specification of HFO

Flash point “°C” min.	66
K. Viscosity in Centistokes @ 50° C max.	370

Ash by wt. %	0.1
Water content by volume % max	1
Sediment by weight % max	0.25
Total Sulphur by weight % max	4.5
Gross calorific value, Kcal/kg	10800

1.9.5 Fuel Linkage

TANGEDCO has approached Ministry of Coal through Ministry of Power for the long term linkage of Coal from the coal sources of Talcher or Mahanadi in Orissa.

The coal requirement has been worked as under:-

Coal required at MCR per hr. (Blended) 872 tonnes

Per day	20928 tonnes.
Annual	6.5 MTPA for 85% PLF

1.9.6 Fuel Transportation

The coal shall be received at Ennore port. The coal will be transported by pipe conveyor from coal berth 3 in Ennore Port and then through 2 x 2000 TPH pipe conveyor to the bunker directly or to stockyard.

1.10 Source Of Water

1.10.1 Source

The raw water intake shall be from the existing cooling water forebay of NCTPS PHASE-II.

1.10.2 Chemical analysis of Sea Water:

As given in Annexure-1, Volume III, Chapter- 3.

1.10.3 Requirement

The requirement of water for the plant will be for meeting the requirement of make up for the re-circulating cooling water system, dust suppression system in coal handling plants, ash disposal system and the RO/ D.M. water plant which will be supplying the power cycle make up requirements, etc. In addition the water requirements will be for drinking and service purposes. Water requirement is estimated as approx. 15523 m^3/hr.

1.11 Source of Equipment

The proposed plant will be supplied, erected and commissioned on Single EPC basis.

1.12 Power Evacuation Plan

Power will be evacuated from the proposed thermal power station at 400 KV voltage level through 400 KV transmission lines . The power evacuation lines would be double circuit 400 KV lines.

1.13 400 KV GIS Switchyard

The 400 KV Switchyard is proposed to have one and a half bus arrangement and will comprise following bays/circuits :

- 2 – Generator transformer bays
- 1– Start up transformer bay
- 4 – Line Bays
- 2 – Bus VT's
- 2 – Bus Reactor Bays
- 2 – Spare bay (Equipped)
- 1 – Equipped bay for future GT
- 2 – Equipped bays for future lines

The switchyard will be complete with galvanized steel structures, lightning surge arrestors, OPGW Equipment, CTs, PTs of suitable VA burden and accuracy class as required for measurement protection and communication, insulators, bus-bars clamps & hard wares etc. The switchyard will be controlled by computerized control and data acquisition (SCADA) system.

1.14 Average Yearly Generation

The average yearly generation is calculated considering the following.

- The expected plant load factor is 85 %. With this PLF the average yearly generation will be around 11914 Million units.

1.15 INFORMATION FOR ENVIRONMENTAL APPRAISAL

1.0 GENERAL INFORMATION ABOUT THE PROJECT

1.1	Name / Title of the Project	:	2 x 660 MW Ennore SEZ Coal Based Supercritical Thermal Power Project at Ash Dyke of NCTPS
1.2	Name of Owner	:	Tamilnadu Generation and Distribution Corporation (TANGEDCO)

1.3	Location of the Project	:	Near Vayalur Village, Ennore, Tamil Nadu
1.4	Site where proposed plant is to be located	:	Ash dyke of NCTPS
1.5	Capacity of the project under consideration	:	2x 660MW
1.5.1	Govt. land / Private land / others	:	TANGEDCO land
1.5.2	Topographical feature, demographic profile & physiography	:	Site has differential levels and require filling to maintain the desried grade level of +10.00 meter above MSL
1.5.3	Nature of soil	:	Clayey soil
1.5.4	Distance from the nearest town / city / major human settlements	:	Chennai -35 km
1.5.5	Population to be displaced	:	Nil
1.5.6	Distance from water source	:	Approx. 5 km (from Cooling Water Forebay of NCTPS Stage II)
1.5.7	Area of forest land, if involved	:	Nil
1.5.8	Distance of forest from the site	:	N.A
1.6	Is this an extension? If so indicate capacity of existing plant	:	No
1.7	What is the ultimate capacity envisaged	:	2x660 MW
2.0	**GENERAL ENVIRONMENTAL INFORMATION**		
2.1	Area of the land proposed to be acquired	:	Refer Plot Plan Land already acquired
	i. Area required for plant	:	500 Acres
	ii. Ash disposal	:	100 % dry fly ash disposal and

			100% wet bottom ash disposal is envisaged to existing ash pond.
	iii. Plant facilities	:	The area is adequate for locating all the required systems for 2x660 MW.
2.2	Area proposed to be built-up or developed	:	Power station will be built-up in the proposed site as indicated in the plot plan.
2.3	Specify site characteristics River basin/ estuarine / coastal / others	:	Site is close to Buckingham Canal
2.4	Is the site situated in the forest area? Give following details	:	No
2.4.1	Area	:	N.A
2.4.2	Type of forests	:	N.A
2.5	Is site situated near to the forests? Give the distance from the site.	:	N.A.
2.6	Give a description of the flora within 25 km of your plant site under the following heads	:	
	a. Crops	:	Refer details in the specification elsewhere.
	b. Forest	:	
	c. Grass land	:	
	d. Endangered species	:	
	e. Others (Specify)	:	
2.6.2	Give details of the following features, if they exist, within a radius of 25 km of the proposed site?	:	
	i. Fisheries	:	
	ii. Sanctuary / natural park biosphere reserve	:	
	iii. Lakes / ponds / reservoir	:	
	iv. Stream / river	:	Buckingham canal is close to the site
	v. Estuary / sea	:	Bay of Bengal is 5 km from site

	vi.	Hills / mountains	:
	vii.	Historic / cultural / tourist / archaeological scenic sites / defence installations	:
2.7		Human settlement	:
2.7.1		Total number of persons proposed to be employed	:
	i.	During construction	: 2500
			450(0.75person/MW) TANGEDCO
	ii.	During operation	: direct employees

PROJECT

2X660 MW ENNORE SEZ COAL BASED STPS

SECTION-C
SPECIFICT TECHNICAL REQUIREMENT

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

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 & DM water storage tank)** as per details in different sections/volumes of this specification for **2X660 MW ENNORE SEZ STPP.**

1.1 SCOPE OF SUPPLY

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

1.1.1 **Two (2) no**. condensate storage tanks (Cap.750 cum) and 2 Nos DM water storage tanks (Cap 1000 cum) complete with all accessories as indicated in **Datasheet –A and sketch of CS**T **& DM water storage tank** given at last of this section.

1.1.2 SS valves, nozzles, piping, fittings, flanges, counter flanges, angles, channels, elbows, level gauge, vent, root valves for instruments (if any), breather pots, dip hatch, Nuts & bolts ,washers wherever required, gaskets, anchor chairs, 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, gratings, earthling pads as per tanks standard specification and applicable design code.

1.1.4 Minimum no of anchor bolts for condensate storage tank shall be twenty (20) Nos.

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

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

1.1.7 **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 Two (2) no. Condensate storage tank and Two (2) nos DM water storage tanks.

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

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

3.0 MANDATORY SPARES

3.1 One (1) No. level gauge for condensate storage tank and one (1) No. level gauge for service water tanks.

4.0 TERMINAL POINTS

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

4.1 Counter flanges of all the nozzles and valves (wherever applicable).

4.2 Drain pipe of seal pot and NaOH breather pots.

5.0 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.

6.0 SERVICES TO BE PROVIDED BY THE CUSTOMER / BHEL

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

7.0 PAINTING / CORROSION PROTECTION REQUIREMENT

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

8.0 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.

9.0 CODES & STANDARD

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

10.0 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 hard copies of each drawing/document during detail engineering along with editable soft copy of the same as per **Annexure-V** given under section -D. 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) **DRG NO. PE-DC-412-167-S001 REV 00**– CONDENSATE STORAGE TANK
b) **DRG NO. PE-DC-412-167-S002 REV 00-** DM WATER STORAGE TANK

16.0 OTHER POINTS TO BE TAKEN CARE BY BIDDER

a. In case 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. Successful Bidder has to arrange sufficient resources like rolling machine, manpower, T&Ps as per contractual requirement.

c. 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.

PROJECT

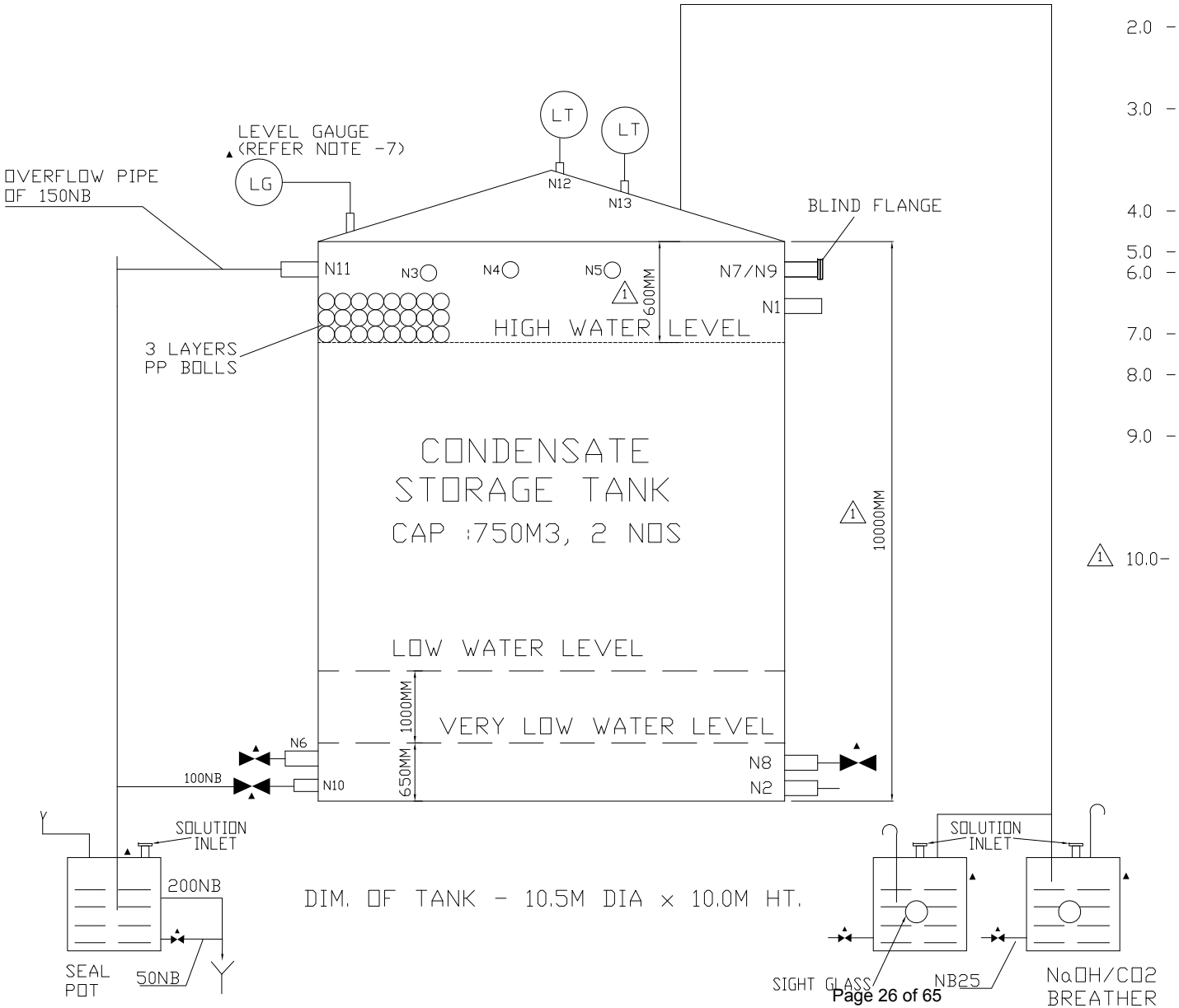
2X660 MW ENNORE SEZ COAL BASED STPS

DATA SHEET MISC TANKS

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

BHEL PEM	DATA SHEET-A FOR CONDENSATE STORAGE TANK	DOC NO: PE-DS-412-167-A001
	PROJECT TITLE: 2X660 MW- ENNOR	SHEET NO: 01 OF 02
		REV NO: 01
1	SERVICE IDENTIFICATION	CONDENSATE STORAGE TANK
2	SYSTEM	CONDENSATE TRANSFER SYSTEM
3	APPLICABLE CODES/ STATUTORY REGULATIONS	IS-803/API650
4	CAPACITY (m3)	750
5	NUMBER REQUIRED	TWO (02) NOS. FOR STATION (ONE NO. PER UNIT)
6	STORAGE MEDIUM	DM WATER
7	TYPE	VERTICAL, CYLINDRICAL
8	SIZE	10.5 M DIA x 10.0M HEIGHT
9	CORROSION ALLOWANCE	2.0MM
10	PRESSURE CLASS	DESIGN FOR FILLED WATER HEAD / ATOMSPHERIC
11	MATERIAL OF CONSTRUCTION	MILD STEEL TO IS:2062, GrB
12	DESIGN TEMPERATURE	60°C
13	LOCATION OF INSTALLATION	OUTDOOR
14	DRAIN VALVE FOR TANK	100 NB
15	DRAIN VALVE FOR NaOH/CO2 BREATHER	25 NB
16	DRAIN VALVE FOR SEAL POT	100 NB
17	PIPE MATERIAL FOR HAND RAILING	CARBON STEEL, GALVANIZED, MEDIUM GRADE
18	NOZZLE CONNECTIONS REQD /	AS PER ENCLOSED SKETCH / SOCKET WELDED FOR
	END CONNECTION	SIZE <= NB50 & FLANGED FOR SIZE > NB50
19	PIPE / NOZZLE MATERIAL	STAINLESS STEEL TO SA312 TP 304
20	VALVES MATERIAL	STAINLESS STEEL
21	VALVES END CONNECTION	SOCKET WELDED FOR SIZE <= NB50
		BUTT WELDED FOR SIZE > NB50
22	INSTRUMENTS / ACCESSORIES REQUIRED	(a) 3 LAYERS OF FLOATING PP BALLS IN ADDITION TO CO2 BREATHER. (b) CONSERVATION VENT VALVE /NAOH BREATHER(TO BE PLACED ON GROUND). (c) OVERFLOW OF 150 NB & DRAIN PIPING OF 100 NB WITH DRAIN VALVE (d) SEAL POT WITH DRAIN VALVE ETC FOR OVERFLOW (e) LEVEL GAUGE FLOAT & ARROW TYPE TO COVER ENTIRE RANG (f) 2 NOS OF NOZZLE CONNECTION OF 80NB LEVEL TRANSMITTERS. (g) SPARE CONNECTION OF 150 NB 2 NOS., 200NB 1NO., 250NB 1 NO. SPARE VALVES SHALL BE PROVIDED FOR OUTLET SPARE CONNECTIONS AND BLIND FLANGE SHALL BE PROVIDED FOR INLET SPARE CONNECTIONS. (h) SAMPLING CONNECTION WITH 25 NB VALVE ON TANK. (i) 3 NOS. INSTRUMENT CONNECTIONS ON TANK ROOF FOR LI.
23	INSIDE PROTECTION & EXTERNAL PAINTING	REFER ANNEXURE-I REGARDING PAINTING
24	MANHOLE	TWO(2) NOS. SIZE OF 600 MM, ONE ON SHELL & OTHER ON ROOF

SKETCH FOR CST



NOTES:

1.0 - HIGH WATER LEVEL SHALL BE MIN.100MM BELOW BOTTOM OF OVERFLOW NOZZLE.

2.0 - ALL NOZZLES (ALONG WITH FLANGES & COUNTER FLANGES), OVERFLOW PIPE, NOZZLE FOR MOUNTING LEVEL INDICATOR, 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. 80NB NOZZLE ON TOP OF THE TANK SHALL BE PROVIDED BY TANK VENDOR FOR MOUNTING OF LTs.

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

5.0 - LOCATION OF THE TANK IS OUTDOOR.

6.0 - THE NET CAPACITY OF TANK I.E 750 CUM IS CAPACITY BETWEEN LOW AND HIGH LEVEL SHOWN IN THIS SKETCH.

7.0 - FLOAT & ARROW TYPE LEVEL INDICATOR SHALL BE PROVIDED.

8.0 - INLET SPARE CONNECTIONS SHALL BE PROVIDED WITH BLIND FLANGE. SPARE VALVES SHALL BE PROVIDED AT SPARE OUTLET CONNECTIONS.

9.0 - A CIRCUMFERENTIAL DRAIN SHALL BE PROVIDED AROUND THE CST FOR TERMINATING THE TANK, SEAL POT & NAOH BREATHER DRAINS. THE CIRCUMFERENTIAL DRAIN SHALL THEN BE CONNECTED TO NEARBY PLANT DRAIN BY CIVIL AGENCY.

1 10.0- SIZE OF TWO(2) NOS MANHOLES, ONE ON SHELL & OTHER ON ROOF ARE 600MM DIA.

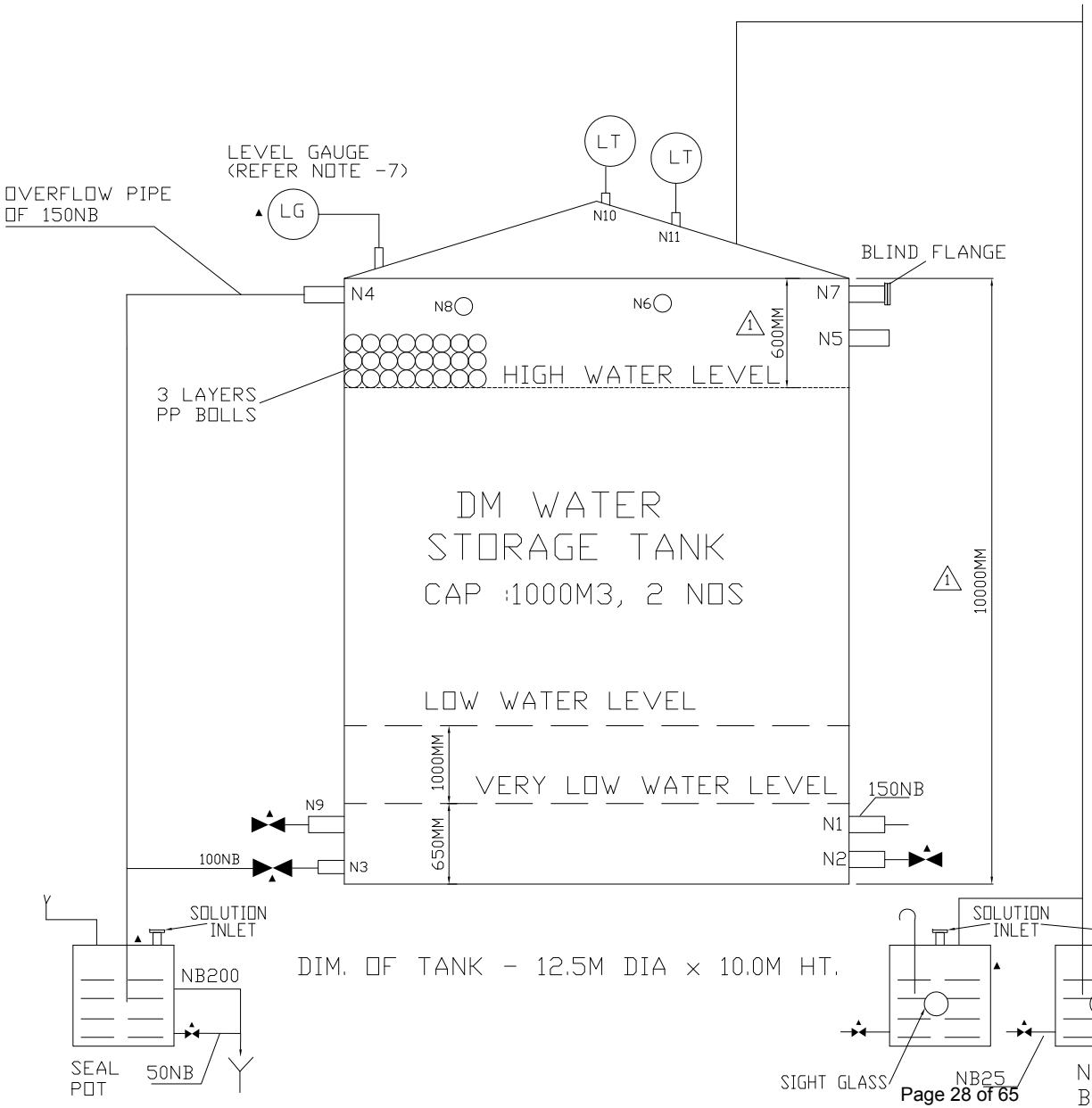
NOZZLE NO.	DESCRIPTION	SIZE (NB)
N1	DM WATER INLET	100
N2	COND OUTLET	250
N3	RE-CIRCULATION	50
N4	RE-CIRCULATION	80
N5	EXCESS DUMP	200
N6	SPARE	200
N7	SPARE	150
N8	SPARE	250
N9	SPARE	150
N10	DRAIN	100
N11	OVERFLOW	150
N12	LT CONNECTION	80
N13	LT CONNECTION	80

BHEL PEM	DATA SHEET-A FOR DM STORAGE TANK	DOC NO: PE-DS-412-167-A001
	PROJECT TITLE: 2X660 MW- ENNOR	SHEET NO: 01 OF 02
		REV NO: 01
1	SERVICE IDENTIFICATION	DM WATER STORAGE TANK
2	SYSTEM	DM WATER MAKE UP SYSTEM
3	APPLICABLE CODES/ STATUTORY REGULATIONS	IS-803/API650
4	CAPACITY (m3)	1000
5	NUMBER REQUIRED	TWO (02) NOS. FOR STATION (ONE NO. PER UNIT)
6	STORAGE MEDIUM	DM WATER
7	TYPE	VERTICAL, CYLINDRICAL
8	SIZE	12.5 M DIA x 10.0M HEIGHT
9	CORROSION ALLOWANCE	2.0MM
10	PRESSURE CLASS	DESIGN FOR FILLED WATER HEAD / ATOMSPHERIC
11	MATERIAL OF CONSTRUCTION	MILD STEEL TO IS:2062 Gr B.
12	DESIGN TEMPERATURE	60°C
13	LOCATION OF INSTALLATION	OUTDOOR
14	DRAIN VALVE FOR TANK	100 NB
15	DRAIN VALVE FOR NaOH/CO2 BREATHER	25 NB
16	DRAIN VALVE FOR SEAL POT	100 NB
17	PIPE MATERIAL FOR HAND RAILING	CARBON STEEL, GALVANIZED, MEDIUM GRADE
18	NOZZLE CONNECTIONS REQD /	AS PER ENCLOSED SKETCH / SOCKET WELDED FOR
	END CONNECTION	SIZE <= NB50 & FLANGED FOR SIZE > NB50
19	PIPE / NOZZLE MATERIAL	STAINLESS STEEL TO SA312 TP 304
20	VALVES MATERIAL	STAINLESS STEEL
21	VALVES END CONNECTION	SOCKET WELDED FOR SIZE <= NB50
		BUTT WELDED FOR SIZE > NB50
22	INSTRUMENTS / ACCESSORIES REQUIRED	(a) 3 LAYERS OF FLOATING PP BALLS IN ADDITION TO CO2 BREATHER. (b) CONSERVATION VENT VALVE /NAOH BREATHER(TO BE PLACED ON GROUND). (c) OVERFLOW OF 150 NB & DRAIN PIPING OF 100 NB WITH DRAIN VALVE. (d) SEAL POT WITH DRAIN VALVE ETC FOR OVERFLOW. (e) LEVEL GAUGE FLOAT & ARROW TYPE TO COVER ENTIRE RANG. (f) 2 NOS OF NOZZLE CONNECTION OF 80NB LEVEL TRANSMITTERS. (g) SPARE CONNECTION OF 200 NB 1 NO., 150 NB 2 NOS AND 100 NB 1 NO. SPARE VALVES SHALL BE PROVIDED FOR OUTLET SPARE CONNECTIONS AND BLIND FLANGE SHALL BE PROVIDED FOR INLET SPARE CONNECTIONS. (h) SAMPLING CONNECTION WITH 25 NB VALVE ON TANK. (i) 3 NOS. INSTRUMENT CONNECTIONS ON TANK ROOF FOR LI.
23	INSIDE PROTECTION & EXTERNAL PAINTING	REFER ANNEXURE-I REGARDING PAINTING
24	MANHOLE	TWO(2) NOS. SIZE OF 600 MM, ONE ON SHELL & OTHER ON ROOF

2X660MW ENNORE SEZ STPS

DOC. NO.: PE-DC-412-167-S002
SHEET NO.: 02 OF 02

SKETCH FOR DMT



NOTES:

1.0 - HIGH WATER LEVEL SHALL BE MIN.100MM BELOW BOTTOM OF OVERFLOW NOZZLE.

2.0 - ALL NOZZLES (ALONG WITH FLANGES & COUNTER FLANGES), OVERFLOW PIPE, NOZZLE FOR MOUNTING LEVEL INDICATOR, 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. 80NB NOZZLE ON TOP OF THE TANK SHALL BE PROVIDED BY TANK VENDOR FOR MOUNTING OF LTs.

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

5.0 - LOCATION OF THE TANK IS OUTDOOR.

6.0 - THE NET CAPACITY OF TANK I.E 1000 CUM IS CAPACITY BETWEEN LOW AND HIGH LEVEL SHOWN IN THIS SKETCH.

7.0 - FLOAT & ARROW TYPE LEVEL INDICATOR SHALL BE PROVIDED.

8.0 - INLET SPARE CONNECTIONS SHALL BE PROVIDED WITH BLIND FLANGE. SPARE VALVES SHALL BE PROVIDED AT SPARE OUTLET CONNECTIONS.

9.0 - A CIRCUMFERENTIAL DRAIN SHALL BE PROVIDED AROUND THE DM WATER TANK FOR TERMINATING THE TANK, SEAL POT & NAOH BREATHER DRAINS. THE CIRCUMFERENTIAL DRAIN SHALL THEN BE CONNECTED TO NEARBY PLANT DRAIN BY CIVIL AGENCY.

1 10.0- SIZE OF TWO(2) NOS MANHOLES, ONE ON SHELL & OTHER ON ROOF ARE 600MM DIA.

NOZZLE NO.	DESCRIPTION	SIZE (NB)
N1	DM WATER OUTLET	150
N2	SPARE	200
N3	DRAIN	100
N4	OVERFLOW	150
N5	DM WATER INLET	100
N6	RECIRCULATION	50
N7	SPARE	150
N8	SPARE	100
N9	SPARE	150
N10	LT CONNECTION	80
N11	LT CONNECTION	80

ANNEXURE-I

Painting specification for Condensate Storage Tank & Service water storage Tank

	Tank inside surface	**Tank outside surface**	**Tank underneath surface**	**Structural steel work, piping, steel floors, & stairways**
Surface preparation	Blast clean to SA 2.5	Wire Brushing/ hand tool cleaning to ST-2.	Wire Brushing/ hand tool cleaning to ST-2.	Wire Brushing/ hand tool cleaning to ST-2.
Primer	Two (2) coats of epoxy based zinc rich primer of 50-60 microns each.	Two (2) coats of synthetic red lead of 25 - 35 microns each.	2 coats of high build coal tar epoxy suitably pigmented (2 pack), DFT:80-100 microns each coat.	Two (2) coats of epoxy based zinc rich primer of 35 microns.
Intermediate coat	N. A.	N. A.	N. A.	N. A.
Finish	Two (2) coats of solvent free epoxy paint, DFT-150 microns per coat	Two (2) coats of synthetic enamel paint of 40 microns each.	N. A.	Two (2) coat of Acrylic polyurethane of 50 microns per coat.
Total DFT	400 - 420 microns	130 - 150 microns	160 – 200 microns	170 microns

Note: - Handrail shall be hot dip galvanizing as per IS 4736.

PROJECT

2X660 MW ENNORE SEZ COAL BASED STPP

CUSTOMER SPECIFICATION
FOR
MISC. TANKS- SITE FABRICATED

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

S. No.	Description	Units	Parameter
29.0	**Mixed Bed Units at outlet of RO Stage II/ SBA Exchanger**		
29.1	Number of streams		Three (3) (2W + 1S)
29.2	Service		Down flow
29.3	Design flow per stream (net)	m^3 / hr	Each MB sized to produce make up of one unit (min 40).
29.4	Vessel Size	M	By Bidder
29.5	Vessel MOC		MSRL
29.6	Cycle time	Hrs.	140
29.7	Regeneration time	Hrs.	4
29.8	Regeneration Level	gm/L	By Bidder
29.9	Resin		ROHM & HASS/ BAYER/ PUROLITE
29.10	Instruments required at MB Outlet		- pH Analyser - Conductivity Analyser -- Silica Analyser - Chloride Analyser - TOC Analyser
30.0	**DM Water Storage Tanks**		
30.1	Number	Nos.	Two (2)
30.2	Capacity of each tank	m^3	1000
30.3	Material of Construction	-	M.S. with solvent free epoxy coated DFT 500 microns (inside) and chlorionated rubber painting DFT 500 microns (outside)
30.4	Protection against atmospheric air	-	3 Layers of floating PP balls to be provided in DM Tank to prevent contact with atmospheric air. This shall be in addition to Co_2 breather
31.0	**CONDENSATE Storage Tanks**		
31.1	Number	Nos.	Two (2)
31.2	Capacity of each tank	m^3	750
31.3	Material of Construction	-	M.S. with solvent free epoxy painting DFT 500 microns (inside) and chlorinated rubber painting DFT 500 microns (outside)
31.4	Protection against atmospheric air	-	3 Layers of floating PP balls to be provided in DM Tank to prevent contact with atmospheric air. This shall be in addition to Co_2 breather

PROJECT

2X660 MW ENNORE SEZ COAL BASED STPS

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.NO	BHEL DOCUMENT NO.	DRAWING TITLE	Submission schedule from LOI Date	Resubmission after incorporating comments	CATEGORY
1	PE-V0-412-167-A101	Design Calculation of tanks: CST & SWT	4 week	With in 1 week	I
2	PE-V0-412-167-A201	General arrangement drawing of CS Tanks including nozzle orientation and civil input details	6 week	With in 1 week	A
3	PE-V0-412-167-A202	General arrangement drawing of DM tanks including nozzle orientation and civil input details	6 week	With in 1 week	A
4	PE-V0-412-167-A203	Fab. drawing-CST & DMT :Tanks roof structural details, staircase details, nozzle connections details, Seal pot & NaOH breather details for CST.	8 week	With in 1 week	I
5	PE-V0-412-167-A301	CST &DMT :Datasheet & GA for Pipe fittings , plates & structure , Level indicator & valves	10 week	With in 1 week	A
6	PE-V0-412-167-A401	QAP for Plates, structures, Pipes & fittings (Both CS & SS), Level indicator & valves (Both CS & SS)	10 week	With in 1 week	I
7		Total engineering completed in time		5 month	

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

SUB-VENDORS ITEMS

All sub-vendor items shall be procured as per BHEL internal approved sub-vendor list. Below is the list of sub-vendors.

LIST OF PROPOSED SUB-VENDORS FOR Misc. tanks- Site fabricated			
S.N	**CAT. OF INSPECTION**	**ITEM**	**PROPOSED SUB-VENDORS**
1	II	Cast Iron Gate/Globe valves	A.V valves, Fluid line valves, Leader valves, Surya valves & instruments
2	II	Cast or forged carbon steel Gate /Globe valves	A.V valves, Fluid line valves, Babcock valves, Leader valves, Valtech industries, V.K valves, weir BDK
3	II	Stainless Steel Valve	FOURESS , KBL , Weir BDK , LEADER, A.V valves.
4	III*	CS PIPES ERW	TISCO, SAIL, JINDAL (Gurgaon), Welspun, MSL, Ratnami
5	III*	CS Pipes -Seamless	Maharastra Seamless /ISMT
6	III	Level Indicator (Float & tape type)	SBEM/Levcon/Sigma
7	III	Structural steel	TISCO/JINDAL/ESSAR STEEL/SAIL
8	III	Paint	Asian Paint / Berger / goodlass Nerolac
9	III*	M.S Plate	SAIL / JINDAL STEEL & POWER LTD / ESSAR / TISCO
10	III*	SS Pipes	RATNAMI /APEX/ Prakash Steelage(upto 50NB)
11	III	CS & SS FITTINGS	Pipe fit, Gujrat infra pipes,MS fittings, Tube products, Sidharth & Gautam, NL hazra or Vendor's approved sources.
	NOTES		
		Inspection Categorization	
	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 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 procured from dealer stocking material from approved makes without correlated test certificate, then inspection category will be II and BHEL witness shall be applicable.**

Annexure-V

DRAWING AND DOCUMENTS FOR SUBMISSION

S.N.	Drawings and documents	Soft and Hard Prints
1.0	DRAWING FOR APPROVAL	
1.1	For approval	Soft+2 Hard Print
1.2	For customer approval	Soft+2 Hard Print
1.3	For final distribution	Soft+2 CD +5 Hard Print
2.0	DRAWING FOR REFERENCE	
2.1	For reference	Soft+2 Hard Print
2.2	For final distribution	Soft+2 CD+5 Hard Print
3.0	CERTIFICATE, REPORTS ETC.	Soft+2 Hard Print
4.0	AS BUILT DRAWINGS (IF REQUIRED)	Soft+2 CD+8 Hard Print
5.0	O&M MANUAL	
5.1	Draft for approval	Soft +3 CD+ 5 Hard Print
5.2	For final distribution	Soft +3 CD + 8 Hard Print
6.0	QUALITY PLAN / Field quality plan / PG test	Soft + 2 Hard Print

PROJECT

2X660 MW ENNORE SEZ COAL BASED STPS

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 & tape type for CST and Float & board type for SW tanks
2	Float & Tape Material	SS 316
3	Guide Cable	SS-316
4	Float Cable	SS-316
5	Spring	SS-304
6	Cover	SS-316
7	Pulley material	Aluminum
8	Body & cover	Die cast aluminum
9	Enclosure	Epoxy coated Die cast aluminum IP55 for float & tape
10	Accuracy	± 2 mm for float & tape type and ± 2 % for float & board type
	Indication	On circular scale for float & tape type and Vertical scale & pointer (red pointer cradle runs vertically up & down registering tank contents on a 150mm wide scale) for float & board type .
	Mounting	Indicator mounted outside at side of tank at shoulder height from ground level for float & tape. Side mounted outside tank for float & board.
11	Range	To suit tank size
12	Quantity	one(1) number per tank

PLATES & STRUCTURAL STEEL

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

PIPES, FITTINGS, FLANGES & ACCESSORIES

	Specification	**Service / clarified water**	**DM water Service for**	**DM water Service for piping of 65NB &**

				piping up to 50NB	**above**
1.0	**Piping**				
1.0.1	Material	Carbon steel IS-1239 heavy grade up to 150NB and IS 3589 for sizes above 150NB with minimum pipe thickness of 6mm.		SS as per A312 Gr. 304, Sch-40S, B36.19.	SS as per A312 Gr. 304, Sch-10S, B36.19.
1.0.2	Construction	ERW/ Seamless		Seamless	Seamless
1.0.3	Joints	SW for sizes up to 50NB	Flanged or BW for sizes - 65NB & above	Socket welded as per B16.11	Flanged or Butt welded as per B16.5 & B16.25
2.0	**Fittings**	**For piping of 65NB & above**	**For piping up to 50NB**	**For piping up to 50NB**	**for piping of 65NB & above**
2.0.1	Material	A234 Gr. WPB **or as compatible with IS:1239 for sizes below 150NB / IS3589 for sizes 150NB & above**	A105 or as compatible with IS1239	A182 F304	A351 CF8 or A403 WP304
2.0.2	Construction	Welded/Seamless	Forged	Forged	Welded / Seamless
2.03	Standard	ANSI B16.9 for BW fabricated fittings, AWWA-C-208	ANSI B16.11 or IS1239, Part-II	ANSI B16.11	ANSI B16.5, ANSI B16.25
2.04	End details	Butt welded as per ANSI B16.25	Socket welded as per ANSI B16.11	Socket welded as per ANSI B16.11	Flanged as per ANSI B16.5 or Butt welded as per ANSI B16.25, flanged for valves & equipments
3.0	**Flanges**	Class 150 as per ANSI B16.5 complete with nuts, bolts & gaskets, material as per clause 2.0.1 above.			Class 150, Flat face as per ANSI B16.5 complete with nuts, bolts & gaskets, material as per clause 2.0.1 above.

VALVE

	Valve category	**SERVICE**	
1.	Cast iron valves	Service/clarified water	For sizes 65NB & above

2.	Carbon steel valves	Service/clarified water	For sizes 50NB & below
3.	Stainless steel valves	DM water	All sizes

1.0	Valve classification	Cast iron valve	SS valve	Carbon Steel valve
2.0	**Basic Design code**			
2.0.1	Gate	IS 14846	ANSI B16.34	i)API600 for 50NB & above/ANSI B16.34 ii)API602 for sizes below 50NB/ANSI B16.34
2.0.2	Globe	MSS-SP-85		BS-1873 / ANSI B16.34
3.0	**Pressure class**	To be suitably chosen for min. pressure of 10 kg/cm2 at 80 degC		
4.0	**Construction**	Cast body and bonnet / cover	Forged body up to 50NB and cast body above that	Forged body up to 50NB
5.0	**Material**			
5.0.1	Body and Bonnet / cover	IS210 gr. FG 260 or A216 Class B	A351 CF8M for Cast body, A182 F304 for forged body	A216 gr. WCB for cast body & A105 for forged body
5.0.2	Trim/disc	IS210 Gr. FG 260 or A216 Class B	A182 F304	13% Cr. Steel as per A182 Gr. F6 heat treated and hardened (min 250 HB) for cast body and A105 Hard faced with Stellite (min 350HB for above 800 class and 250HB for class 800) for forged body.
5.0.3	Seating surface	13% Cr. Steel as per IS 1570	13% Cr. Steel as pe A182 Gr.F6	13% Cr. Steel as per A182 Gr.F6
6.0	**End preparation**	SW for 50NB & below and flanged with counter flanges for 65NB & above		
7.0	**Testing**			
7.1	Gate	IS 14846	ANSI B16.34	API 598
7.2	Globe	Hydrostatic test as per API 598		BS-1873

PROJECT

2X660 MW ENNORE SEZ COAL BASED STPS

QAP FOR PIPES, FITTINGS, VALVES AND LEVEL INDICATOR

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

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					

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

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 Signature		CR-Critical Characteristics MA - Major Characteristics MI- Minor Characteristics		FOR BHEL				FOR CUSTOMER		APRD. BY			

PROJECT

2X660 MW ENNORE SEZ COAL BASED STPS

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

PROJECT:- 2X660MW ENNORE SEZ STPP

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

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 & DM WATER TANKS) **Rev 00**

2 X 660MW ENNORE STPS

SCHEDULE OF MAIN SUPPLY, MANDATORY SPARES AND E&C (SCH - 01)

Sl.No	DESCRIPTION OF EQUIPMENT / ITEM	Ex-works price	ED	CST	FREIGHT	E&C Charges	Service tax on E&C	Total Price (For site)
1	2	3	4	5	6	7	8	9 = 3 + 4 + 5 + 6 + 7+8
1.0.0	Lump sum firm price for **SUPPLY** comprising design, engineering, manufacturing, inspection / testing at vendor's works, duly packed, and delivery to site including freight in line with drawings/ documents/ test procedures to be approved by customer / consultant, inclusive of all prevailing taxes, duties and other levies, complete with all accessories required for the total scope defined as per specification no. PE-TS-412-167-A00**1** for **2 Nos. Condensate Storage tanks of size as 10.5M dia X 10.0 M Ht. and 2 Nos DM water storage tanks of size as 12.5M dia x 10.0M Ht.** (Refer Sch-02 for details)					NA		
2.0.0	Lump sum firm price for **Erection & commissioning** comprising unloading, storage, handling at site, erection and commissioning, minor civil works as required, hydro test at site, painting, handing over to the customer in line with drawings/ documents/ test procedures to be approved by customer / consultant inclusive of all prevailing taxes, duties and other levies, complete with all accessories required for the total scope defined as per specification No. PE-TS-412-167-A001 **for 2 Nos. Condensate Storage tanks of size as 10.5M dia X 10.0 M Ht. and 2 Nos DM water storage tanks of size as 12.5M dia x 10.0M Ht.**	NA						
3.0.0	Lump sum price for **Mandatory spares** for 2 Nos. Condensate Storage tanks of size as 10.5M dia X 10.0 M Ht. and 2 Nos DM water storage tanks of size as 12.5M dia x 10.0M Ht. as per **Schedule-03**					NA		
4.0.0	**Total Price (1.0.0+2.0.0)**	NA						
5.0.0	**Grand total Price (1.0.0+2.0.0+3.0.0)**	NA						

NOTES

a. Bidder to note that total price indicated above at 5.0.0 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.

b. Bidder to note that price indicated in column 9 for Erection & Commisioning (S.N. 2.0.0) shall be minimum 20 % of grand total price(S.N. 4.0.0) .

c. Break-up of Supply price (S.n 1.0.0) shall be furnished in **Schedule-02** and that of Mandatory spares in **Schedule-03.**

d. 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.

e. Bidder shall furnish the price of all the items as indicated in the price schedules - **SCH-1,2 & 3**. **Bidder's offer shall be liable to be rejected incase bidder does not furnish the same.**

Date:_____

Bidder's / bidder's representative signature **Company seal**

SUGGESTIVE PRICE SCHEDULE - MISC. TANKS (CST & DM WATER TANKS)							
2 X 660MW ENNORE STPS							
							Rev 00
BREAK UP OF MAIN SUPPLY PRICE (SCH - 02)							
Sl.No	DESCRIPTION OF EQUIPMENT / ITEM	Ex-works price	ED	CST	FREIGHT	Total price (For site)	Item price %age w.r.t supply price
1	2	3	4	5	6	7 = 3 + 4 + 5 + 6	8
5.0	**Break - up of Supply price given at S.N.1.0.0 & COL.9 of SCHEDULE - 1**						
5.1	Lump sum price of total CS plates for the tanks						60-65
5.2	Lump sum price of all structures including hand-railings, staircase, breather pots etc. for the tanks						6-10
5.3	Lump sum price of total number of valves required for the tanks						8-10
5.4	Lump sum price of total length of the piping for the tanks						10-15
5.5	Lump sum price of total no. of level gauges required for the tanks						1-2
5.6	Lump sum price for commissioning spares like CAF gasket, nuts, bolts, washers etc.						1-3
5.7	Lump sum price of paints, any other item etc.						3-5
5.8	**Total**						(89-110)
	Notes:						
a	Total at S.N 5.8 , col no. 7above should match with total supply price(given at S.N1.0.0, col.9 of SCH-01)						
b	Items price %age w.r.t total **FOR site supply price** is indicated under colum no.8 of each row from 5.1 to 5.7. Bidder to strictly fill the prices of each item under column no.7 as per indicated percentage only.						
	Date:_____						
	Bidder's / bidder's representative signature			**Company seal**			

SUGGESTIVE PRICE SCHEDULE - MISC. TANKS (CST & DM WATER TANKS)						Rev 00
2 X 660MW ENNORE STPS						
	SCHEDULE OF MANDATORY SPARES(SCH - 03)					
Sl.No	**DESCRIPTION OF EQUIPMENT / ITEM**	**Ex-works price**	**ED**	**CST**	**FREIGHT**	**Total Price (For site)**
1	**2**	**3**	**4**	**5**	**6**	**7 = 3 + 4 + 5 + 6**
6.0	**List of mandatory spares:**					
6.1	**Level indicators (Float and board type)**					
6.1.1	One No. LI for DM water storage tanks					
6.1.2	One No. LI for Condensate storage tanks					
6.3	**Total Price (6.1.1+6.1.2)**	NA				
	Notes:					
a	Total Price at S.N. 6.3, col 7 shall match with price at S.N.3.0.0, col 9 of SCH-01.					
	Date:_____					
	Bidder's / bidder's representative signature			**Company seal**		

ANNEXURE-A

2X660MW ENNORE SEZ STPP PKG- MISC. TANK-SITE FABRICATED (CST & DMT)

LIST OF COMMISSIONING SPARES

S.No.	Item	Quantity	Unit	Unit ex-works price	Total ex-works price	ED	CST	FREIGHT	Total
1	2	3	4	5	6	7	8	9	6 to 9
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.								