

NTPC LIMITED

1X500 MW VINDHAYACHAL STPS, STAGE-V, UNIT NO.- 13

VOLUME IIB & III

**TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM**

SPECIFICATION NO.: PE-TS-389-166-A001



BHARAT HEAVY ELECTRICALS LTD

**POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA**

INDEX

S. NO.	Description
1.0	➤ Volume-II B- Technical Specification
2.0	a) Section-A, Intent of Specification
3.0	b) Section- B, Project Information
4.0	c) Section –C,
	A. Specific Technical Requirement
	B. Annex-I- System Write Up
	C. Annex-II
	I. Equipment Design Criteria-PIPING, VALVES
	II. MATERIAL OF CONSTRUCTION(LDO STORAGE TANK)
	D. Annex-III
	Quality Plans- Mechanical Systems
	E. Annex-IV
	Tentative List of Sub vendors
	F. Annex-V
	Painting Specification
	G. Annex-VI
	Dwgs /Docs to be submitted with bid
	H. Annex –VII
	Drawings/Documents to be submitted after award of contract
	I. Annex –VIII
	GENERAL TECHNICAL REQUIREMENT
	J. TECHNICAL SPECIFICATION (ELECTRICAL PORTION)
	K. TECHNICAL SPECIFICATION (ELECTRICAL PORTION)
5.0	d) Section-D
	A. Technical Specification for Tanks
6.0	➤ Volume-III, Technical Schedules & Checklist to be submitted by bidder
7.0	➤ Drawings
	• Plot plan, Dwg No.- 2260-999-POC-F-001
	• PIPING LAYOUT OF FUEL OIL SYSTEM, DRAW. NO.- PE-VO-209-166-A509
	• Process & Instrumentation Diagram FOR LDO UNLOADING & STORAGE SYSTEM. Dwg No.- PE-DC-389-166-A101
	• SKETCH WITH LOCATION OF FUEL OIL FACILITY RELATED TO FOHS SYSTEM(STAGE-V). Dwg. No.- PE-SK-389-166-A101
8.0	➤ Unpriced price schedule

1X500MW VINDHAYACHAL STPS, UNIT NO.- 13 (STAGE-V)

**TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM**

VOLUME-IIB

SECTION – A

(INTENT OF SPECIFICATION)



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



TITLE

TECHNICAL SPECIFICATION FOR
**FUEL OIL UNLOADING & STORAGE
SYSTEM**

1X500 MW VINDHAYACHAL STPS, STAGE-V

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II B

SECTION A

REV 00

DATE

SHEET OF

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, painting, forwarding, proper packing and shipment and delivery at site, unloading, handling & transportation at site, Erection & Commissioning including commissioning spares(if applicable), minor civil works as required on FOR site basis, Performance and guarantee testing and handing over of **FUEL OIL UNLOADING & STORAGE SYSTEM** as per details in different sections / volumes of this specification for **1X500MW VINDHAYACHAL STPS STAGE-V, UNIT NO.- 13**.
- 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 of the responsibility of providing such facilities to complete the supply, erection and commissioning of FUEL OIL UNLOADING & STORAGE SYSTEM.
- 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 is 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.



TITLE

TECHNICAL SPECIFICATION FOR
**FUEL OIL UNLOADING & STORAGE
 SYSTEM**

1X500 MW VINDHAYACHAL STPS, STAGE-V

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II B

SECTION A

REV 00

DATE

SHEET OF

- 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 **NTPC LIMITED** including their consultant as interpreted by BHEL in the relevant context.

1X500MW VINDHAYACHAL STPS, UNIT NO.- 13 (STAGE-V)

**TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE SYSTEM**

VOLUME-IIB

SECTION – B

(PROJECT INFORMATION)



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





SUB-SECTION – II


PROJECT INFORMATION


**VINDHYAHCAL STPP-V (1X500MW)
STEAM GENERATOR WITH
ELECTROSTATIC PRECIPITATOR PACKAGE**

**TECHNICAL SPECIFICATION
SECTION-VI
BID DOC. NO.: CS-2260-101-2**

CLAUSE NO.	PROJECT INFORMATION			
	INTRODUCTION			
1.00.00	BACKGROUND			
	Vindhyachal STPP was conceived as a pit head coal based super thermal power plant of 2260 MW (6x210 MW + 2x500 MW) capacity for which land was acquired during stage-I of the project. The capacity of the project was increased to 3260 MW by adding two units of 500 MW under Stage-III. Additional two units of 500 MW under Stage- IV of the project are under implementation. Further, the capacity of the project was proposed to be increased to 4760 MW by adding one unit of 500 MW under Stage-V. Stage-I, II & III of the project comprising of six units of 210 MW + two units of 500 MW + two units of 500 MW are under commercial operation. Two units of 500 MW under stage IV and one unit of 500 MW under stage V of the project is under implementation. The capacity after implementation of Stage V of the project shall be 4760 MW.			
2.00.00	CAPACITY			
	Stage	Capacity	Status	
	I	6x210 MW	Under Commercial Operation	
	II	2x500 MW	Under Commercial Operation	
	III	2x500 MW	Under Commercial Operation	
	IV	2x500 MW	Presently under implementation	
	V	1x500 MW	Presently under implementation	
3.00.00	LOCATION AND APPROACH			
	The proposed power station is located in Singrauli district of Madhya Pradesh, having a latitude and longitude of 24° 06' N and 82° 40' E respectively. The site is situated on the North-Western bank of Rihand Reservoir and is confined within the boundaries of Singrauli STPP discharge channel towards South, Ballia nallah towards East, power corridor of SSTPP and Jayant Mine Township towards North. Renukoot, the nearest town, is about 50 kms. away from the project site. The approach road for Vindhyachal STPP has been drawn from the peripheral road of Singrauli STPP.			
	The nearest rail head Shakti Nagar Railway Station, is approximately 2.0 km away from the project site.			
	Airport			
	The nearest airport is Varanasi located at a distance of approximately 220 km from the project site.			
	The vicinity plan of the project site is placed at Annexure A-I.			
	Major road and road distance from the project site are as under:			
	Between Stations	By Road (kms)	By Rail (kms)	
	Vindhyachal-Lucknow	435	475	
	Vindhyachal-New Delhi	850	925	
	Vindhyachal- Sidhi	095	-	
	Vindhyachal-Bhopal	610	590	
VINDHYACHAL STPP-V(1X500MW) STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2260-101-2		PART-A SUB-SECTION-II PROJECT INFORMATION
PAGE 1 OF 12				

CLAUSE NO.	PROJECT INFORMATION			
4.00.00	LAND A total area of 5378 acres of land was acquired for the project during implementation of Stage-I. The plant facilities and township for this project would be accommodated in the land acquired during Stage-I of the project. However, for ash dyke, approximately 260 acres of land is proposed to be acquired.			
5.00.00	WATER The source of raw water for the project is hot water Discharge channel of CW System of Singrauli STPP as that of in existing Stage-I, II, III & IV of Vindhyachal STPP. Raw water is proposed to be used for meeting the complete water requirement of the project. Normal Make up water requirement for this project would be about 1800 m3/hr with ash water re-circulation system and 2800 m3/hr with once thru system. The total committed for the project is 180 Cusecs and the same has been duly concurred by CWC. The make-up water requirement of Stage-V will be about 20 Cusecs which shall be met from surplus water available within existing commitment.			
6.00.00	COAL AVAILABILITY AND LINKAGE Coal requirement for Vindhyachal STPP, Stage-I, II & III is presently being met from Northern Coalfields Ltd. (NCL). The coal requirement for one 500 MW Unit shall be about 2.7 MTPA at 90% PLF. For FR purposes, coal from NCL has been considered. Application for accord of long-term coal linkage has been submitted to Ministry of Coal vide dated 17.11.08			
7.00.00	COAL TRANSPORTATION Coal requirement for Stage-V shall be met from Stage-IV itself. Accordingly Stage-IV CHP capacity has been selected as 2000 MTPH. Coal input to Stage-IV & Stage V may be from BOBR or BOX N wagons.			
8.00.00	RAILWAY SIDING For bringing the equipment and material to the power house through rail, a permanent railway siding has already been constructed during Stage-I, II&III. This siding is proposed to be extended upto Stage-V of the project to provide rail access to unloading bays and transformer yard.			
9.00.00	METEOROLOGICAL DATA Important meteorological data from nearest observatory at Sidhi is placed at Annexure A-II.			
10.00.00	PLANT WATER SCHEME The Plant water scheme is described below.			
11.00.00	CONDENSER COOLING (CW) WATER SYSTEM It is proposed to provide recirculating type CW system with induced draft type cooling towers, Raw water for Stage – V of this project shall be pumped from the hot water (CW system) discharge channel of Singrauli Project of NTPC to Water pretreatment Plant. The treated clarified water shall be pumped to the hot water discharge ducts of Stage – V circulating Water (CW) system at the upstream of cooling towers as make up to the system. It is			
VINDHYACHAL STPP-V(1X500MW) STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2260-101-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 2 OF 12

CLAUSE NO.	PROJECT INFORMATION			
	proposed to operate the CW system at a C.O.C. of about 4 and chemical treatment programme (using acid dosing and scale cum corrosion inhibitors dosing) shall be employed in addition to blow down of CW water to control the CW system water chemistry. The expected circulating water analysis is given in Annexure A-III of the Sub-section.			
12.00.00	EQUIPMENT COOLING WATER (ECW) SYSTEM (UNIT AUXILIARIES) The plant auxiliaries of Steam Generator shall be cooled by Demineralised water (DM) in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system.			
13.00.00	ASH WATER SYSTEM (a) It is proposed to operate ash water system in a closed circuit. The ash water from the ash dyke shall be recirculated. During re-circulation mode, the make up to the ash water system (to compensate for the ash water blow down and evaporation loss in ash dyke) shall be supplied from CW blow down. (b) During initial operating stage of the project, when decanted ash water is not available from the dyke, the ash water system shall be operated in once through mode. The make-up water to ash water system shall be pumped from the raw water (from the discharge channel of Singrauli station) source and CW blow down water. (c) Considering total ash handling plant water requirement of 1100 Cu.M/hr. for slurry formation during re-circulation mode operation, it is expected that about 970 M³/hr of decanted ash water shall return to the ash handling system after accounting for evaporation loss. (d) The quality of raw water is given at Annexure A-III.			
14.00.00	OTHER MISCELLANEOUS WATER SYSTEMS (a) CW system blow down water shall be used for dust suppression system of coal handling plant, ash slurry pumps sealing, make-up to ash handling plant, make-up to fire water storage tanks and cooling water requirement of hydrogen generation plant. The service (wash water) water collected from various areas shall be treated using oil water separators, tube settlers, coal settling pits etc. as per requirement and treated water from liquid effluent treatment plant shall be recycled back to the service water system for re-use. The excess service water shall be led to central monitoring basin for disposal. (b) Separate water Pre-treatment plants are proposed for Circulating water (PT-CW) system and Demineralization Plant (PT-CW) plant (c) It is proposed to provide a DM plant for this stage of the project. From the proposed DM plant, DM water shall be pumped to meet the Steam Cycle make-up water requirement, makeup the hydrogen generation plant and makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water shall be provided from Dematerializing plant. In addition, separate set of boiler fill pumps shall be provided to fill the boiler from these DM water storage tanks, DM water required for regeneration of condensate polishing plant and resin transfer operation shall also be provided by these tanks.			
VINDHYACHAL STPP-V(1X500MW) STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2260-101-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 3 OF 12

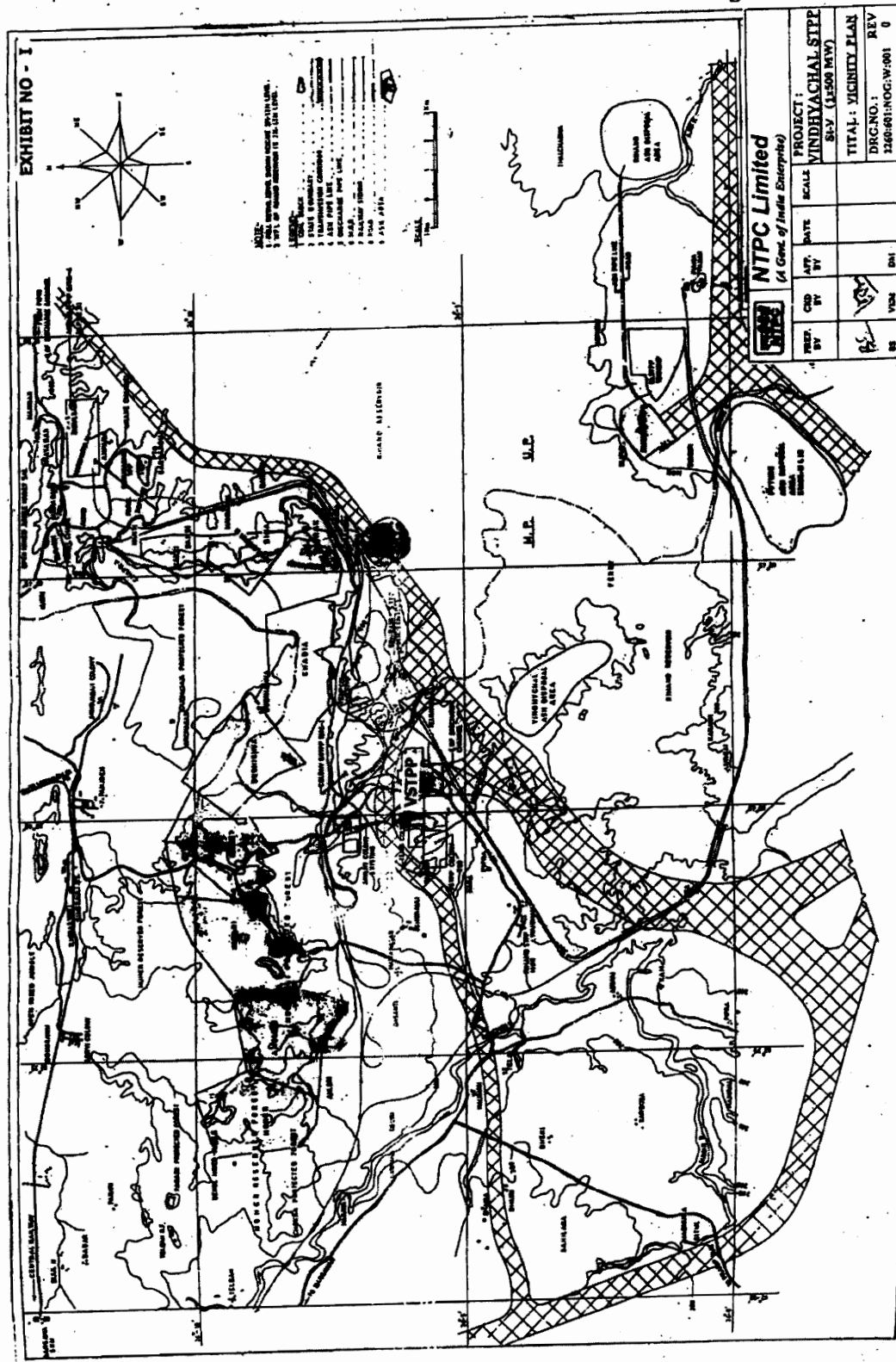
CLAUSE NO.	PROJECT INFORMATION			
	<p>(d) The quality of filtered (potable) water and DM water is given in Annexure – A-III of this sub-section.</p>			
15.00.00	<p>Criteria for Wind Resistant Design of Structures and Equipment</p> <p>All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given in Sub-Section-V, Part-B, Section-VI, i.e. Technical Specification for Civil and Structural Works.</p>			
16.00.00	<p>Criteria for Earthquake Resistant Design of Structures and Equipment</p> <p>All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in Sub-Section-V, Part-B, Section-VI, i.e. Technical Specification for Civil and Structural Works.</p>			
VINDHYACHAL STPP-V(1X500MW) STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2260-101-2		PART-A SUB-SECTION-II PROJECT INFORMATION
PAGE 4 OF 12				

CLAUSE NO.

PROJECT INFORMATION



ANNEXURE A-I Page 1 of 1



VINDHYACHAL STPP-V(1X500MW)
STEAM GENERATOR WITH ELECTROSTATIC
PRECIPITATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC. NO.: CS-2260-101-2

PART-A
SUB-SECTION-II
PROJECT
INFORMATION

PAGE 5 OF 12

CLAUSE NO.

PROJECT INFORMATION



ANNEXURE A-II
Page 1 of 2

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन: सिंधी STATION: Sidhi
LAT 24°25' N LONG 81°52' E
समुद्री सतह से ऊँचाई 272 METRES
1958 से 1980 तक के जलवायु अवलोकन
BASED ON OBSERVATIONS FROM 1958 TO 1980

		वायु तापमान										वर्षा									
माह	STATION LEVEL PRESSURE	दैनिक तापमान					अधिकतम तापमान					अधिकतम तापमान					अधिकतम तापमान				
		सुबह तापमान		दिवस तापमान		शाम तापमान		सबसे कम तापमान		सबसे अधिक तापमान		सबसे कम तापमान		सबसे अधिक तापमान		सबसे कम तापमान		सबसे अधिक तापमान			
		DRY BULB	WET BULB	DAILY MAX	DAILY MIN	HIGHEST IN THE MONTH	LOWEST IN THE MONTH	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR		
AIR TEMPERATURE																					
MONTH	STATION LEVEL PRESSURE	MEAN					EXTREMES					HUMIDITY					CLOUD				
		DRY BULB	WET BULB	DAILY MAX	DAILY MIN	HIGHEST IN THE MONTH	LOWEST IN THE MONTH	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR	DATE AND YEAR	RELATIVE HUMIDITY	VAPOUR PRESSURE	ALL CLOUDS	LOW CLOUDS	NO. OF RAINY DAYS	TOTAL MONTHLY RAINFALL	WINTER MONTH WITH MOST RAIN	WINTER MONTH WITH LEAST RAIN	DATE AND YEAR	
JAN	985.4	12.2	10.1	24.3	8.1	29.1	3.3	32.8	21	1.0	1962	78	10.8	1.2	0.8	27.0	2.0	116.1	0.0	49.4	21
FEB	983.4	15.9	12.4	27.6	10.8	32.8	5.3	38.0	28	2.0	1974	68	12.1	1.1	0.7	18.4	1.7	80.8	0.0	34.4	28
MAR	981.0	22.0	18.8	33.4	15.5	38.4	10.0	41.2	30	4.6	1972	51	13.1	0.8	0.5	13.2	1.0	58.7	0.0	30.2	06
APR	977.0	29.1	19.3	39.1	21.5	43.4	16.5	46.8	10	11.8	1968	38	15.0	0.5	0.3	3.4	0.5	17.7	0.0	12.2	01
MAY	972.8	35.6	21.8	42.0	25.8	45.1	21.2	46.6	28	17.0	1960	35	17.5	0.8	0.5	8.8	0.8	57.0	0.0	23.2	16
JUN	968.4	31.8	25.0	39.2	27.5	44.2	23.4	47.4	09	20.0	1968	58	26.4	2.7	1.7	133.5	8.3	675.3	8.4	180.2	07
JUL	965.4	35.5	25.4	37.8	25.1	37.8	22.7	42.2	01	17.0	1968	83	30.8	5.2	3.2	338.2	15.0	584.8	114.8	168.8	18
AUG	968.7	30.2	25.3	31.7	24.8	34.9	22.6	38.8	03	17.4	1968	85	30.7	5.3	3.4	325.2	14.9	620.1	154.4	176.5	08
SEP	967.2	28.9	25.9	32.3	23.8	35.5	21.1	39.0	11	18.2	1972	82	28.1	3.9	2.6	211.8	9.2	484.1	44.4	168.4	12
OCT	971.0	27.0	24.6	32.6	19.4	35.0	14.8	38.4	05	12.2	1964	73	22.4	1.6	1.0	33.4	2.2	130.8	0.0	69.8	11
NOV	984.1	18.5	15.3	29.5	13.0	32.8	8.7	35.9	04	4.0	1970	69	14.9	0.8	0.5	12.1	0.7	116.0	0.0	96.4	11
DEC	985.0	12.4	11.1	25.3	8.3	28.7	4.0	31.2	31	1.0	1961	74	11.5	0.5	0.4	7.7	0.7	38.8	0.0	33.2	02
ANNUAL MEAN	977.8	23.5	19.0	32.5	16.8	45.5	2.9	48.8		1.0		66	19.5	2.1	1.3	112.7	55.0	2082.3	505.5	189.8	
NUMBER OF YEARS	21	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	22

689

VINDHYACHAL STPP-V(1X500MW)
STEAM GENERATOR WITH ELECTROSTATIC
PRECIPITATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC. NO.: CS-2260-101-2

PART-A
SUB-SECTION-II
PROJECT
INFORMATION

PAGE 6 OF 12

1

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063

CLAUSE NO.

PROJECT INFORMATION




ANNEXURE – A-III
Sheet 1 of 5

COOLING WATER ANALYSIS

	Constituent	as	mg per litre
1.	Calcium	CaCO ₃	148.0
2.	Magnesium	CaCO ₃	37.5
3.	Sodium & Potassium	CaCO ₃	47.5
4.	Bicarbonate	CaCO ₃	104.5
5.	Chloride	CaCO ₃	47.5
6.	Sulphate	CaCO ₃	81.0
7.	Corbonate	CaCO ₃	0
8.	Silica	SiO ₂	25.0
9.	Iron	Fe	.75
10.	pH Value	-	7.6-7.9
11.	Turbidity	NTU	50

Note: The C.W system is expected to operate at about 4.0 Cycles of Concentration.

CLAUSE NO.	PROJECT INFORMATION																																																						
	<div style="text-align: right;">  </div> <div style="text-align: right;"> ANNEXURE – A-III Sheet 2 of 5 </div> <div style="text-align: center;"> RAW WATER ANALYSIS </div> <table border="1"> <thead> <tr> <th></th> <th>Constituent</th> <th>as</th> <th>mg per litre</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Calcium</td> <td>CaCO₃</td> <td>34.0</td> </tr> <tr> <td>2.</td> <td>Magnesium</td> <td>CaCO₃</td> <td>15.0</td> </tr> <tr> <td>3.</td> <td>Sodium & Potassium</td> <td>CaCO₃</td> <td>19.0</td> </tr> <tr> <td>4.</td> <td>Bicarbonate</td> <td>CaCO₃</td> <td>46.0</td> </tr> <tr> <td>5.</td> <td>Chloride</td> <td>CaCO₃</td> <td>12.0</td> </tr> <tr> <td>6.</td> <td>Sulphate</td> <td>CaCO₃</td> <td>10.0</td> </tr> <tr> <td>7.</td> <td>Corbonate</td> <td>CaCO₃</td> <td>0</td> </tr> <tr> <td>8.</td> <td>Silica</td> <td>SiO₂</td> <td>10.0</td> </tr> <tr> <td>9.</td> <td>Iron</td> <td>Fe</td> <td>2.0</td> </tr> <tr> <td>10.</td> <td>pH Value</td> <td>-</td> <td>7.6-8.2</td> </tr> <tr> <td>11.</td> <td>Turbidity</td> <td>NTU</td> <td>Upto 1000</td> </tr> <tr> <td>12.</td> <td>Temperature (°C)</td> <td></td> <td>43</td> </tr> </tbody> </table> <p>Note: Raw water from hot water channel of Singrauli STPP</p>				Constituent	as	mg per litre	1.	Calcium	CaCO ₃	34.0	2.	Magnesium	CaCO ₃	15.0	3.	Sodium & Potassium	CaCO ₃	19.0	4.	Bicarbonate	CaCO ₃	46.0	5.	Chloride	CaCO ₃	12.0	6.	Sulphate	CaCO ₃	10.0	7.	Corbonate	CaCO ₃	0	8.	Silica	SiO ₂	10.0	9.	Iron	Fe	2.0	10.	pH Value	-	7.6-8.2	11.	Turbidity	NTU	Upto 1000	12.	Temperature (°C)		43
	Constituent	as	mg per litre																																																				
1.	Calcium	CaCO ₃	34.0																																																				
2.	Magnesium	CaCO ₃	15.0																																																				
3.	Sodium & Potassium	CaCO ₃	19.0																																																				
4.	Bicarbonate	CaCO ₃	46.0																																																				
5.	Chloride	CaCO ₃	12.0																																																				
6.	Sulphate	CaCO ₃	10.0																																																				
7.	Corbonate	CaCO ₃	0																																																				
8.	Silica	SiO ₂	10.0																																																				
9.	Iron	Fe	2.0																																																				
10.	pH Value	-	7.6-8.2																																																				
11.	Turbidity	NTU	Upto 1000																																																				
12.	Temperature (°C)		43																																																				
VINDHYACHAL STPP-V(1X500MW) STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-2260-101-2	PART-A SUB-SECTION-II PROJECT INFORMATION																																																				
		PAGE 9 OF 12																																																					

CLAUSE NO.

PROJECT INFORMATION





ANNEXURE – A-III
Sheet 3 of 5

CLARIFIED WATER ANALYSIS

	Constituent	as	mg per litre
1.	Calcium	CaCO ₃	59.2
2.	Magnesium	CaCO ₃	15.0
3.	Sodium & Potassium	CaCO ₃	19.0
4.	Bicarbonate	CaCO ₃	41.7
5.	Chloride	CaCO ₃	19.0
6.	Sulphate	CaCO ₃	32.5
7.	Carbonate	CaCO ₃	0
8.	Silica	SiO ₂	10.0
9.	Iron	Fe	.0.30
10.	pH Value	-	7.6-8.2
11.	Turbidity	NTU	10
12.	Temperature (°C)		43

Note: At the outlet of clarifier of PT Plant

CLAUSE NO.	PROJECT INFORMATION																																																		
	<div style="text-align: right;">  </div> <div style="text-align: right;"> ANNEXURE – A-III Sheet 4 of 5 </div> <div style="text-align: center;"> FILTERED WATER ANALYSIS (Drinking Water) </div> <table border="1"> <thead> <tr> <th></th> <th>Constituent</th> <th>as</th> <th>mg per litre</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Calcium</td> <td>CaCO₃</td> <td>59.2</td> </tr> <tr> <td>2.</td> <td>Magnesium</td> <td>CaCO₃</td> <td>15.0</td> </tr> <tr> <td>3.</td> <td>Sodium & Potassium</td> <td>CaCO₃</td> <td>19.0</td> </tr> <tr> <td>4.</td> <td>Bicarbonate</td> <td>CaCO₃</td> <td>41.7</td> </tr> <tr> <td>5.</td> <td>Chloride</td> <td>CaCO₃</td> <td>19.0</td> </tr> <tr> <td>6.</td> <td>Sulphate</td> <td>CaCO₃</td> <td>32.5</td> </tr> <tr> <td>7.</td> <td>Carbonate</td> <td>CaCO₃</td> <td>0</td> </tr> <tr> <td>8.</td> <td>Silica</td> <td>SiO₂</td> <td>10.0</td> </tr> <tr> <td>9.</td> <td>Iron</td> <td>Fe</td> <td>0.30</td> </tr> <tr> <td>10.</td> <td>pH Value</td> <td>-</td> <td>7.5-7.7</td> </tr> <tr> <td>11.</td> <td>Turbidity</td> <td>NTU</td> <td>2</td> </tr> </tbody> </table>				Constituent	as	mg per litre	1.	Calcium	CaCO ₃	59.2	2.	Magnesium	CaCO ₃	15.0	3.	Sodium & Potassium	CaCO ₃	19.0	4.	Bicarbonate	CaCO ₃	41.7	5.	Chloride	CaCO ₃	19.0	6.	Sulphate	CaCO ₃	32.5	7.	Carbonate	CaCO ₃	0	8.	Silica	SiO ₂	10.0	9.	Iron	Fe	0.30	10.	pH Value	-	7.5-7.7	11.	Turbidity	NTU	2
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	<div data-bbox="1193 264 1417 320" data-label="Text"> <p>ANNEXURE – A-III Sheet 5 of 5</p> </div> <div data-bbox="644 353 1129 443" data-label="Section-Header"> <p>ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER</p> </div> <table border="1" data-bbox="363 472 1426 875"> <thead> <tr> <th>Sl. No.</th> <th>Characteristics</th> <th></th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Silica (Max.)</td> <td>-</td> <td>0.02 ppm as SiO₂</td> </tr> <tr> <td>2.</td> <td>Iron as Fe</td> <td>-</td> <td>Nil</td> </tr> <tr> <td>3.</td> <td>Total hardness</td> <td>-</td> <td>Nil</td> </tr> <tr> <td>4.</td> <td>pH value</td> <td>-</td> <td>6.8 to 7.2</td> </tr> <tr> <td>5.</td> <td>Conductivity</td> <td>-</td> <td>Not more than 0.1 excluding the effects of free CO₂</td> </tr> </tbody> </table>				Sl. No.	Characteristics		Value	1.	Silica (Max.)	-	0.02 ppm as SiO ₂	2.	Iron as Fe	-	Nil	3.	Total hardness	-	Nil	4.	pH value	-	6.8 to 7.2	5.	Conductivity	-	Not more than 0.1 excluding the effects of free CO ₂
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1X500MW VINDHAYACHAL STPP,
STAGE-V, UNIT NO.-13

**TECHNICAL SPECIFICATION
FOR
FUEL OIL UNLOADING & STORAGE
SYSTEM**

**VOLUME-IIB
SECTION-C
(SPECIFIC TECHNICAL REQUIREMENT)**



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



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME IIB

SECTION--C

REVISION 00

DATE:

Page 1 of 10

1.0.0 SCOPE OF WORK

Design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, painting, forwarding, proper packing, shipment and delivery at site, unloading, handling & transportation at site, Erection & Commissioning, minor civil works as required, Performance and guarantee testing and handing over of Fuel Oil System shall be as per details in different sections of this specification.

P&I Diagrams and write-up for Fuel Oil Handling System (for tender purpose) is enclosed with the specification. Detailed P&I Diagrams, System write up & Control philosophy shall be furnished by the successful bidder during detail engineering & the same shall be subject to customer approval without any commercial implication.

1.1.0 SCOPE OF SUPPLY

Scope of supply by bidder shall comprise of but not necessarily limited to the following. P&I Diagrams mentioned in clause No. 15 of this section may plz be referred.

- A. One(1) no. fixed roof type M.S. Storage tank of LDO as per IS 803 having dimension as (dia.14.0 M dia x9.0M ht from tank bottom to bottom of overflow nozzle) as per details indicated in NTPC specification.
- B. One no level indicator (Float & Arrow type) & 1 Nos level transmitter of Ultrasonic type mounted on LDO storage tank
- C. Five(5) nos 80NB LDO unloading hoses with isolation valve
- D. Two(2) no Motor operated ball valve as tank isolation valves- One no. each at tank inlet and at tank outlet. This isolation valve shall be located inside the tank dyke. The MOV actuator shall be of flame proof design.
- E. All piping, valves, fittings etc within terminal points.
- F. Relocation of existing unloading header and Pipe and pipe fittings with isolation valves required for the same.
- G. Interconnection of new LDO tank with existing unloading pumps discharge.
- H. Items required for achieving control and monitoring as per relevant clauses mentioned elsewhere in specification.
- I. All foundation bolts/ anchor bolts required for any equipment foundation under the package.

1.2.0 SCOPE OF SERVICES

Scope of services by bidder will include but not necessarily limited to the following:

- a. Unloading, Storage, handling and transportation at site.
- b. Minor civil work like chipping of foundation, grouting below base plate for all structures, equipment, grouting of anchor bolts wherever these are not placed in the foundation during casting of foundation itself, excavation & filling of earth for buried MS pipes if and as required. To the extent possible, vendor shall ensure to supply all foundation bolts timely so as to facilitate placement of these bolts while casting the foundation.
- c. Pre- Commissioning work such as flushing, hydraulic testing etc. Necessary consumables and instrumentation as required for inspection and testing at works as well as at site including pre-commissioning activities shall be arranged by the successful bidder at their own cost.
- d. Erection & Commissioning of Fuel Oil Unloading & Storage System with modification in existing unloading header and unloading pump discharges piping.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME IIB

SECTION--C

REVISION 00

DATE:

Page 2 of 10

- e. Erection of all foundation bolts/ anchor bolts etc. as required for any equipment. In case these are not erected when foundation is being cast refer point no b above.
- f. Inspection & testing, Performance Requirements and Performance Guarantees.
- g. Painting of tank and all other items within scope of supply.
- h. Making Good/Repairing/replacement of and damaged done by bidder to adjacent structure, pipes etc. while erecting equipment's related to Fuel Oil system
- i. Electrical scope as per enclosure elsewhere in the specification
- j. Preparation of drawing showing common facilities, if any, between BHEL & Vendor supplied equipment.
- k. Preparation of civil assignment drawings i.e. pedestals details, insert plates / embedment's plates required for supporting pipes and equipment etc. and review of civil drawing prepared by customer based on civil assignment drawing of bidder. In case any modification is required in the civil work already done based on civil inputs given by vendor, rework shall be done at the cost and risk of the vendor.
- l. Preparation of all drawings as per list enclosed under Annexure IX.
- m. Preparation of all necessary drawings/data/ documents for obtaining necessary Approval of statutory authorities like PESO , IBR , Weight & Measures Department and any other agency/ competent authority related to installation of Fuel Oil Handling System on behalf of the customer. Successful bidder shall inform customer well in advance requirement of authority letter along with format for the same. After issuance of authority letter by customer, it will be vendor's responsibility to regularly follow up with the concerned authorities to obtain timely approval from these authorities. Any delay on account of the same, unless any specific information related to above approval to be furnished by customer is delayed by customer, shall be to vendor's account and shall not be used as a reason for extension in contract completion.
- n. Layout drawing to be prepared for statutory approval apart from showing the technical requirements shall necessarily show key plan showing approach to site with mile stone, Survey No., Khesra No, Plot No. etc.
- o. Supply of temporary equipment and services for chemical cleaning, steam blowing, energisation, testing etc as applicable.
- p. Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance.
- q. All other facilities/ services as described in section on site services in TCE specification and related to Fuel Oil Handling System scope of work within terminal point.
- r. Relevant requirements as per GTR, GCC, ECC & SCC.

Any other service required for making the installation complete in all respect within battery limits and for satisfactory erection & commissioning of the system as well as to meet any statutory requirement relevant to the package, unless specifically EXCLUDED from scope of services.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME IIB

SECTION--C

REVISION 00

DATE:

Page 3 of 10

Fuel oil (LDO)

: **Towards oil unloading & Storage tank side:**

- Outlet of fuel oil unloading road tanker nozzle
- Existing unloading pump suction & discharge header outside the Pump House

Towards P&H Unit Size:

- Up to 0.5 meter outside the Pump House near the LDO pressurizing pumps for stage-V located in stage-III PH. Further piping up to pressuring pumps & up to boiler will be by other units of BHEL. Temperature- Ambient; Pressure – 1.0 Kg/cm² (a)
Bidder to plan the layout and size the pipe between storage tank and P&H unit in a manner so as to ensure availability of above TP pressure of 1.0 Kg/cm² (a) limiting tank foundation height for storage tanks to 1 m and the P&H unit FFL Approx 500 mm above ground level
- From Return of Pressurizing Pump– From 500mm outside P&H unit shed, Pressure – 3.0 kg/cm² (g); Elevation- Approx 4 m above P&H unit FFL

Equipment & line drain for LDO and Storage tank drains for LDO.

: Equipment and line drain for LDO unloading pumps, tank drain for LDO tanks shall be terminated by the bidder in the drain oil tank (existing) located in LDO unloading cum P&H unit building / shed of stage-III.

Instrument Air

: Bidder have to take from the existing (stage-III) Pump House

Drain from dyke area

: To OWS (existing, stage-III) during normal condition & to plant drain during rainy season through two way valve pit. Valves in the valve pit along with limit switch for the same are included in bidder's scope.

Change in location of terminal points by up to 50 meters in plan view and 10 m in elevation view shall have no price implication. Isolation valves at the terminal points shall be in the scope of the bidder.

Wherever exact coordinate of TP is not given, bidder to consider location at specified distance from the respective facilities from where distance in bidder's scope will be maximum.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME IIB

SECTION--C

REVISION 00

DATE:

Page 4 of 10

3.0.0 EXCLUSION

- a) Civil work for fuel oil unloading & storage system including
 - I. Road tanker unloading platform
 - II. Tank foundations
 - III. Unloading Pump House
 - IV. Dyke wall and barbed fencing
 - V. Encasing of buried pipes, providing culvert for the same, if required.
 - VI. Hume Pipes, if any
 - VII. Civil works like pits, wherever required.
 - VIII. Handrails other than those on the storage tanks.
 - IX. Various cable & pipe trenches, pipe pedestals, drains, sumps, insert plates for pedestals for pipe supports.

However, location, sizing and loads, top of concrete elevations, top of grout elevations etc. and any other input related to above as applicable for above shall be given by the vendor.

- b) Fire Protection system for storage tanks,
- c) Air Conditioning / ventilation of Fuel Oil pump houses.
- d) Lifting equipment (electric operated hoist) for unloading pump house for maintenance purpose of these pumps. Capacity of lifting equipment is envisaged as 2 T with lift as 7.5 m. Bidder to confirm adequacy of the same.
- e) DCS control. However, all logic for implementation of control and monitoring from DCS shall be provided by successful bidder during detail engineering.
- f) All power feeder and power supply cables for all motor drives.
- g) Fee for obtaining statutory approval from PESO and any other statutory authority.
- h) Exclusion as indicated in Electrical & C&I portion of technical specification
- i) Relevant exclusion as per GTR, GCC, SCC & ECC.

4.0.0 SERVICES TO BE PROVIDED BY THE CUSTOMER

- a) Relevant services as per GCC, SCC & ECC.

5.0.0 PERFORMACE REQUIREMENTS AND PERFORMANCE GUARANTEES

This will comprise of:

- a) Inspection and testing of all valves as per approved QAP.
- b) Each storage tank shall be guaranteed for capacity and stability.
- c) Entire piping and supports for smooth operation.
- d) noise & vibration level of all operating pumps in parallel. The capacity of pumps while operating in parallel will be verified by indication in tank level difference.
- e) Noise level for safety valve to be limited to 105 dBa



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME IIB

SECTION--C

REVISION 00

DATE:

Page 5 of 10

- f) All other machines / components / system shall be acoustically designed for a surface sound pressure level of $L_p < 85$ dB (A), measured in accordance with ISO 3746 respectively at a distance of 1.0 m from equipment surface and at a height of 1.5m above ground level. The surface sound pressure level (L_p) shall be averaged over the measurement surface and corrected for effect of background noise and the influence of reflected sound at measurement surface (environmental correction). With sound pressure levels of 85 dB (A) or less according ISO it shall be ensured that maximum surface noise levels of any item of plant of less than 85 dB (A) at 1.0 m from outline and a height of 1.5m from the floor shall be met during normal operating conditions.
- g) In case during test it is found that the equipment/system has failed to meet the guarantees, the contractor shall carry out all necessary modifications and/or replacements to make the equipment/system comply with the guaranteed requirements at no extra cost to the Employer. However, if the contractor is not able to demonstrate the guarantees, even after the above modifications/replacements within ninety (90) days or a reasonable period allowed by BHEL, after the tests have been completed, BHEL will have the right to Reject the equipment / system / plant and recover the payments already made or accept the equipment / system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by BHEL.
- h) The successful bidder will prepare a document titled “HANDLING OVER PROTOCOL” consisting various activities to be demonstrated by them for handing over of the package.**

6.0.0 LAYOUT REQUIREMENTS

- a) System layout shall conform to the requirements of the Petroleum Act 1934 & Petroleum Rules 2002, OISD 118 latest edition whichever is more stringent. The layout shall also conform to all other relevant OISD specifications
- b) All established engineering practices with regard to layout of various equipment & piping shall be followed and the same shall be subject to Customer approval during detail engineering without any commercial implication.
- c) Tentative Location of items related to Fuel Oil handling System is shown in enclosed drawings. This will be finalized during detail engineering based on equipment dimensions and other layout related requirements. There will however be no cost implication on account of the same.
- d) For road tanker unloading of LDO, LDO pumps will be located above ground. Further, while selecting pipe size, velocity inside the pipe shall not overshoot the velocity criteria indicated elsewhere in the specification.
- e) To the extent possible, all valves shall be located at grade level for easy operation & maintenance. Where location at grade level is not possible, suitable operating and maintenance platform made of MS grating and access ladder/ staircase/walkways to the same shall be given by the bidder. The platform and walkways will be designed by considering load of at least 750Kg/M².
- f) Where pipes are routed in a manner that it hampers man movement in that area, suitable no. of cross overs made of MS gratings shall be given across such pipes to facilitate easy man movement in such areas. Further suitable access ladder of MS construction shall be given for access to equipment/ pipes located in pit/ trench. Such structures shall be designed by considering a load of at least 750Kg/M².
- g) For all pedestal supported pipes, Customer scope will be limited to pedestal with insert plates. Maximum height of pedestal to be provided by CUSTOMER shall be 300 mm from FGL/FFL in the corresponding area. Structures required above these pedestals for supporting the pipes are included in the scope of the bidder. Pipe having BOP up to 2.0m



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME IIB

SECTION--C

REVISION 00

DATE:

Page 6 of 10

from the grade level / FFL / FGL in the corresponding area shall be pedestal supported. However, inside the pump house no pedestals / insert plate shall be provided for fixing. Bidder shall support the pipes using pipe supports and anchor fasteners inside the pump house.

- h) Layout shall be prepared in a way to avoid the buried piping to the maximum possible extent.
- i) Oily water collected in storage tank area, oil unloading area will normally be collected in OWS pit by gravity either through trench (limited to a depth of 0.5 m) or through buried pipe (limited to a depth of 1.0 m) . However, in case depth of pipe between the pit and OWS pit exceeds 1 m or gravity flow is not possible due to layout constraints (which can be reviewed during detail engineering), the oily water waste shall be collected by pumping to OWS pit. Necessary pumps, valves, pipes, pipe supports, and instruments etc. for the same shall be included by bidder in their scope.
- j) Rainwater collected inside the dyke shall be diverted to storm water drain while contaminated oily waste shall be sent to OWS. All valves required in pits outside the dyke are included in bidder's scope of supply.
- k) Instruments to be mounted on tank shall be suitably located so as to have easy access from the staircase without interfering with man movement on the staircase. Wherever this is not possible, suitable platform along with access to the same shall be provided by FO System bidder.
- l) Signals from all field instruments shall be first terminated in Junction boxes before transmitting this signal either to Control panel or to I/O rack or to DCS. Junction box is included in bidder's scope. Erection of cable between field instruments to Junction Box is also included in bidder's scope. Scope of cable supply shall be as per project specific scope split sheet.
- m) All piping shall be arranged to provide clearance for removal of equipment requiring maintenance and easy access to valve and other piping accessories required for operation and maintenance. The layout drawing to be submitted by the successful bidder will necessarily show the valve orientation and access to valve and accessories.
- n) Instrument/ LIE/LIR shall not be located in space meant for walkway & maintenance space across the equipment , maintenance bay of building. Location of all instrument shall be marked in tipping layout drawing to ensure correct location of the same.

7.0.0 EQUIPMENT SELECTION & DESIGN CRITERIA

The minimum design criteria/ technical details to be followed for various equipment shall be as per Data Sheets / Design criteria under **Annexure-II including NTPC specification** and other details placed elsewhere in the specification. In case of any contradictory requirement for specification of particular equipment, and clarifications not having been sought by the bidders, the most stringent requirement as per interpretation of the BHEL will prevail. Successful bidder will furnish detailed data sheets/ specifications / design calculations for various equipment for customer's/ consultant's approval during detail engineering. For items for which specific technical specification is not enclosed, data sheet / dwgs / design calculations for such items shall be subject to customer/ consultant approval during detail engineering. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

8.0.0 PAINTING / CORROSION PROTECTION REQUIREMENT

This will be as per **Annexure-V**. During detailed engineering stage, successful bidder shall prepare and submit the painting schedule for FOHS in line with customer specification for each equipment pipe, tanks, structure etc. for customer approval and changes suggested shall be taken care without any commercial implication.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME IIB

SECTION--C

REVISION 00

DATE:

Page 7 of 10

9.0.0 POWER PLANT PIPING & VALVES

Power plant piping and valve details are enclosed under **Annexure – II**

10.0.0 QUALITY ASSURANCE, QUALITY PLANS, INSPECTION & TESTING PROCEDURE:

- a) 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 approval.
- b) 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.
- c) The Field Quality Plan of bidder shall also be submitted by the successful bidder during detail engineering for customer's / consultant's approval. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.
- d) For flame proof actuator, motors, junction boxes, instruments etc. as per specification requirement, valid test certificate for the same shall be submitted by the vendor as part of QC documentation. In case valid test certificates are not available, necessary test shall be conducted in line with applicable standard in presence of customer and cost of such test shall be deemed to be included in the contract price

11.0.0 SUB-VENDOR ITEMS

The tentative make of Sub-vendor items shall be generally as per **Annexure-IV** enclosed which is subject to customer approval during detail engineering. Make of any unlisted items shall be subject to customer approval during detail engineering. For such items, bidder to furnish list of sub-vendors during detail engineering stage for customer's review and approval. 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 that the equipment/system has been operating satisfactorily for two years as on the scheduled date of bid opening.

The successful bidder will get the makes of all items approved from Customer/ Consultant during detail engineering within two months of placement of LOI. The complete list will be necessarily be submitted within one month of placement of LOI to ensure timely placement of order for BOIs

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.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME IIB

SECTION--C

REVISION 00

DATE:

Page 8 of 10

Dealers are not acceptable for any item of the package. Bidder shall procure all items including plates, structural, flanges, counter flanges etc. from approved sub vendor only.

12.0.0 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-VI**. Any documents other than those indicated in **Annexure-VI** will not be reviewed and will not form part of contract.

13.0.0 DRAWINGS/ DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

Tentative list of drawing / document required during detail engineering is attached in **Annexure – VII**. 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 implication shall be entertained by BHEL.

14.0.0 DRAWINGS DISTRIBUTION SCHEDULE

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

15.0.0 DRAWINGS ENCLOSED WITH THE SPECIFICATION

Following drawings enclosed will form part of the specification.

- a) Plot plan
- b) Process & Instrumentation Diagram LDO UNLOADING AND STORAGE System.
- c) Sketch with Location of fuel oil facilities related to FOHS system (Stage-V).
- d) Piping Layout of Fuel Oil System (stage-III).

The P&ID is indicative and show the minimum requirement to be followed including minimum requirement of instruments. Any other item and instruments required (within the terminal points) to make the system complete in all respect and for satisfactory operation of the system shall also deemed to have been included by the bidder in their scope. The detailed P&I diagrams for LDO system in line with specification requirement shall be developed by the vendor during detail engineering for customer's approval and without any commercial implication to customer. Bidder to note that the while preparing PIDs after placement of order, successful bidder shall incorporate line numbers Instrument tag nos., KKS Numbering, equipment no, Line Spec, Line MOCs, legend / symbol chart , equipment capacity , relief valve capacity and set pressure, control valve capacity, range, fail position etc. in these drawing and same are subject to the customer approval.

16.0.0 Mandatory Spares

Mandatory spares are not applicable.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME IIB

SECTION--C

REVISION 00

DATE:

Page 9 of 10

17.0.0 OTHER REQUIREMENTS

i) Site Visit before submission of offer.

Bidders shall make Site visit in order to familiarize themselves with existing condition of site before submitting the bid in order to make their offer complete. During detail engineering also, the successful bidder shall be responsible for the correctness of details wrt existing facility at site. Customer approval on any drawing having details of existing facility shall not be cited by the successful bidder a valid reason for any shortcoming in the work by them. BHEL shall also not entertain any cost implication for any lack of input data with regard to site during detail engineering. .

ii) Detailed erection manual for each of the equipment as well as complete system supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.

iii) The O&M Manual to be submitted by the successful bidder will necessarily address the following:

- a. Complete System Description along with PIDs, write up on electrical philosophy and safety/process interlocks etc.
- b. Instructions for plant operation
- c. Commissioning procedure of the system
- d. Chapter on precautions to be taken during:
 - Operation
 - Idle time
 - Long shutdown
- e. Chapter on trouble shooting during plant operation covering:
 - Safety aspects
 - Do's and do not's
 - Maintenance schedule
 - Schedule of lubricants & consumables
- f. O & M instruction for all individual equipment which shall invariably contain but not necessarily limited to the following:
 - Equipment description/interdiction
 - Data sheet, Equipment GA & Cross Section Drawing
 - Catalogue of each equipment
 - DO's & DON'T's
 - Duty Conditions
 - Installation & Safety Recommendation
 - Start-up & shut down procedure
 - Instructions for testing and adjustment of system parameters
 - Disassembly & Assembly Instructions giving sequence no. of each component
 - List of Replacement/ Spare parts along with their drawing and catalogues and procedure for ordering spares.
 - Reason & Remedy Chart for any problem
 - Maintenance Schedules- Daily, Weekly, Monthly, Half Yearly and Annual indicating clearly the spares part and man-hour requirement for each stage.
 - Detailed specification/ Schedule of all the consumables including lubricant oils, greases, chemicals etc. required for the complete system
 - Commission procedure for equipment.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME IIB

SECTION--C

REVISION 00

DATE:

Page **10** of **10**

iv) Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.

v) In case vendor submits revised drawing/doc after approval of the corresponding drawing/doc, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion. However, in case changes are necessitated due to any constraints at customer end, delay in review/ approval of such revised drawing beyond one month will be to customer's account.

vi) Bidder to note that the successful bidder, during detail engineering, will submit the drg/doc through web based Document Management System in addition to hard copies to be submitted as per dwg/ document distribution schedule. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end


- Internet explorer version – Minimum Internet Explorer 7
- Internet speed – 2 mbps (Minimum preferred)
- Pop ups from our external DMS IP (124.124.36.198) should not be blocked
- Vendor's Internal proxy setting should not block DMS application's link (http://124.124.36.198/wrenchwebaccess/login.aspx)"

DMS user manuals to be used by BHEL PEM vendors for uploading, viewing, revising, commenting and tracking documents on PEM's DMS have been uploaded on PEM internet website (www.bhelpem.com) under the Vendor session.

For quick access bidder may refer the link <http://bhelpem.com/DMSManuals/DMSManuals.html>

vii) Final Electrical Load list will be submitted by the successful bidder as per agreed drawing/ doc submission schedule. Thereafter any change in the electrical load list shall be entertained only subject to its feasibility, and BHEL reserves the right to debit the vendor cost of any changes necessitated in the switch gear /MCC on account of changed loads.

viii) Wherever CIVIL works is excluded from the bidder's scope, successful bidder shall furnish civil assignment drawings. The corresponding CIVIL drawing prepared by BHEL / CIVIL agency, based on civil assignment drawing of bidder will be furnished to the successful bidder for concurrence. In case any modification is required in the civil work already carried out based on final civil inputs given by vendor, BHEL reserves the right to debit cost of such rework to vendor".

	TECHNICAL SPECIFICATION FOR FUEL OIL HANDLING SYSTEM 1X500MW VINDHAYACHAL STPP, STAGE- V	SPECIFICATION NO. PE-TS-389-166-A001	
		VOLUME II-B	SECTION 'C' - ANNEXURE-1
		REVISION 00	DATE:

ANNEXURE-I

(SYSTEM WRITEUP)



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C'-
ANNEXURE-1

REVISION 00

DATE:

PAGE 1 of 2

1.0 SYSTEM DESCRIPTION:

Light Diesel Oil (LDO) shall be used for initial startup & for flame stabilization during boiler start-up & subsequently during normal operation. The Fuel Oil Handling System envisaged comprises unloading & storage of LDO.

Fuel Oil Characteristics to be considered are placed at Annexure-I.

1.1 Light Diesel Oil System (LDO)

Light Diesel Oil (LDO) shall be delivered to power station site by 5 nos. road tankers. The LDO will be unloaded through flexible neoprene unloading hoses.

LDO from unloading header shall be pumped with the help of two (2) nos. (1W+1S) **existing unloading pumps of phase-III** each of capacity 50 m³/hr.

One (1) no. LDO storage tank having dimension as 14.0M dia x9.0 M ht (from tank bottom up to bottom of overflow nozzle) is envisaged. 20.0 Number of Anchor on Storage Tank foundation are firm and Bidder to ensure same

1.2 Drain Oil System, Sump water & Oil Water Separation

Fuel oil drain from the new LDO Storage tank shall be taken to the existing drain oil tanks as and when required. The drained oil in the drain oil tank will be pumped to the existing storage tank only. Pumping of drain oil to new LDO storage tank is not envisaged.

The Oil water from the new LDO storage tank dyke area will also be taken to existing Oil Water separator pit. Modification, if any, required in the civil structure of OWS is excluded from BHEL scope of work and the same shall be done by NTPC.

2.0 INSTRUMENTATION & CONTROL

DDCMIS based FOPH Control panel (EDN's scope) of Stage-V shall be located in the existing FOPH control room of Stage-III and shall be employed for control of pressuring pumps & associated system of stage-V under SG package. All the associated instruments and drives shall be suitably interfaced from the field/ switchgear to the FOPH Control System of Stage-V (located in Stage-III FOPH Control Room).

Signal of new LDO storage tank Level transmitter, inlet and outlet motorized valves of LDO storage tank shall be wired to max DNA based FOPH control panel of Stage-III.

For wiring signals of New LDO Storage Tank's Level Transmitter, inlet and outlet motorized valves status and for implementing their control in Stage-III FOPH Control System, necessary logic modification and any other augmentation (software /hardware) required in stage-III shall be done by BHEL.

Signal of unloading system viz. LDO tank level, status of motorized valves and unloading pumps shall be made available in FOPH control panel of stage-V through hard link between FOPH control panel of stage -III & stage-V for monitoring purpose only.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C' -
ANNEXURE-1

REVISION 00

DATE:

PAGE 2 of 2

Selector switch (in soft) shall be used for stopping of existing unloading pumps while filling the new LDO tank or the existing LDO tank.

Necessary modification in HMI graphics of both Stage-III FOPH control panel and Stage- V shall be done to achieve the above requirement.


3.0 ELECTRICAL REQUIREMENTS:

Actuator on tank inlet and outlet valve shall have integral starter.

All power feeder and power supply cables for all motor drives shall be CUSTOMER/NTPC scope.

4.0 LIGHT DIESEL OIL (LDO) ANALYSIS AS PER IS 1460,2000

SL.	DESCRIPTION	UNIT	VALUE
1.1	Viscosity at 40° C	Cst	2.5 to 15.7
1.2	Density at 15° C Max.	kg/m3	850
1.3	Flash point, Min	°C	66
1.4	Pour point, Max. (Winter / Summer)	°C	12 / 21
1.5	Water content, Max.	% vol.	0.25
1.6	Sediment, Max.	% wt	0.10
1.7	Sulphur, Max.	% wt	1.8
1.8	Ash content, Max.	% wt	0.02
1.9	Gross calorific value (Approximate)	Kcal / kg	10,000


	TECHNICAL SPECIFICATION FOR FUEL OIL HANDLING SYSTEM 1X500MW VINDHAYACHAL STPP, STAGE- V	SPECIFICATION NO. PE-TS-389-166-A001	
		VOLUME II-B	SECTION 'C' - ANNEXURE-II
		REVISION 00	DATE:

ANNEXURE-II

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			<div>एन टी पी सी NTPC</div>
	PIPING, VALVES & PUMPS			
1.01.00	Piping			
1.01.01	Piping for 50 mm and larger size shall be butt-welded and small piping below 50 mm shall be socket welded.			
1.01.02	Piping shall be capable of withstanding the maximum pressure as follows:			
	a)	Fuel oil pipe line	10kg/cm ² 90 deg.C	
	c)	Instrument air	5-7 kg/cm ² , 40 deg.C	
	The minimum thickness of the pipe as detailed in this specification shall be adhered to.			
1.01.03	Expansion loops shall be provided for oil lines in order to restrict end forces and movements, and the necessary design calculations shall be furnished for Employer's approval.			
1.01.04	Outdoor support shall be provided with sliding movement of pipe over the support. All steel sliding support faces shall be covered with stainless steel plates with counter sunk screws on both top and bottom sliding faces of support.			
1.01.05	All guides anchors braces, dampers, expansion joint and structural steel to be attached to the building/structure trenches etc. shall be provided by Contractor.			
1.01.06	The oil piping material shall conform to API-5L Grade B ERW pipe or site fabricated from min. 8 mm thick steel plates to IS:2062 Gr.B / IS:3589 Gr. Fe410 for size 450NB and above. For sizes 400 NB and below the pipe material shall be conforming to API-5L Gr.B ERW. The pipe thickness (min.) for oil service shall be as under.			
	450 NB	:	7.14 mm (material as per API-5L Grade.B)	
	400 NB	:	6.35 mm	
	350/300 NB	:	6.35 mm	
	250/200 NB	:	5.56 mm	
	150 NB	:	4.78 mm	
	100/80/65 NB	:	3.96 mm	
	50 NB	:	3.91 mm	
	40 NB	:	3.68 mm	
	25 NB	:	3.38 mm	
	20 NB	:	2.87 mm	
VSTPP-V (1X500 MW) STATION PIPING PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A		SUB-SECTION-IIA-01 B-FO-M2
				PAGE 1 OF 4

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES			<div>एनटीपीसी NTPC</div>
1.01.07	15 NB : 2.77 mm			
	The minimum pipe size for various applications is indicated in the tender drawings. Wherever the pipe size is not indicated, the same shall be selected as per following criteria of velocity of the fluid in the pipeline.			
	a) Suction side of the pump for oil & water application 0.6-1.2 m/sec.			
	b) Discharge side of the pump for oil & water application 1.0-1.5 m/sec.			
1.01.08	Fittings for oil service shall be Butt welded fittings, conforming to ANSI B16.9 and material to ASTM-A-234. Fittings of 50mm size and below shall be socket welded conforming to ANSI B16.11, material to ASTM-A-105. Fitting of 50mm size and below shall be socket welded conforming to ANSI B-16.11, material to ASTM-A-105 (Forging).			
1.01.09	Vents at the highest point and drains at the lowest point shall be provided.			
2.00.00	VALVES			
2.01.00	All valves shall be suitable for most stringent service conditions i.e. flow, temperature and pressure under which they may be required to operate. The valves shall be full bore and sizes of valves shall be the same as that of the parent pipe.			
2.02.00	All manually operated valves shall be provided with gear operator of proven quality, reputed make and conforming to internationally accepted standard, if the effort required to operate the valve exceeds 25 kgf.			
2.03.00	All valves shall be provided with hand wheels, extension spindles and floor stands or any other arrangement wherever required so that they can be operated manually with ease by a single operator from the nearest operating floors either at a lower or higher elevation as the case may be. Wherever necessary for safety purpose, locking devices shall be furnished with valves.			
2.04.00	Gate Valves			
2.04.01	Gate valves shall be used for isolation purpose for sizes above 300 NB for oil lines. The gate valves shall be provided with hand wheel, position indicator and draining arrangement.			
2.04.02	Gate valves for sizes up to and including 40 NB shall be of class 800, forged carbon steel valves with solid wedge, OS & Y rising stem, bolted bonnet with deep stuffing box and lantern ring. Trim shall be of 13% chrome steel. Body material shall conform to ASTM A 105 and ends shall be socket welded.			
2.04.03	For sizes above 40 NB, valves shall be of class 150/300 (depending on service), Cast Carbon Steel gate valves. Face to face dimensions shall be as per ANSI B 16.10. Body material shall be ASTM A 216 Gr. WCB and ends shall be flanged to ANSI 150/300 lbs rating with raised face. Other particulars shall remain same as above.			
2.04.04	The valves shall conform to API-600/API-602 and shall be tested to API 598/IS: 6157 requirements. IBR certificates as necessary shall also be provided.			
VSTPP-V (1X500 MW) STATION PIPING PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	SUB-SECTION-IIA-01 B-FO-M2	PAGE 2 OF 4

CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES	एनटीपीसी NTPC		
2.05.00	Globe Valves			
2.05.01	Globe valves shall be used for regulation purpose for all sizes in oil lines. They shall be provided with hand wheel, position indicator and draining arrangement.			
2.05.02	Globe valves for sizes up to and including 40 NB shall be of class 800 forged carbon steel valves with plug type disc. Other particulars shall be same as 2.04.02 above .			
2.05.03	For sizes above 40NB, valves shall be class 150/300 (depending on service) Cast Carbon steel globe valves with plug or ball type disc. Other particulars shall be same as 2.04.03 above .			
2.05.04	The valve shall conform to BS: 1873/BS: 5352 and shall be tested to BS:6755/ BS: 5146 requirements. IBR certificates as necessary shall also be provided.			
2.06.00	Check Valves			
2.06.01	Check valves shall be used for non return service for all sizes in oil lines.			
2.06.02	For sizes up to and including 50NB, check valves shall be of class 800 forged Carbon Steel horizontal lift type, with bolted cover. Valves shall have 13% Chrome Steel trim and body material to ASTM A 105. Ends shall be socket welded.			
2.06.03	For sizes above 50NB, check valves shall be of class 150/300 (depending on service) Cast Carbon Steel valves of swing check type having bolted cover. Trim shall be of 13% Chromium Steel and body material to ASTM A 216 Gr. WCB. Ends shall be flanged to ANSI Class 150/300 lb rating with raised face.			
2.06.04	The valve shall conform to BS: 1868/BS: 5352/ANSI B16.34 and shall be tested to BS: 5146 / BS:6755/API 598 requirements. IBR certificates as necessary shall also be provided.			
2.07.00	Oil Line Plug/Ball Valves			
2.07.01	Plug/Ball valves shall be used for isolation purpose in oil lines for sizes up to and including 300 NB. Valves shall be wrench or gear and hand wheel operated and shall have 'port' position indicators with CLOSE/OPEN indications marked on valve body.			
2.07.02	Ball valves for sizes up to and including 300 NB shall be of class 150 full bore type. Body material for plug/Ball valves shall be ASTM-A-216 GR. WCB. The ball shall be of SS-AISI-316 quality and plug material (for plug valves) shall be hardened steel to ASTM-A-216 Grade WCB with suitable heat treatment. Plug valves shall be self lubricated taper type of proven design.			
2.07.03	FO storage tank Inlet/fill line shall be provided with remote operated Ball valves. The details of valves shall be as per clause No.2.07.01 and 2.07.02. The actuator details shall be furnished by the bidder for Employer's approval.			
2.07.04	All ball valves shall conform to BS: 5351 and fire safe test shall conform to BS: 6755 part-2/ API 607. All plug valves shall conform to BS: 5353 and fire safe test shall meet the requirements of BS:6755 part-2. Fire safe certificates shall be submitted to Employer for approval. In absence of the certificates, the fire test shall be carried out by valve supplier.			
VSTPP-V (1X500 MW) STATION PIPING PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-A	SUB-SECTION-IIA-01 B-FO-M2	PAGE 3 OF 4


CLAUSE NO.	SCOPE OF SUPPLY AND SERVICES <div data-bbox="1305 123 1457 199" style="text-align: right;">  </div>														
3.00.00 3.01.00 3.03.00	<p>HOSES</p> <p>The hoses for LDO shall conform to BS:1435 (latest edition), type S-7. The design temperature of the oil is 105 deg.C. The length of the hose shall be 8000 mm and dia 75 NB. Both the end connections shall be galvanized in accordance with BS:729/zinc sprayed as per BS:2569, Part-1.</p> <p>Strainers :</p> <p>The strainers at the suction of various pumps shall be simplex type basket strainers. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least six (6) times the internal area of the connecting pipe lines. The strainer element shall be 40 mesh. Pressure drop across the strainers in new connection shall not exceed 1.5 MLC at full flow. The material of construction of various parts shall be as follows:</p> <table border="0"> <tr> <td>(a)</td><td>Body</td><td>:</td><td>MS to IS:2062 (min. 8mm thk) or Pipe to IS:3589 (min. 6.35 mm thk)</td></tr> <tr> <td>(b)</td><td>Strainer Element</td><td>:</td><td>Stainless Steel (AISI 316)</td></tr> <tr> <td>(c)</td><td>End connection</td><td>:</td><td>Flanged</td></tr> </table>			(a)	Body	:	MS to IS:2062 (min. 8mm thk) or Pipe to IS:3589 (min. 6.35 mm thk)	(b)	Strainer Element	:	Stainless Steel (AISI 316)	(c)	End connection	:	Flanged
(a)	Body	:	MS to IS:2062 (min. 8mm thk) or Pipe to IS:3589 (min. 6.35 mm thk)												
(b)	Strainer Element	:	Stainless Steel (AISI 316)												
(c)	End connection	:	Flanged												
VSTPP-V (1X500 MW) STATION PIPING PACKAGE	TECHNICAL SPECIFICATION SECTION-VI PART-A	SUB-SECTION-IIA-01 B-FO-M2	PAGE 4 OF 4												

Material of Construction






1.00.00

LDO STORAGE TANKS:

- | | | |
|------|--------------------------------|---|
| i) | Type of Construction | Vertical, Cylindrical, non-pressure, fixed roof type with atmospheric vents |
| ii) | Codes | Design and construction as per IS:803 |
| iii) | Design pressure | |
| | a) Internal Pressure | 66Kgf/m ² |
| | b) Vacuum | 63.5Kgf/m ² |
| iv) | Design Temperature | Ambient Temperature |
| v) | * Capacity cu.m | 1400 cu meter |
| vi) | * Dimensions (I.D x height) | 14 m dia x 9 m ht. (min.) |
| vii) | Material of construction | |
| | a) Tank Shell, roof and bottom | IS: 2062 Tested quality steel plates |
| | b) Structural | IS: 2062 Tested quality steel plates |
- * Note: Bidder has to offer the tanks as per the dimensions indicated at (vi) above. Height of the tank shall mean the vertical distance between tank bottom upto bottom of overflow nozzle.
- | | | |
|-------|---|---|
| viii) | Corrosion Allowance (minimum) | ----- 1.8 mm ----- |
| ix) | Shell Joint efficiency factor | ----- 0.85 ----- |
| x) | Vent | Tank shall be provided with open and free flow type atmospheric vent, which allows unimpeded flow of vapors out of and allows air into tank and at the same time prevents rain and air-borne dust from getting into the tank. |
| xi) | Nominal Venting capacity Shall be obtained by reference to API guide for tank venting (API-200) | |
| | c) Design Parameters: | |
| | - Construction code | IS: 2825, Class2/ ASME Section-VIII, Divn. I |
| | - Mechanical standard code | TEMA, Class C |

	TECHNICAL SPECIFICATION FOR FUEL OIL HANDLING SYSTEM 1X500MW VINDHAYACHAL STPP, STAGE- V	SPECIFICATION NO. PE-TS-389-166-A001	
		VOLUME II-B	SECTION 'C' - ANNEXURE-III
		REVISION 00	DATE:

ANNEXURE-III

	Name of Contract Package: Fuel Oil system Sub Contractor: M/s Thermosystems Pvt. Ltd.	QAP FOR MS PLATES & STRUCTURAL STEEL BHEL Doc. No. PE-V0-356-166-A701 TSPL Doc. No. TSPL-P197-QAP-801 Rev. Date: 03.03.2012	 										
Sl. No.	Component & Operation	Characteristics	Class	Type/Method of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks	
										M	V	C	
Raw Material													
1	MS Plate & Structure	Chemical Composition	Major	Chemical Analysis	One sample/ cast/batch/ heat	Manufacturer's Test Certificate	Relevant code/ IS 2062 Grade B/ Grade A	MTC	P	R	R		
2	MS Plate & Structure	Mechanical	Major	Mechanical Properties	One sample/ cast/batch/ heat	Manufacturer's Test Certificate	Relevant code/ IS 2062 Grade B/ Grade A	MTC	P	R	R		
				Legend: M: Manufacturer V: TSPL C: BHEL	P: Perform R: Review								
Sub Contractor	Signature	Contractor		MTC: Manufacturer's Test Certificate									

Digitally signed
by RB YADAV

DN: cn=RB

By YADAV, o=BHEL, Approved By






ou=PEM,

email=ram@bhe



lpem.co.in, c=IN



Date: 2012.03.05



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	Name of Contract Package: Fuel Oil system Sub Contractor: M/s Thermosystems Pvt. Ltd.	QAP FOR PIPES & FITTINGS BHEL Doc. No. PE-V0-356-166-A702 TSPL Doc. No. TSPL-P197-QAP-802 Rev.0 Date: 23.10.2012											
Sl. No.	Inspection /Test Stage	Characteristics	Class	Type/Method of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	Agency	Remarks			
									P	W	V		
Inprocess & final Inspection													
1	Pipe	Chemical Composition	Major	Chemical Analysis	One sample/ heat	Manufacturer's Test Certificate	As per ASTM A106/ANSI B36.10	MTC	3	2	1		
		Hydro test	Major	Leack test	100%	Manufacturer's Test Certificate	As per ASTM A106/ANSI B36.10	MTC	3	2	1		
		Surface dimensional end finish marking coating	Major	visual measurement visual measurement visual	10% 10% 1% 1% 1%	Manufacturer's Test Certificate	As per ASTM A106/ANSI B36.10	MTC	3	2	1		
2	Fitting	Surface dimensional end finish marking coating	Major	visual measurement visual measurement visual	Random	Manufacturer's Test Certificate	As per ASTM A234 WPB or ANSI B16.9/B16.11	MTC	3	2	1		
				Legend: 1: BHEL/TCE 2: BHEL/ TSPL 3: Manufacturer									
Sub Contractor	Contractor	Signature		MTC: Manufacturer's Test Certificate									



Name of Contract Package: Fuel Oil system			QAP FOR PRESSURE INDICATOR BHEL Doc. No. PE-V0-356-166-A706 TSPL Doc. No. TSPL-P197-QAP-806 Date: 29.07.2013					TATA			BHEL					
Sub Contractor: M/s Thermosystems Pvt. Ltd.			Manufacturer : GENERAL INSTRUMENTS CONSORTIUM													
Sl. No.	Inspection /Test Stage/Components	Characteristics	Class	Type/Method of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks				
									P	W	V					
1.0 RAW MATERIALS & BOUGHT OUT ITEMS																
1.1	CASING,BOURDON TUBE & MOVEMENT	Chemical composition	MA	CHEMICAL TEST	1 sample from each lot	as per approved drawings	as per approved drawings	Test certificate	3	3	2,1	Test certificate/IR/ log book review only				
		WORKMANSHIP ,FINISH & DIMENSIONS					VISUAL MEASUREMENT	100%					as per approved drawings	IR/log book	3	3
		CONTACT TYPE & NUMBER	MA	VISUAL	100%	as per approved drawings	as per approved drawings	Test certificate/IR	3	3	2,1					
2.0 ASSEMBLY																
2.1	ASSEMBLY	Marking-tag No,model,range	MA	VISUAL	100%	as per approved drawings	as per approved drawings	Inspection report	3	2	2,1	Inspection report review only				
		Workmanship					as per approved drawings						as per approved drawings	3	2	2,1
		dial size,scale graduation					as per approved drawings						as per approved drawings	3	2	2,1
		End connection					as per approved drawings						as per approved drawings	3	2	2,1
		Switch contact type & Nos.					as per approved drawings						as per approved drawings	3	2	2,1
3.0 ROUTINE TEST																
3.1	ROUTINE TEST	CALIBRATION,ACCUARACY,HYSTRESIS,OVERLOAD,SET POINT,ADJUSTMENT&REPEATABILITY	CR	measurement	100%	as per approved drawings	as per approved drawings	Inspection report	3	2	2,1	Inspection report review only				
		Hydraulic Test					MEASUREMENT						100%	as per approved drawings	Inspection report	3

4.0 Type test												
4.1	Type test	enclosure protection class	CR	varification	each Type	as per approved drawings	as per approved drawings	Test certificate	3	2	2,1	Test certificate review only
		blow out disc	CR	varification	each Type	as per approved drawings	as per approved drawings	Test certificate	3	2	2,1	Test certificate review only
		switch contact rating	CR	varification	each Type	as per approved drawings	as per approved drawings	Test certificate	3	2	2,1	Test certificate review only
5.0 Painting												
5.1	Painting	shade & finish	MA	VISUAL	100%	as per approved drawings	as per approved drawings	Inspection report	3	2	2,1	Inspection report review only
6.0 Packing												
6.1	Packing	Soundness of packing	MA	AS PER MANUFACTURING STANDARD	100%	PACKING LIST	AS PER MANUFACTURING STANDARD	PACKING LIST	3	2	2,1	PACKING LIST review
				Legend:		P: Perform W: Witness V: Verification						
Thermosystem pvt.ltd.		Contractor		MTC: Manufacturer's Test Certificate				Reviewed By		Approved By		
Sub Contractor		Signature										

Name of Contract Package: Fuel Oil system Sub Contractor: M/s Thermosystems Pvt. Ltd.		QAP FOR DIFFERENTIAL PRESSURE INDICATOR BHEL Doc. No. PE-V0-356-166-A706 TSPL Doc. No. TSPL-P197-QAP-806 Date: 29.07.2013 Manufacturer : Baumer Technologies India Pvt. Ltd.																	
Sl. No.	Inspection /Test Stage/Components	Characteristics	Class	Type/Method of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks							
									P	W	V								
1.0 RAW MATERIALS & BOUGHT OUT ITEMS													Test certificate/IR/ log book review only						
1.1	CASING,BOURDON TUBE & MOVEMENT	Chemical composition	MA	CHEMICAL TEST	1 sample from each lot	as per approved drawings	as per approved drawings	Test certificate	3	3	2,1								
		WORKMANSHIP ,FINISH & DIMENSIONS										VISUAL MEASUREMENT		100%	as per approved drawings	IR/log book	3	3	2,1
1.2	SWITCH	CONTACT TYPE & NUMBER	MA	VISUAL	100%	as per approved drawings	as per approved drawings	Test certificate/IR	3	3	2,1								
2.0 ASSEMBLY													Inspection report review only						
2.1	ASSEMBLY	Marking-tag No,model,range	MA	VISUAL	100%	as per approved drawings	as per approved drawings	Inspection report	3	2	2,1								
		Workmanship										VISUAL		100%	as per approved drawings	as per approved drawings	3	2	2,1
		dial size,scale graduation										VISUAL		100%	as per approved drawings	as per approved drawings	3	2	2,1
		End connection										MEASUREMENT		100%	as per approved drawings	as per approved drawings	3	2	2,1
		Switch contact type & Nos.		VISUAL	100%	as per approved drawings	as per approved drawings		3	2	2,1								
3.0 ROUTINE TEST													Inspection report review only						
3.1	ROUTINE TEST	CALIBRATION,A CCUARACY,HYS TRESIS,OVERLO AD,SET POINT,ADJUST MENT&REPEAT ABILITY	CR	measurement	100%	as per approved drawings	as per approved drawings	Inspection report	3	2	2,1								
		Hydraulic Test										MEASUREMENT	100%	as per approved drawings	as per approved drawings	Inspection report	3	2	2,1




4.0 Type test											
4.1	Type test	enclosure protection class	CR	varification	each Type	as per approved drawings	as per approved drawings	Test certificate	3	2	Test certificate review only
		blow out disc	CR	varification	each Type	as per approved drawings	as per approved drawings	Test certificate	3	2	Test certificate review only
		switch contact rating	CR	varification	each Type	as per approved drawings	as per approved drawings	Test certificate	3	2	Test certificate review only
5.0 Painting											
5.1	Painting	shade & finish	MA	VISUAL	100%	as per approved drawings	as per approved drawings	Inspection report	3	2	Inspection report review only
6.0 Packing											
6.1	Packing	Soundness of packing	MA	AS PER MANUFACTURING STANDARD	100%	PACKING LIST	AS PER MANUFACTURING STANDARD	PACKING LIST	3	2	PACKING LIST review
 Thermosystem pvt.ltd.				Legend:		P: Perform W: Witness V: Verification					
Sub Contractor		Contractor		MTC: Manufacturer's Test Certificate		Reviewed By		Approved By			
		Signature									




		Name of Contract Package: Fuel Oil system Sub Contractor: M/s Thermosystems Pvt. Ltd.		QAP FOR TEMPERATURE INDICATOR BHEL Doc. No. PE-V0-356-166-A706 TSPL Doc. No. TSPL-P197-QAP-806 Date: 29.07.2013 Manufacturer : Baumer Technologies India Pvt. Ltd.								
Sl. No.	Inspection /Test Stage/Compone	Characteristics	Class	Type/Method of check	Quantum of check	Reference Documents	Acceptanc e Norms	Format of Record	Agency			Remarks
									P	W	V	
1.0 RAW MATERIALS & BOUGHT OUT ITEMS												
1.1	Capillary bulb & thermowell	Chemical composition	CR	CHEMICAL TEST	1 sample from each lot	as per approved drawings	as per approved drawings	Test certificate	3	3	2,1	Test certificate /IR/ log book review only
		marking	MA	VISUAL	100%	as per approved drawings	as per approved drawings	log book	3	3	2,1	
		Dimensions	MA	MEASUREMENT	100%	as per approved drawings	as per approved drawings	log book	3	3	2,1	
1.2	Casing & Bezel	material	MA	CHEMICAL TEST	sample	as per approved drawings	as per approved drawings	Test certificate/I R	3	3	2,1	
		defect		VISUAL	100%	as per approved drawings	as per approved drawings	log book	3	3	2,1	
		Dimensions		MEASUREMENT	sample	as per approved drawings	as per approved drawings	log book	3	3	2,1	
		Threading		thread Matching	100%	as per approved drawings	as per approved drawings	log book	3	3	2,1	
1.3	Dial	Size,range,scale length,least count,spacing & graduation	MA	MEASUREMENT & VISUAL	sample	as per approved drawings	as per approved drawings	log book	3	3	2,1	
		Colour		VISUAL	100%	as per approved drawings	as per approved drawings	log book	3	3	2,1	
		Resistance to dry heat & hot water		OVEN & BATH	sample	as per approved drawings	as per approved drawings	log book	3	3	2,1	
1.4	COMPLETE SENSING ELEMENT	Correct assembly & workmanship	MA	VISUAL	100%	as per approved drawings	as per approved drawings	log book	3	3	2,1	
		Dimensions		MEASUREMENT	100%	as per approved drawings	as per approved drawings	log book	3	3	2,1	
		Welding & other defects		VISUAL	100%	as per approved drawings	as per approved drawings	log book	3	3	2,1	
1.5	Thermowell	Dimensions ,thickness,concentricity of bore OD & length	MA	MEASUREMENT	100%	as per approved drawings	as per approved drawings	log book	3	3	2,1	
		Leak test	CR	hyd. Test at 1.5 times of design pressure	100%	as per approved drawings	as per approved drawings	inspection report	3	3	2,1	
		Threading	MA	thread Matching	100%	as per approved drawings	as per approved drawings	inspection report	3	3	2,1	
2.0 Final inspection												
2.1	ASSEMBLY	correct assembly,workmanship & finish	MA	VISUAL & Measurement	100%	as per approved drawings	as per approved drawings	Inspection report	3	2	2,1	Test certificate /IR/ log book
		mounting & connection		VISUAL	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		dia scale		VISUAL	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		Cleanliness		VISUAL	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		Marking		VISUAL	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
2.2	ROUTINE TEST	Accuracy										




			MA	measurement	100%	as per approved drawings	as per approved drawings	Test report	3	2	2,1	www review only
		Overload	CR	MEASUREMENT	10%	as per approved drawings	as per approved drawings	Test report	3	2	2,1	
		Response Time	MA	MEASUREMENT	10%	as per approved drawings	as per approved drawings	Test report	3	2	2,1	
2.3	Type test	ambient temp	MA	MEASUREMENT	sample	as per approved drawings	as per approved drawings	Test certificate	3	2	2,1	
		Weather proofness	CR	MEASUREMENT	sample	as per approved drawings	as per approved drawings	Test certificate	3	2	2,1	
3.0 Packing												
3.1	Packing	Soundness of packing	MA	AS PER MANUFACTURING STANDARD	100%	PACKING LIST	AS PER MANUFACTURING STANDARD	PACKING LIST	3	2	2,1	PACKING LIST review
 Thermosystem pvt.ltd.					Legend:							
					1: BECL/TCE			P: Perform				
					2:BHEL/ TSPL			W: Witness				
					3.Manufacturer			V: Verificat				
Sub Contractor			Contractor		MTC: Manufacturer's Test Ce			Reviewed By		Approved By		
Signature												



QAP FOR LEVEL INDICATOR






		Name of Contract Package: Fuel Oil system Sub Contractor: M/s Thermosystems Pvt. Ltd.		QAP FOR LEVEL INDICATOR BHEL Doc. No. TSPL Doc. No. Date: LOI/PO: P197-LOI-19 DATED 06.08.2012 Manufacturer : Chemtrols Samil(india) Pvt. Ltd.								
Sl. No.	Inspection /Test Stage/Component	Characteristics	Class	Type/Method of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks
									P	W	V	
1	Flanges	Dimension & material specification	Major	Chemical Analysis	one sample per heat or lot	Specification /Approved Drawing	Specification /Approved Drawing	MTC/IR	3	-	1,2	-
2	Float	Dimension & material specification	Major	Chemical Analysis	one sample per heat or lot	Specification /Approved Drawing	Specification /Approved Drawing	TC/IR	3	-	1,2	-
3	Studs/Nuts	Dimension & material specification	Major	Visual Examination	100%	Specification /Approved Drawing	Specification /Approved Drawing	COC/IR	3	-	1,2	-
4	Assembly	Dimension & material specification	Major	Dimensional Check Visual	100%	Specification /Approved Drawing	Specification /Approved Drawing	IR/COC	3	-	1,2	-
5	Painting	Painting specification	Major	-	-	CSIPL standard	CSIPL standard	IR	3	-	1,2	-
6	Packing	-	Major	Road Worthy Packing	100%	CSIPL standard	CSIPL standard	-	3	-	1,2	-
				Legend: 1: BECL/TCE 2:BHEL/ TSPL 3:Manufacturer MTC: Manufacturer's Test Certificate						Approved By		
Thermosystem pvt. ltd. Sub Contractor		Contractor		Signature				Reviewed By		Approved By		






		Name of Contract Package: Fuel Oil system		QAP FOR PRESSURE SWITCH BHEL Doc. No. PE-V0-356-166-A706 TSPL Doc. No. TSPL-P197-QAP-806 Date: 29.07.2013								
Sub Contractor: M/s Thermosystems Pvt. Ltd.		Manufacturer : Switzer instrument Ltd.										
Sl. No.	Inspection /Test Stage/Compone	Charactoristics	Class	Type/Met hod of	Quantum of check	Reference Document	Acceptanc e Norms	Format of Record	Agency			Remarks
									P	W	V	
1.0 RAW MATERIALS												
1.1	Sensing Element,casing,c ontact, process connection	Chemical composition	MA	Chemical Analysis	1 sample from each lot	as per approved drawings	as per approved drawings	test report	3	2	2,1	TC/IR review only
		make,marking, Damage & Cracks	MA	Visual	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		Leakage	MA	Pressure Test	100%	as per approved drawings	no leak	log book	3	2	2,1	
	Micro Switch	No & type of contacts	MA	Visual	100%	as per approved drawings	no leak	log book	3	2	2,1	
		continuity	CR	electrical	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
2.0 FINAL INSPECTION												
2.1	ASSEMBLY	MARKING,RANG,MODEL,TAG No,SI No.	MA	visual	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	TC/IR review only
		Correct assembly,Wor kmanship & finish	MA	visual	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		Connection	MA	visual & measure ment	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
		Scale marking	MA	visual	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
		Cleanliness	MA	visual	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		Over all dimensions	MA	visual	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
2.2	Routine Test	Over load	CR	measure ment	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
		Repeatability	CR	measure ment	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
		Set Point adjustment	CR	measure ment	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	






		Differential	CR	measure ment	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
		Contact rating	CR	measure ment	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
		insulation resistance & HV	CR	electrical	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
2.3	Type Test	Weather proofness	CR	measure ment	sample/d esign	as per approved drawings	as per approved drawings	test report	3	2	2,1	
3.0 Packing												
3.1	Packing	Soundness of packing	MA	visual	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
				Legend:								
Thermosystem pvt.ltd.				1: BECL/TCE		P: Perform						
				2:BHEL/ TSPL		W: Witness						
				3.Manufacturer		V: Verification						
Sub Contractor		Contractor		MTC: Manufacturer's Test Certificate				Reviewed By		Approved By		
Signature												

		Name of Contract Package: Fuel Oil system			QAP FOR DIFFERENTIAL PRESSURE SWITCH BHEL Doc. No. PE-V0-356-166-A706 TSPL Doc. No. TSPL-P197-QAP-806 Date: 29.07.2013							
Sub Contractor: M/s Thermosystems Pvt. Ltd.		Manufacturer : Switzer instrument Ltd.										
Sl. No.	Inspection /Test Stage/Compone	Charactoristics	Class	Type/Met hod of	Quantum of check	Reference Document	Acceptanc e Norms	Format of Record	Agency			Remarks
									P	W	V	
1.0 RAW MATERIALS												
1.1	Sensing Element,casing,c ontact, process connection	Chemical composition	MA	Chemical Analysis	1 sample from each lot	as per approved drawings	as per approved drawings	test report	3	2	2,1	TC/IR review only
		make,marking, Damage & Cracks	MA	Visual	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		Leakage	MA	Pressure Test	100%	as per approved drawings	no leak	log book	3	2	2,1	
	Micro Switch	No & type of contacts	MA	Visual	100%	as per approved drawings	no leak	log book	3	2	2,1	
		continuity	CR	electrical	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		2.0 FINAL INSPECTION										
2.1	ASSEMBLY	MARKING,RANG,MODEL,TAG No,SI No.	MA	visual	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	TC/IR review only
		Correct assembly,Wor kmanship & finish	MA	visual	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		Connection	MA	visual & measurement	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
		Scale marking	MA	visual	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
		Cleanliness	MA	visual	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		Over all dimensions	MA	visual	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
2.2	Routine Test	Over load	CR	measure ment	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
		Repeatability	CR	measure ment	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
		Set Point adjustment	CR	measure ment	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	


		Differential	CR	measure ment	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
		Contact rating	CR	measure ment	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
		insulation resistance & HV	CR	electrical	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
2.3	Type Test	Weather proofness	CR	measure ment	sample/d esign	as per approved drawings	as per approved drawings	test report	3	2	2,1	
3.0 Packing												
3.1	Packing	Soundness of packing	MA	visual	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
 Thermosystem pvt.ltd.				Legend:								
				1: BECL/TCE		P: Perform						
				2:BHEL/ TSPL		W: Witness						
				3.Manufacturer		V: Verification						
Sub Contractor		Contractor		MTC: Manufacturer's Test Certificate			Reviewed By		Approved By			
Signature												


		Name of Contract Package: Fuel Oil system Sub Contractor: M/s Thermosystems Pvt. Ltd.		QAP FOR LEVEL SWITCH BHEL Doc. No. PE-V0-356-166-A706 TSPL Doc. No. TSPL-P197-QAP-806 Date: 29.07.2013 Manufacturer : Levcon Instruments Pvt.Ltd.								
Sl. No.	Inspection /Test Stage/Components	Characteristics	Class	Type/Method of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks
									P	W	V	
1.0 RAW MATERIALS												
1.1	Non wetted parts	Physical & Chemical Properties	MA	Physical & Chemical Analysis	1/cast	as per approved drawings	as per approved drawings	test report	3	2	2,1	TC/IR review only
1.2	Float assembly & wetted parts	Physical & Chemical Properties: float, Chemical Properties: wetted parts	MA	Physical & Chemical Analysis	1/batch	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
1.3	Chamber	Dimensions & leak tightness	MA	measurement, visual, hyd test	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
1.4	Float	Leak Tightness	MA	hyd. Test	100%	as per approved drawings	no leakage	inspection report	3	2	2,1	
1.5	Switch	make, type & rating	MA	visual	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
		contact continuity	CR	electrical	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
2.0 FINAL INSPECTION												
2.1	ASSEMBLY	MARKING, RANG, MODEL, TAG No, SI No.	MA	visual	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	TC/IR review only
		Correct assembly, workmanship & finish	MA	visual	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		Connection	MA	visual & measurement	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
		Scale marking	MA	visual	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
		Cleanliness	MA	visual	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
		Over all dimensions	MA	visual	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
2.2	Routine Test	Over load	CR	measurement	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
		Repeatability	CR	measurement	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
		Set Point adjustment	CR	measurement	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
		Differential	CR	measurement	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
		Contact rating	CR	measurement	100%	as per approved drawings	as per approved drawings	inspection report	3	2	2,1	
		insulation resistance & HV	CR	electrical	100%	as per approved drawings	as per approved drawings	test report	3	2	2,1	
2.3	Type Test	Weather proofness	CR	measurement	sample/design	as per approved drawings	as per approved drawings	test report	3	2	2,1	
2.4	Packing	Soundness of packing	MA	visual	100%	as per approved drawings	as per approved drawings	log book	3	2	2,1	
 Thermosystem pvt.ltd.				Legend: 1: BECL/ TCE 2: BHEL/ TSPL 3: Manufacturer				P: Perform W: Witness V: Verification				
Sub Contractor		Contractor		MTC: Manufacturer's Test Certificate				Reviewed By		Approved By		
Signature												


		Name of Contract Package: Fuel Oil system Sub Contractor: M/s ThermoSystems Pvt. Ltd.			BHEL Doc. No. PE-V0-356-166-A706 TSPIL Doc. No. TSPL-P197-QAP-806 Date: 29.07.2013 Product: ZTD Manufacturer : Baumer Technologies India pvt. Ltd.						
Sl. No.	Inspection / Test Stage/Components	Characteristics	Class	Type/Method of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	Agency		Remarks
									P	W	V
1.0 RAW MATERIALS & BOUGHT OUT ITEMS											
1.1	Diaphragm	Chemical composition	MA	Material test	1 sample from each lot	as per approved drawings	as per approved drawings	Lab certificate	3	3	2,1
1.2	Chamber		MA				as per approved drawings				
2.0 INPROCESS INSPECTION											
2.1	Dimension	Measurement	MA	Dimension	10%	as per approved drawings	as per approved drawings	Q.C.Record	3	2	2,1
2.2	Process Conn		Thread	10%	as per approved drawings	as per approved drawings	Q.C.Record	3	2	2,1	
3.0 FINAL INSPECTION & TESTING											
3.1	Performance Check	scale accuracy	MA	measurement	100%	as per approved drawings	calibration certificate	Material test Certificate	3	2	2,1
		Leak Test									
		Electrical continuity test									
		electric strength test									
		Switching differential test									
3.2	finished	Weather proof test	MA	Type test for ingress protection IP 65 visual	1 sample per design	IS -13947 PART-1	IS -13947 PART-1	Lab certificate	3	2	2,1
		Identification/T ag no									
4.0 Packing											
4.1	Packing	Soundness of packing	MA	AS PER MANUFACTURING STANDARD	100%	PACKING LIST	AS PER MANUFACTURING STANDARD	PACKING LIST	3	3	2,1
 Thermosystem pvt.ltd.			Legend:								
			1: BECL/TCE								
			2:BHEL/ TSPL								
			3.Manufacturer								
Sub Contractor		Contractor		MTC: Manufacturer's Test Certificate		Reviewed By		Approved By			
Signature											

				Name of Contract Package: Fuel Oil system Sub Contractor: M/s Thermosystems Pvt. Ltd.				QAP FOR TEMPERATURE SWITCH BHEL Doc. No. PE-V0-356-16G-A706 TSPL Doc. No. TSPL-P197-QAP-806 Date: 29.07.2013 Product: W1 Manufacturer : Baumer Technologies India Pvt. Ltd.							
Sl. No.	Inspection /Test Stage/Components	Characteristics	Class	Type/Method of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	P	Agency W	V	Remarks			
1.0 RAW MATERIALS & BOUGHT OUT ITEMS															
1.1	Bar	Chemical composition	MA	Material test	1 sample from each lot	as per approved drawings	as per approved drawings	Lab certificate	3	3	2,1	lab certificate review only			
2.0 INPROCESS INSPECTION															
2.1	Dimension	Measurement	MA	vernier	10%	as per approved drawings	as per approved drawings	Q.C.Record	3	2	2,1	QC record review only			
2.2	Process Conn			Thread guage	10%	as per approved drawings	as per approved drawings	Q.C.Record	3	2	2,1				
3.0 FINAL INSPECTION & TESTING															
3.1	Performance Check	hydro test identification/Tag no	MA	Leakage visual	100%	as per approved drawings	as per approved drawings	compliance test certificate	3	2	2,1	compliance test certificate review only			
3.2	finished composition				100%		3	2	2,1						
4.0 Packing															
4.1	Packing	Soundness of packing	MA	AS PER MANUFACTURING STANDARD	100%	PACKING LIST	AS PER MANUFACTURING STANDARD	PACKING LIST	3	3	2,1	PACKING LIST review			
								Legend: 1: BECL/TCE 2:BHEL/ TSPL 3.Manufacturer MTC: Manufacturer's Test Certificate							
Thermosystem pvt.ltd.				Contractor				Reviewed By							
Signature				Signature				Approved By							

QAP FOR TEMPERATURE ELEMENT

MANUFACTURER : PYRO ELECTRIC INSTRUMENTS		MANUFACTURING QUALITY PLAN			Tpp CUSTOMER : M/s BHEL, PEM, Noida . PACKAGE : FOHS LOI NO. : P-197/B/16/5788 Dtd.		BHEL QAP NO. : TSPL QAP NO. REVISION DATE SHEET NO.					
ITEM : RTD ASSEMBLIES WITH THREADED THERMOWELLS		CHARACTERISTICS / ITEM	CLASS	TYPE /METHOD OF CHECK	QUANTUM OF CHECK	DOCUMENTS REFERRED	ACCEPTANCE NORM	FORMAT OF RECORD	INSP. AGENCY			
									P	W	V	RMK
SRL NO.	COMPONENTS / OPERATION											
1	RTD INSERT	ROUTINE TEST										
		A) DIMENSIONS + VISUAL TYPE	MA	MEASUREMENT	100%	APP'D DRGS	APP'D DRGS	TEST REPORT	3	-	2,1	
		B) CONTINUITY	MA	ELECTRICAL	100%	PROCEDURE INSTRUCTION	PROCEDURE INSTRUCTIONS	TEST REPORT	3	-	2,1	
		C) POLARITY	MT	ELECTRICAL	100%	PROCEDURE INSTRUCTION	PROCEDURE INSTRUCTIONS	TEST REPORT	3	-	2,1	
		D) IR TEST AT AMBIENT at 500Vdc	MA	ELECTRICAL	100%	PROCEDURE INSTRUCTION	PROCEDURE INSTRUCTIONS	TEST REPORT	3	-	2,1	
		E) LEAK TEST AT 7KG/CM2	MA	ELECTRICAL	100%	PROCEDURE INSTRUCTION	NO LEAKAGE	TEST REPORT	3	-	2,1	
		F) IDENTIFICATION CODE	CT	VISUAL	100%	IDENTIFICATION CODES	IEC 751	TEST REPORT	3	-	2,1	
2	RTD INSERTS	A) CALIBRATION AT 5 POINTS at 0Deg C, 100Deg C & 200Deg C.	MA	ELECTRICAL	100%	IEC 751, CLASS A	IEC 751, CLASS A	TEST REPORT	3	-	2,1	
3	HEAD	FLAMEPROOF	MA/CR	TESTING	EXPROOF	IS:2148, GR IIA,IIB	TEST CERTIFICATE & TEST REPORT	Central Institute of Mining & Fuel Reasearch CERTIFICATE	3	-	2,1	
CATEGORY : CR : CHAR AFFECTING SAFETY OF EQPT AND PERSONS MT : CHAR AFFECTING APPERANCE MA : CHAR AFFECTING PERFORMANCE CT : CHAR AFFECTING TRACEABILITY AND IDENTIFICATION												
MANUFACTURER SUBCONTRACTOR						REVIEWED BY			NAME & SIGNATURE OF APPROVING AUTHORITY			
<div style="text-align: center;">  SIGNATURE C/QA/016/QAP.PR112.3710/R2 </div>						LEGEND :			BHEL DOC NO. PE-V0-356-166-A722			
						1-BECL/TCE 2-BHEL/TSPL 3-MANUFACTURER(MICON)			Performing the test w- Agency report MTC - Material test cert. COC - cert. of compliance Mfrgr- Manufacturer Manufacturer As per Approved Sub Vendor List :			REV 0

MANUFACTURER : 			MANUFACTURING QUALITY PLAN ITEM : RTD ASSEMBLIES WITH THREADED THERMOWELLS			Tpp CUSTOMER : M/s BHEL, PEM, Noida . PACKAGE : FOHS LOI NO. : P-197/B/16/5788 Dtd.			BHEL QAP NO. : TSPL QAP NO. REVISION DATE 5/3/2013 SHEET NO. 2 OF 2 W.O. 572						
SRL NO.	COMPONENTS / OPERATION	CHARACTERISTICS / CHECKED	CAT	TYPE /METHOD OF CHECK	QUANTUM OF CHECK	DOCUMENTS REFERED	ACCEPTANCE NORM	FORMAT OF PLAN	INSP. AGENCY <table border="1"> <tr> <td>P</td> <td>W</td> <td>V</td> </tr> </table>			P	W	V	RMK
P	W	V													
4	RAW MATERIAL FOR THERMOWELL ROD	METALLURGY	MA	CHEMICAL COMPOSITION	PER LOT	ASTM A 479 ASTM A 262	ASTM A 479	INHOUSE /VENDOR TEST CERTIFICATE	3	-	2,1				
5	THERMOWELLS	A) DIMENSIONS+ VISUAL CHECK	MA	MEASUREMENT	100%	APP.DRGS/ P.O.SPECS	APP.DRGS/ P.O.SPECS	TEST REPORT	3	-	2,1				
		B)THERMOWELL MATERIAL INTEGRITY	CR	HYDROTEST INTERNALLY	100%	PROCEDURE INSTRUCTION	NO LEAKAGE	TEST REPORT	3	2	2,1				
CATEGORY : CR : CHAR AFFECTING SAFETY OF EQPT AND PERSONS MT : CHAR AFFECTING APPEARANCE MA : CHAR AFFECTING PERFORMANCE CT : CHAR AFFECTING TRACEABILITY AND IDENTIFICATION															
MANUFACTURER SUBCONTRACTOR SIGNATURE				LEGEND : 1-BECL/TCE 2-BHEL/TSPL 3-MANUFACTURER(MICON)				REVIEWED BY NAME & SIGNATURE OF APPROVING AUTHORITY		BHEL DOC NO. PE-VO-356-166-A722		REV 0			
				Performing the test w- Agency report MTC - Material test cert.											
				COC - cert. of compliance Mfg- Manufacturer As per Approved Sub Vendor List :											
Note : 1) w - Witnessed by customer will be carried out on 10% of the order quantity & balance items review internal results 2) R-Review documents . C/QA/016/QAP.PRTT12.3710/R2															

	Name of Contract Package: Fuel Oil system Sub Contractor: M/s Thermosystems Pvt. Ltd.		QAP FOR LEVEL TRANSMITTER BHEL Doc. No. PE-V0-356-166-A706 TSPL Doc. No. TSPL-P197-QAP-806 Date: 2.05.2013 Manufacturer : Emerson Process Management(india) Pvt. Ltd.							
Sl. No.	Inspection /Test Stage/Components	Characteristics	Class	Type/Method of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	Agency	Remarks
Raw Materials										
1	Raw materials& components (Diaphragm,sensing material,housing,Electronic & other component)	Material properties,size, rating,make,type	Major	Internal test /Check	As per apr. draw& data sheet	Manuf.drawing/catalog	As per apr. draw& data sheet	Internal test report	3	
Inprocess Inspection										
2	Assembly& fitting	soundness of fitting,connections & terminal making	Major	Verification	100%	Manuf.drawing/catalog	As per apr. draw& data sheet	Internal test report	3	
Final Inspection										
3	Routine Test	a) General finish& visual verification	Major	Visual	10%	Manuf.drawing/catalog	As per apr. draw& data sheet	TC	3	2,3 1,2
		b) Calibration Check	Critical	Electrical	5%	Manuf.drawing/catalog	As per apr. draw& data sheet	TC	3	2,3 1,2
		c) Connection check	Major	Visual	5%	Manuf.drawing/catalog	As per apr. draw& data sheet	TC	3	2,3 1,2
		d) Operation check	Major	Electrical	5%	Manuf.drawing/catalog	As per apr. draw& data sheet	TC	3	2,3 1,2
Packing & dispatch										
4	Packing & dispatch	soundness of packing against transit damage	Major	Verification	100%	PO specification	PO specification	Internal report	3	
<div data-bbox="1177 1899 1251 1966" data-kind="parent" data-rs="4">  </div> <div data-bbox="1177 1361 1267 1518" data-kind="parent" data-rs="4">  </div> <div data-bbox="1177 1014 1283 1339" data-kind="parent" data-rs="4"> Legend: 1: BECL/TCE 2:BHEL/ TSPL 3.Manufacturer P: Perform W: Witness V: Verification </div> <div data-bbox="1177 857 1283 1003" data-kind="parent" data-rs="4"></div>										
Thermosystem pvt.ltd.			Contractor			MTC: Manufacturer's Test Certificate			Reviewed By	
Sub Contractor			Signature						Approved By	

QUALITY ASSURANCE PLAN											
CLIENT:- THERMOSYSTEM PVT.LTD.				PROJECTS:- 2x250 MW BHAVNAGAR TPP				QAP NO:- 535			
P.O.NO:- LOI-P-197-LOI-7				DATE: 22.05.2012				REV NO: 01			
MICON VALVES (I) PVT.LTD 7, WADEE MANZIL, 2ND FLOOR, OPP. MEMON CO.OP. BANK, 75-77E, LADY JAMSHEDJI RD, MAHIM, MUMBAI - 16				P.O.NO:- LOI-P-197-LOI-7				DATE: 06.06.2012.			
MUMBAI - 16				P.O.NO:- LOI-P-197-LOI-7				PAGE NO: 1 OF 4			
MUMBAI - 16				P.O.NO:- LOI-P-197-LOI-7				AGENCY REMARKS			
SL NO	COMPONENT & OPERATIONS	CHARATERISTICS	TYPE & METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTAN CE NORMS	FORMAT OF RECORD	P	W	V	
1	RAW MATERIAL										
1.1	Castings (Body, Side Pc & Ball	a. Verification	Material Tc	100%	Appr. Drg. Tech, Specs	Appr Drg & Tech, specs	Material TC	3	3/2	1,2	
		b. Size / Class	Material Tc	100%	Appr. Drg. Tech, Specs	Appr. Drg & Tech, specs	Material TC	3	3/2	1,2	
		c. Material ID	Material Tc	100%	Appr. Drg. Tech, Specs	Appr Drg Tech, specs	Material TC	3	3/2	1,2	
		d. Heat No.	Material Tc	100%	Appr. Drg. Tech, Specs	Appr.Drg Tech, specs	Material TC	3	3/2	1,2	
		e. Surface Defect	Visual	100%	MSS-SP-55 ASTME B16.5 B16.10 B16.11	No crack acceptable ASTME B16.5 B16.10 B16.11	Inspection Report ASTME B16.5 B16.10 B16.11	3	3/2	1,2	
		f. Dimension	Vernier Scale	100%				3	3/2	1,2	
		g. Tensile Properties	Verification of foundry Tc	100%	Foundry TC for WCB	ASTM A216 GR WCB/A105		3	3/2	1,2	
		h. Chemical Properties	Verification of foundry Tc	100%	Foundry TC for WCB	ASTM A216 GR WCB/A105		3	3/2	1,2	
		i. Heat Treatment	Verification of foundry Tc	100%	Foundry TC for WCB	ASTM A216 GR WCB/A105		3	3/2	1,2	
1.2	SS Round Bar (Stem)	a. Dimension b. Chemical properties	Dimensional Check of main element	1 / lot/ size 1 / lot/size	SS 410 SS 304 SS 316	SS 410 SS 304 SS 316	LAB TC	3	3/2	1,2	

Note:-1. BECL/TCE
2. BHCL/TSPL
3. MANUFACTURER (MICON)



Customer's Inspector
(Sign & Stamp)

QUALITY ASSURANCE PLAN																					
MICON VALVES (I) PVT.LTD 7, WADEE MANZIL, 2ND FLOOR, OPP. MEMON CO.OP. BANK, 75-77E, LADY JAMSHEDJI RD, MAHIM, MUMBAI – 16				CLIENT:- THERMOSYSTEM PVT.LTD.								PROJECTS:- 2x250 MW BHAVNAGAR									
				P.O.NO:- LOI-P-197-LOI-7								DATE:-22.05.2012		TPP							
												DATE		QAP							
												PAGE		NO							
				SL NO		COMPONENT & OPERATIONS		CHARATERISTICS		TYPE & METHOD OF CHECK		EXTENT OF CHECK		REFERENCE DOCUMENT		ACCEPTANCE NORMS		FORMAT OF RECORD		AGENCY	
1.3		FASTENER		a. Dimension b. Tensile Properties c. Chemical Properties d. Heat Treatment		Dimensional Verification of Mfg. TC Verification of Mfg. TC		1/lot/size 100% 100% 100%		Appr. Drg Appr. Drg Appr. Drg Appr. Drg		Appr. Drg Appr. Drg Appr. Drg Appr. Drg		MFG TC MFG TC MFG TC		3 3 3 3		3/2 3/2 3/2 3/2		1.2 1.2 1.2 1.2	
1.4		GASKET		a. Dimension b. Chemical		Dimensional Mfg. TC		1/lot/size 1/lot/sizw		As per DRG & PO		Mfg. Drg Relevant STD		MFG TC —		3 3		3/2 3/2		1.2 1.2	
1.5		GLAND PACKING		a. Dimension		Dimensional		1/lot/size		As per DRG & PO		Mfg. Drg		MFG TC		3		3/2		1.2	
1.6		Lever		a. Dimension b. Surface Defect		Dimensional Visual		1/lot/size 100%		As per DRG & PO As per DRG & PO		Mfg. Drg Mfg. Drg		GRIR No crack acceptabl		3 3		3/2 3/2		1.2 1.2	

Note: 1. BECL/TCE

2. BHCL/TSPL

3. MANUFACTURER (MICON)



Customer's Inspector
(Sign & Stamp)



QUALITY ASSURANCE PLAN																	
MICON VALVES (I) PVT.LTD 7, WADEE MANZIL, 2ND FLOOR, OPP. MEMON CO.OP. BANK, 75-77E, LADY JAMSHEDJI RD, MAHIM, MUMBAI - 16				CLIENT: - THERMOSYSTEM PVT.LTD.				PROJECTS:- 2x250 MW BHAVNAGAR TPP									
				P.O.NO:- LOI-P-197-LOI-7				DATE:-22.05.2012				QAP NO:- 535		REV NO:- 01			
				TYPE & METHOD OF CHECK				EXTENT OF CHECK				REFERENCE DOCUMENT				ACCEPTANCE NORMS	
				SL.NO.				CHARACTERISTICS				FORMAT OF RECORD				AGENCY	
2.0				IN PROCESS INSPECTION								REMARKS					
2.1	Body/Side Pc & Ball	a. Machined Surface	Visual	100%	Mfg. Drg	No. Blow holes are acceptable Mfg. Drg.	In process report	3	3/2	1,2							
		b. Dimension	Dimensional	100%	Mfg Drg	No Blow Holes are acceptable Mfg. Drg	--	3	3/2	1,2							
2.1	Ball	Machine Surface	Visual	100%	Mfg Drg		In process report	3	3/2	1,2							
2.2	Components	b. Dimension	Dimension	100%	Mfg Drg	Mfg. Drg	In process report	3	3/2	1,2							
2.3	Assembly	Operational Test	i. Full Opening /Closing Test ii. Min Stem Projection iii. Smooth Operation	100%	APPR.DRG. P.O.	Mfg Std & Appr. drg.	In process report	3	3/2	1,2							
				100%	APPR.DRG. P.O.	Mfg. Std & Appr. drg	In process report	3	3/2	1,2							
				100%	APPR.DRG. P.O.	Mfg. Std & Appr. drg	In process report	3	3/2	1,2							
				100%	APPR.DRG. P.O.	Mfg. Std	In process report	3	3/2	1,2							

Note: 1. BECL/TCE

2. DRUG/TSPL

3. MUMBAI PVT LTD



Customer's Inspector
(Sign & Stamp)

QUALITY ASSURANCE PLAN

MICON VALVES (I) PVT.LTD 7, WADEE MANZIL, 2ND FLOOR, OPP. MEMON CO.OP. BANK, 75-77E, LADY JAMSHEDJI RD, MAHIM, MUMBAI - 16				CLIENT: - THERMOSYSTEM PVT.LTD.				PROJECT:-2x250 MW BHAVNAGAR TPP				
P.O.NO:- LOI-P-197-LOI-7				DATE:- 22.05.2012				QAP NO:- 535				
RD, MAHIM, MUMBAI - 16				P.O.NO:- LOI-P-197-LOI-7				REV NO:- 01				
RD, MAHIM, MUMBAI - 16				P.O.NO:- LOI-P-197-LOI-7				DATE :- 06.06.2012.				
RD, MAHIM, MUMBAI - 16				P.O.NO:- LOI-P-197-LOI-7				PAGE NO:- 4 OF 4				
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	TYPE & METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD			AGENCY		REMARKS
							P	W	V			
3.0	FINAL INSPECTION (Before Painting)											
3.1	Ball Valve	a. Dimension	Flange Drilling Face to Face	100%	Relevant Std/App Drg	Relevant Std/App Drg	Dimensional report	3	3/2	1,2	Random by TPI	
		b. Operational Test	1. Full Opening / Closing Test	100%	App Drawing	Relevant Std/App Drg	Dimensional report	3	3/2	1,2	Random by TPI	
		c. Pressure Testing	Hydro shell Hydro Seat Air Seat	100%	App Drawing	App Drawing	Testing Register	3	3/2	1,2	100% by Manufacturers & 10 % by Third Party Inspection Agency	
				100%	App Drawing	App Drawing	Testing Register	3	3/2	1,2		
				100%	App Drawing	App Drawing	Testing Register	3	3/2	1,2		
Paint & Packing	a. Surface	Visual	Dryness		Painting certificate & MVI	Film thickness shall be more than 105 micron	Testing Register	3	3/2	1,2	For a C.S .Casting 105 M minimum and for forgings painting not applicable.	
		Visual	Two coat of redoxide				Testing Register	3	3/2	1,2		
		Visual	One coat of hammer tone dark grey/Sea green				Testing Register	3	3/2	1,2		
		Visual	Anti rust layer at machined surface				Testing Register	3	3/2	1,2		
		Visual	Fixing of wooden/plastic and protector.				Dispatch Register	3	3/2	1,2		

Note: 1. BECL/TCE
2. BHEL/TSP

MANUFACTURER (MICON)



Customer's Inspector
(Sign & Stamp)

MANUFACTURING QUALITY ASSURANCE PLAN											
MICON VALVES (I) PVT.LTD 7, WADEE MANZIL, 2ND FLOOR, OPP. MEMON CO.OP. BANK 75-77E, LADY JAMSHEDJI RD, MAHIM, MUMBAI - 16				CLIENT:- THERMOSYSTEM PVT.LTD.				PROJECTS:- FOHS 2x250 MW BHAVNAGAR TPP			
				P.O.NO:-P-197-LOI-10				QAP NO:- 562			
				Gate, Globe, Swing Check				REV NO: 01			
				DATE: 03.07.2012.				DATE: 08.10.2012			
SL NO	COMPONENT & OPERATIONS	CHARACTERISTICS	TYPE & METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	P	W	V
1	RAW MATERIAL										
1.1	Forgings/Castings (Body/Bonnet Cover & Disc/wedge)	a. Verification	Material Tc	100%	Appr. Drg. Tech. Specs	APPr.Drg & Tech.specs	Material TC	3	3.2	1.2	
		b. Size / Class	Material Tc	100%	Appr. Drg. Tech. Specs	APPr.Drg & Tech.specs	Material TC	3	3.2	1.2	
		c. Material ID	Material Tc	100%	Appr. Drg. Tech. Specs	APPr.Drg & Tech.specs	Material TC	3	3.2	1.2	
		d. Heat No.	Material Tc	100%	Appr. Drg. Tech. Specs	APPr.Drg & Tech.specs	Material TC	3	3.2	1.2	
		e. Surface Defect	Visual	100%	MSS-SP-55	No crack acceptable	Inspection Report	3	3.2	1.2	
		f. Dimension	Vernier Scale	100%	ASTME B16.5 B16.10 B16.11	ASTME B16.5 B16.10 B16.11	ASTME B16.5 B16.10 B16.11	3	3.2	1.2	
		g. Tensile Properties	Verification of foundry Tc	100%	Foundry TC for WCB	ASTM A 216GR WCB/A105		3	3.2	1.2	
		h. Chemical Properties	Verification of foundry Tc	100%	Foundry TC for WCB	ASTM A 216GR WCB/A105		3	3.2	1.2	
		i. Heat Treatment	Verification of foundry Tc	100%	Foundry TC for WCB	ASTM A 216GR WCB/A105		3	3.2	1.2	
1.2	SS Round Bar	a. Dimension b. Chemical properties	Dimensional Check of main element	1 / lot/ size 1 / lot/size	SS 410 SS 304 SS 316	PO --	LAB TC	3	3.2	1.2	

Note 1. BECL/TCE

2. BHEL/TSPL

3. MANUFACTURER (MICON)



Customer's Inspector
(Sign & Stamp)

MANUFACTURING QUALITY ASSURANCE PLAN													
MICON VALVES (I) PVT.LTD 7, WADEE MANZIL, 2ND FLOOR, OPP. MEMON CO.OP. BANK, 75-77E, LADY JAMSHEDJI RD, MAHIM, MUMBAI - 16				CLIENT: - THERMOSYSTEM PVT.LTD.						PROJECTS: - FOHS 2x250 MW BHAYNAGAR TPP			
				P.O.NO:-P-197-LOI-10						DATE:-03.07.2012.		QAP NO 562	
				Gate, Globe, Swing Check.						REV NO 01			
				TYPE & METHOD OF CHECK						FORMAT OF RECORD		DATE 08/10/2012	
SL NO	COMPONENT & OPERATIONS	CHARACTERISTICS	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS			
							P	W	V				
1.3	FASTERNER	a. Dimension b. Tensile Properties c. Chemical Properties d. Heat Treatment	1/lot/size 100%	Appr. Drg Appr. Drg	Appr. Drg Appr. Drg	MFG TC	3	3,2	1,2				
			100%	Appr. Drg	Appr. Drg	MFG TC	3	3,2	1,2				
			100%	Appr. Drg	Appr. Drg	MFG TC	3	3,2	1,2				
1.4	GASKET Spiral wound	a. Dimension b. Chemical	1/lot/size 1/lot/size	As per Appr.Drg. P.O.	Mfg. Drg Relevant STD	MFG TC	3	3,2	1,2				
1.5	GLAND PACKING	a. Dimension	1/lot/size	As per Appr.Drg. P.O.	Mfg. Drg	MFG TC	3	3,2	1,2				
1.6	HAND WHEEL	a. Dimension b. Surface Defect	1/lot/size 100%	As per Appr.Drg. P.O. As per Appr.Drg. P.O.	Mfg. Drg Mfg. Drg	GRIR No crack acceptabl	3	3,2	1,2				

1. BECL/TCE
2. BHEL/TSPL
3. MANUFACTURER (MICON VALVES)



Customer's Inspector
(Sign & Stamp)

MANUFACTURING QUALITY ASSURANCE PLAN												
MICON VALVES (I) PVT.LTD 7, WADEE MANZIL, 2ND FLOOR, OPP. MEMON CO.OP. BANK, 75-77E, LADY JAMSHEDJI RD, MAHIM, MUMBAI - 16		CLIENT: - THERMOSYSTEM PVT.LTD.				PROJECTS:- 2x250 for MW BHAVNAGAR TPP		QAP NO:- 562				
		P.O.NO:-P-197-LOI-10				DATE:-03.07.2012		REV NO:- 01		DATE :- 08/10/2012.		
		Gate, Globe, Swing Check.				FORMAT OF RECORD		AGENCY		PAGE NO:- 3 OF 4		
		SL.NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	TYPE & METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	P	W
2.0	IN PROCESS INSPECTION											
2.1	Body/Cover & Disc/Wedge & Plug	a. Machined Surface	Visual	100%	Mfg. Drg.	No. Blow holes are acceptable Mfg. Drg.	In process report	3	3,2	1,2		
		b. Dimension	Dimensional	100%	Mfg Drg.			3	3,2	1,2		
2.1	Disc/Wedge	Machine Surface	Visual	100%	Mfg Drg.	No Blow Holes are acceptable	In process report	3	3,2	1,2		
2.2	Components	b. Dimension	Dimension	100%	Mfg Drg.	Mfg. Drg.	--do--	3	3,2	1,2		
2.3	Assembly	Operational Test	i. Full Opening /Closing Test ii. Back Seat Check iii. Min Stem Projection iv. Smooth Operation	100%	Appr.Drg.& P.O.	Mfg. Std & Appr.Drg.	In process report	3	3,2	1,2		
				100%	Appr.Drg & P.O			P	3,2	1,2		
				100%	Appr.Drg. & P.O.			P	3,2	1,2		
				100%	Appr.Drg. & P.O.			P	3,2	1,2		

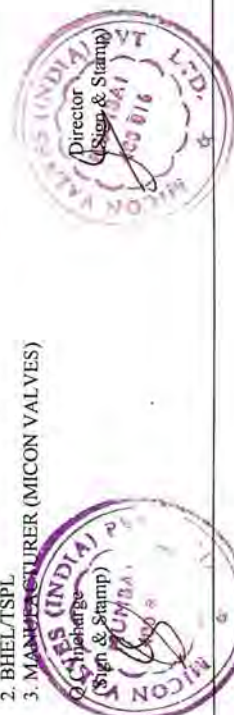
1. BECL/TCE
2. BHBL/TSPL
3. MANUFACTURER (MICON VALVES)



Customer's Inspector
(Sign & Stamp)

MANUFACTURING QUALITY ASSURANCE PLAN												
MICON VALVES (I) PVT.LTD 7, WADEE MANZIL, 2ND FLOOR, OPP. MEMON CO.OP. BANK, 75-77E, LADY JAMSHEDJI RD, MAHIM, MUMBAI - 16				CLIENT: -THERMOSYSTEM PVT.LTD.				PROJECT:- FOHS 2x250 MW BHAVNAGAR TPP				
				P.O.NO:-P-197-LOI-10				QAP NO:- 562				
				Gate, Globe, Swing Check.				REV NO:- 01				
				TYPE & METHOD OF CHECK				DATE:-03.07.2012				
SL NO.	COMPONENT	CHARATERISTICS	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS		
							P	W	V			
3.0	FINAL INSPECTION (Before Painting)											
3.1	Gate Valve Globe Valve Swing Check Valve.	a. Dimension	Flange Drilling Face to Face	Appr.Drg.	Appr.Drg.	Dimensional report	3	3,2	1,2	Random by TPI		
		b. Operational Test	1. Full Opening / Closing Test	Appr.Drg.	Appr.Drg.	Dimensional report	3	3,2	1,2			
		c. Pressure Testing	Hydro shell Hydro Seat Air Seat	Appr.Drg.	Appr.Drg.	Testing Register	3	3,2	1,2	Random by TPI		
	Paint & Packing	a. Surface	Visual	Painting certificate	Film thickness Shall be more then 105 micron	Testing Register	3	3,2	1,2	100% by Manufacturers & 10 % by Third Party Inspection Agency		
							3	3,2	1,2			
			Dryness			Testing Register	3	3,2	1,2	For a C.S. Casting 105 micron minimum and for forgings painting is not applicable.		
			Two coat of redoxide One coat of hammer tone dark grey Anti rust layer at machined surface Fixing of wooden/plastic and protector			Testing Register	3	3,2	1,2			
			Visual			Testing Register	3	3,2	1,2			
			Visual			Testing Register	3	3,2	1,2			
			Visual			Testing Register	3	3,2	1,2			
			Visual			Testing Register	3	3,2	1,2			
			Visual			Testing Register	3	3,2	1,2			

1. BECL/TCE
2. BHEL/TSPL
3. MANUFACTURER (MICON VALVES)



Customer's Inspector
(Sign & Stamp)

MANUFACTURERS NAME & ADDRESS :				MANUFACTURING QUALITY PLAN					BHEL QAP NO :		
M/s SUDEEP INDUSTRIES PRIVATE LIMITED 12, PRANNATH SUR LANE, KOLKATA - 700002.				ITEM : STEAM & CONDENSATE HOSE SIZE : 50 MM x 7.5 Mtrs. 25 MM x 7.5 Mtrs.					Project : FOHS for 2x250 MW BHAYNAGAR TPP Customer : M/s.BHEL,PEM,NOIDA Package : FOHS LOI No. :		
SL.NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTAM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	INSP AGENCY	REMARKS	
1	2	3	4	5	6	7	8	9	P	W	V
A.	<u>RAW MATERIAL</u>										
1.0	Stainless Steel Hose	Chemical Properties	Major	Chemical	Sample	AISI 304	AISI 304	Lab TC/ QC Report	3	-	2.1
B.	<u>STAINLESS STEEL WIRE</u>	Chemical Properties	Major	Chemical	Sample	AISI 304	AISI 304	Lab TC/ QC Report	3	-	2.1
C.	<u>END FITTINGS</u>										
1.0	Flange / Nut	Chemical Composition	Major	Chemical	Sample	IS : 2062 Gr. B	IS : 2062 Gr. B	- DO -	3	-	2.1
2.0	Nipple	Physical & Chemical	Major	Chemical	Sample	ASTM A 106 Gr B	ASTM A 106 Gr B	- DO -	3	-	2.1
D.	<u>FINAL INSPECTION</u>										
1.0	Finished Product Check for Completeness	a) Visual & Dimensional b) Hydraulic Test	Major Major	Visual & Dimensional Pressure Test	100% 100%	App. DRG/DS App. DRG/DS	App. DRG/DS App. DRG/DS	- DO - - DO -	3 3	- -	2.1 2.1
BHEL Doc No. PE-VO-356-186-A722 / Rev : 0											
BHEL QAP NO :											
TSPL NO. :											
Revision :											
Date :											
Page :											
REVIEWED BY											
NAME & SIGN OF APPROVING AUTHORITY											




QUALITY ASSURANCE MECHANICAL

FUEL OIL HANDLING SYSTEM

CLAUSE NO.	QUALITY ASSURANCE			<div>एन टी पी सी NTPC</div>
FUEL OIL HANDLING SYSTEM				
Tanks and Vessels				
1.	Only Qualified welders as per approved WPS and PQR shall be deployed for fabrication of tanks.			
2.	Dimensional checks, during in-process and final inspection, shall be carried out for alignments, circularity, verticality, orientation of connections, slope of bottom plate etc.			
3.	NDT on weld joints shall be done as per relevant / applicable standard. However, minimum requirement of NDT , as given below, shall be complied :			
	a.	100% DPT on root run (butt welds / back-gouged welds).		
	b.	100% DPT on all finished welds.		
	c.	RT on butt welded seams (which shall cover 'T' / Cross joints) as per design code / Standard..		
4.	All tanks shall be subjected to hydraulic test. Other tests, as per relevant code, given below shall be applicable :			
	a.	Vacuum test for bottom plate seam testing and annular plate.		
	b.	Air / vacuum test for roof testing.		
Fuel Oil Pumps/Drain Oil Pump/Water Pump				
1.	Pump casing shall be hydraulically tested at a pressure 150% of specified shut off head or 2 times working pressure (whichever is higher) for leak tightness.			
2.	Rotating parts i.e. Screws / Rotors shall be statically and dynamically balanced as per requirements of code ISO: 1940 Gr. 6.3 or better.			
3.	Pump rotors / Screws shall be subjected to NDT i.e. UT (dia. is >=50mm) at proof machine condition and DPT after machining.			
4.	All pumps shall be performance tested as per relevant / applicable code.			
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-E-87 FOH MECHANICAL	PAGE 1 OF 3

CLAUSE NO.	QUALITY ASSURANCE		<div>एन टी पी सी NTPC</div>
PIPING, VALVES, STRAINERS AND FITTINGS:			
1.	All pipes and fittings shall be tested as per applicable code. Welds of Steam Pipe joints shall be 10% radio graphed and 100% DP tested.		
2.	Pipes dia 450mm and above if fabricated from plate as well as fabricated fittings shall be hydro tested at 1.5 times design pressure. All such fabrication welds are also to be 100% DP tested after root run and on finished welds.		
3.	All valves shall be hydraulically tested for body, seat and back seat (as applicable) as per relevant standard. Check valves shall also be tested for leak tightness test at 25% of the specified seat test pressure.		
4.	Valves shall be offered in unpainted condition.		
5.	Functional checks of the valves for smooth operation, valve travel, opening and closing time shall be checked. Current drawn by actuators shall also be checked.		
6.	Fire safe test for ball/Plug valves shall also be done as per applicable codes/standard.		
7.	Strainer body shall be hydraulically tested and Pressure drop v/s flow rate test shall be done for Strainers. Weld joints are to be DP tested.		
SUCTION HEATERS / FLOOR COIL HEATERS:			
1.	All pipes / tubes / plates shall be tested as per applicable code.		
2.	Only qualified welders shall be deployed as per approved and qualified procedure.		
3.	Checks for tube thinning, mock-up for tube to tube-sheet joints shall be done.		
4.	Hydro test for shell side and tube side shall be done at 150% of specified design pressure (including temp. correction) for respective sides. Complete heating coils shall also be hydrotested.		
5.	Dimensinal Checks, NDT, Heat treatment shall be done on dished ends as per relevant / applicable code.		
6.	NDT on weld joints, including weld joints of dished ends if any, shall be done as per relevant / applicable standard. However for weld joints under Steam Pressure are to be 10% radiographed as minimum requirement.		
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-E-87 FOH MECHANICAL PAGE 2 OF 3

CLAUSE NO.	QUALITY ASSURANCE		
	<p>Insulation :</p> <ol style="list-style-type: none"> 1. Rockwool/Mineral Wool/Glass Wool shall be tested as per relevant IS. However Thermal Conductivity type test shall be minimum once in six months as per IS:3346. 2. Lagging/Cladding shall be tested as per relevant Standard to meet data sheet requirements. <p>Monorail Hoists:</p> <ol style="list-style-type: none"> 1. 100% RT on tension joints, 10% RT on compression joints of butt welds shall be done. 2. Forging of dia 50mm or more shall be UT tested. 3. Chain pulley block shall be tested as per IS:3832 4. Deflection, load, overload and travel check as per IS:3177 shall be done on assembled HOT. <p>Flex Hoses</p> <p>Tests such as Adhesion, Property before and after aging, swelling, tensile, elongation at break for rubber and vacuum test, pressure test, burst/proof pressure test, dimension of finished hose shall be carried out as per relevant standard.</p> <p>Pressure Reducing Station, Steam Traps:</p> <p>Functional check to meet the data sheet requirements and pressure test at 1.5 x Design Pressure shall be carried out for individual component as well as for assembled pressurized system.</p>		
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-E-87 FOH MECHANICAL	PAGE 3 OF 3

QUALITY ASSURANCE CONTROL & INSTRUMENTATION

PROCESS CONNECTION AND PIPING

PROCESS CONNECTION AND PIPING

ITEMS	TESTS													
	Visual ®	GA, BOM, Layout of component & construction feature®	Dimension ®	Paint Shade/thickness ®	Flattening,flaring, hydrotest, hardness check as per ASTM standard (A)	Component Ratings ®	Wiring ®	Make, Model, Type, Rating®	IR & HV ®	Review of TC for instrument/devices (R)	Accessibility of TBs/Devices ®	Illumination, grounding ®	Tubing ®	Leak/Hydro test(A)
Local Instrument enclosure	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	
Local instruments racks	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	
Junction Box	Y	Y	Y	Y*		Y		Y	Y					
Gauge Board	Y	Y	Y	Y		Y		Y		Y			Y	Y
Impulse pipes and tubes	Y		Y		Y			Y						Y
Socket weld fittings ANSI B-16.11	Y		Y					Y						Y
Compression fittings	Y		Y					Y					Y	Y
Instrument valves & Valve manifolds	Y		Y					Y					Y	Y
Copper tubings ASTM B75	Y							Y						Y

*-applicable for painted junction boxes.

Note: R-Routine Test

A- Acceptance Test

Y – Test applicable

Note: This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.

ELECTRICAL ACTUATOR WITH INTEGRAL STARTER

ELECTRICAL ACTUATOR WITH INTEGRAL STARTER

ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING	Test/Attributes Characteristics												
	RPM ®	No Load Current ®	IR & HV Test®	Mounting Dimension®	All routine Test as per Standard & Specification®	Correct Phase Sequence®	Operation & Setting of limit Switch/Torque Switch®	Stall Torque/Current (A)	Hand Wheel operation/ Auto de clutch function (A)	Function of Aux. like Potentiometer, space heater, position	EPT output ®	Grease leakage ®	Local/ Remote (Open-Stop-Close) Operation® Safety check (Single phasing, Phase correction, Tripping etc.) (A)
ELECTRICAL ACTUATOR WITH INTEGRAL STARTER(IS_9334)													
Motor	Y	Y	Y	Y	Y								
Final Testing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the practices and procedure adopted along with relevant supporting documents.													
® - Routine Test (A) - Acceptance Test Y - Test applicable													

MEASURING INSTRUMENTS

MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)

TESTS ITEMS									
	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (if applicable)(R)	Hydro Test(R)	Material Test certificate ®
1. PR Gauge (IS-3624)	Y	Y	Y	Y	Y				
2. Temp. Gauge (BS-5235)	Y	Y	Y	Y	Y				
3. Pr./D.P.Switch (BS-6134)	Y	Y	Y	Y	Y	Y			
4. Electronic Transmitter(IEC-770)	Y	Y	Y	Y	Y	Y			
5. Temp. Switch	Y	Y	Y	Y	Y	Y			
6. Recorder(IS-9319/ANSI C-39.4)	Y	Y	Y	Y	Y	Y			
7. Vertical indicators	Y	Y	Y	Y		Y			
8. Digital Indicators	Y	Y	Y	Y		Y			
9. Integrators	Y	Y	Y	Y					
10. Electrical Metering Instrument (IS-1248)	Y	Y	Y	Y	Y	Y			
11. Transducer (IEC-688)	Y	Y	Y	Y	Y	Y			
12. Thermocouples (ANSI-MC-96.1)	Y	Y	Y	Y	Y	Y			
13. RTD(IEC-751)	Y	Y	Y	Y	Y	Y			
14. Thermowell	Y		Y				Y	Y	Y
R-Routine Test A- Acceptance Test Y – Test applicable									
: Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.									

ITEMS	TESTS										
	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Requirement as per standard (R)	WPS approval (A)	Non-destructive testing (R)	Calculation for accuracy (R)	Insulation Resistance (R)	IBR Certification as applicable (R)	Hydro test (R)
15. Cold junction compensation box	Y	Y	Y	Y					Y		
16. Orifice plate(BS-1042)	Y	Y	Y	Y	Y	Y	Y			Y	Y
				*		*	*			*	
17. Flow nozzle(BS-1042)	Y	Y	Y	Y	Y	Y	Y			Y	Y
				*							
18. Impact head type element	Y	Y	Y					Y			Y
19. Level transmitter/float type switch	Y	Y	Y	Y					Y	Y	Y
20. Flue Gas analyser	Y	Y	Y	Y							
21. Dust emission monitors	Y	Y	Y	Y							
*Calibration to be carried out on one flow element of each type and size if calibration carried out as type test same shall not be repeated.											
** If applicable											
R-Routine Test A- Acceptance Test Y – Test applicable											
Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.											



TITLE
 TECHNICAL SPECIFICATION FOR
 FUEL OIL UNLOADING & STORAGE SYSTEM

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II B

SECTION -D

REV 0

DATE

SHEET OF

ANNEXURE-IV



TITLE

**TECHNICAL SPECIFICATION FOR
FUEL OIL STORAGE & TRANSFER SYSTEM**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II - B

SECTION -C


REV 0

DATE

SHEET 1 OF 3

Tentative list of Sub-vendors

S.no	Package	Vendor	
MECHANICAL			
	CS PALTES & STRUCTURES	SAIL TISCO- JAMSHEDPUR ESSAR STEEL	
	CS/GI PIPES- ERW	TISCO SAIL AJANTA TUBES, GHAZIABAD JINDAL , GHAZIABAD SURYA ROSHINI, BAHADUR GARH	UPTO 400 NB UPTO 350 NB UPTO 400 NB
	SEAMLESS PIPES	ISMT, AHMEDNAGAR MAHARASHTRA SEAMLESS, RAIGARH BHEL, TRICHY	
	SS PIPES	REMI, MUMBIA RATNAMI, AHMEDABAD CHOKSI, AHMEDABAD	
	FITTINGS	MS FITTINGS, KOLKATA SIDDHATHA & GAUTAM , FARIDABAD EBY, MUMBAI BHRAT FORGE , PUNE TUBE PRODUCTS, BARODA NITIN PROFILE, BARODA	
	RUBBER HOSE	D WREN & CO., KOLKAT SUDEEP INDUSTRIES, KOLKATA HYDROKIMP, MUMBAI PRESIDENCY RUBBER, KOLKATA	
	METALLIC HOSES	M/S TUBEX	OTHER MAKES ALSO ACCEPTABLE SUBJECT TO FURNISHING OF CREDENTIALS TO THE SATISFACTION OF BHEL.
	CAST STEEL GATE/GLOBE/NR VALVES	BABCOCK BORSIG ESPANA, S.A. CRESCENT VALVES MFG.CO.PVT.LTD. FOURESS ENGG.INDIA LTD. KSB PUMPS LTD. LEADER VALVES LTD. NITON INDUSTRIES B.D.K ENGG INDUSTRIES LTD.	
	CARBON STEEL BALL VALVES	AQUA VALVES PVT.LTD. CRESCENT VALVES MFG.CO.PVT.LTD. FISHER-XOMOX SANMAR LTD. KSB PUMPS LTD. LEADER VALVES LTD. MICROFINISH VALVES LTD. B.D.K ENGG INDUSTRIES LTD.	Valves shall be of Fire Safe Design
	CARBON STEEL PLUG VALVES	AUDCO INDIA LIMITED, CHENNAI B.D.K ENGG INDUSTRIES LTD. FISHER-XOMOX SANMAR LTD.	
	G.M. GATE/GLOBE/NRV	A.V. VALVES LIMITED LEADER VALVES LTD. SANT VALVES PVT. LTD.	

		TITLE TECHNICAL SPECIFICATION FOR FUEL OIL STORAGE & TRANSFER SYSTEM	SPECIFICATION NO. PE-TS-389-166-A001	
			VOLUME II - B	
			SECTION -C	
			REV 0	DATE
			SHEET 2 OF 3	
	SUMP PUMPS / SUBMERSIBLE PUMPS	KIRLOSKAR BROS. LTD. KSB PUMPS LTD. KISHOR PUMPS PVT.LTD SU MOTORS PVT.LTD. MATHER & PLATT SAM		
	FUEL OIL PUMPS	UT PUMPS & SYSTEMS LTD., FARIDABAD TUSHACO PUMPS LTD., MUMBAI ROTO PUMPS, KANPUR ALWEILER, GERMANY		
	THERMAL INSULATION	LLOYD INSULATION (INDIA) LTD., BANGALORE MINWOOL ROCK FIBRES LTD., HYDERABAD MEGA INSULATIONS PRIVATE LIMITED, GUJARAT ROCKWOOL INDIA LTD. GOENKA ROCKWOOL (INDIA) PVT.LTD		
	ALUMINIUM SHEETS/COILS (THERMAL INSULATION PKG)	BHARAT ALUMINIUM CO.LTD. HINDALCO INDUSTRIES LTD. INDIAN ALUMINIUM CO.LTD. NALCO		
	STRAINERS	FILTRATION ENGINEERS (I) PVT.LTD. MULTITEX FILTRATION ENGINEERS LTD. JAYPEE INDUSTRIES PVT. LTD. OTOKLIN PLANTS & EQUIPMENTS LTD GREAVES COTTON		
	M.E. BELLOWS	EXPANSION JOINT SYSTEMS INC. USA FLUIDINE ENGRS.INDIA PVT.LTD FLEXICAN BELLOWS & HOSES PVT.LTD. LONESTAR INDUSTRIES MUNRO & MILLER FITTINGS LTD., U.K METALLIC BELLOWS (INDIA) PVT. LTD.		
	SUCTIONHEATER	PARKAIRE, NEW DELHI REYNOLD ENGINEERING, MUMBAI	Other makes also acceptable subject to furnishing of credentials to the satisfaction BHEL.	
	PRESSURE REDUCING VALVE	LEADER JN MARSHALL MAZDA		
	SAFETY RELIEF VALVE	LEADER, JULLANDAR JN MARSHALL, MUMBAI BHEL, TRICHY KEYSTONE, BARODA		
	STEAM TRAPS	SPIRAX MARSHAL PENNANT ENGINEERING LEADER VALVES LTD CRESCENT VALVES MFG. CO. LTD.		

NOTE:-

Sub vender list is indicative only and will be subject to customer approval during detail engineering of the package without any commercial implication on account of the same.

SPECIFICATION NO. PE-TS-389-166-A001

SECTION 'C'-
ANNEXURE-V

DATE:

ANNEXURE-V



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C' -
ANNEXURE-V

REVISION 00

DATE:

PAGE 1 of 3

**ANNEXURE-V
(PAINTING SCHEDULE)**

A.0.0 SURFACE PREPARATION AND PAINTING FOR PIPING

A.1.0 Preparation and cleaning of piping

(a) The pipeline shall be thoroughly cleaned of all rust, grease, dirt, weld scales and weld burrs etc. moisture or other foreign matter by power cleaning method such as sand blasting, power tool cleaning, etc. Grease or heavy oil shall be removed by washing with a volatile solvent such as gasoline. Kerosene will not be permitted for cleaning. This cleaning operation shall be immediately followed by priming with the mechanical priming machine.

(b) Certain inaccessible portions of the pipe line (which otherwise not possible to be cleaned by power cleaning methods) may be scrubbed manually with a stiff wire brush and scrapped where necessary.

(c) The cleaning and priming operation shall be carried out at site. The entire pipe length shall be cleaned but the ends of the pipes shall be left without coating for a distance of 230mm for joints, which shall be coated manually at site after laying, welding and testing the pipe.

(d) On the internal surface for pipes 1000 Nb and above, a coat of primer followed by a hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied to achieve a total DFT of 150 microns.

Pipes shall be cleaned both internally and externally thoroughly by blast cleaning or power tool cleaning method as indicated above. In case of oil piping, cleaning will have to be done by pickling. No painting is required on galvanised pipe surface or galvanised steel surface. Similarly no painting is required on stainless steel pipe or stainless steel surfaces. However, necessary colour banding for identification as per colour code shall be done. External surface of piping shall be cleaned and prepared as indicated in the painting schedule below.

A.2.0 Primer painting

After the surface is prepared in a manner acceptable to the Project Manager two coats of red oxide (zinc chromate / zinc phosphate) primer conforming to IS- 2074/IS-12744 or equivalent BS shall be applied. Primer shall be applied by brushing to ensure a continuous film without holidays. Primer shall be immediately applied without any time lag after the surface preparation.

Any equipment which has been given the shop coat of primer shall be carefully examined after its erection in the field and shall be treated with a touch up coat of red oxide primer wherever the shop coat has been abraded, removed or damaged during transit/erection, or defaced during welding.

A.3.0 Finish painting

(a) Paint to be used shall be synthetic enamel paint conforming to IS-2932 or equivalent. The manufacturer of paints and colour/shade shall be as approved by the Project Manager.

(b) Finish paintings shall be carried out in three coats consisting of one under coat and two finishing coats.

(c) The primed surface shall be cleaned of dust/ dirt/ grease etc. without scratching or in any way damaging the primer coat. Over this dry surface an optimum coat of under coating of synthetic enamel shall be applied. The under coat shall be allowed to dry.

(d) Paint shall be applied by brushing. It shall be ensured that brush marks are minimum and the requirements of workmanship is as specified in IS-1477.

(e) Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of the ready mixed



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C' -
ANNEXURE-V

REVISION 00

DATE:

PAGE 2 of 3

type in original sealed containers as packed by the paint manufacturer. No thinners shall be permitted.

(f) No painting shall be done in frost/foggy weather or when the humidity is high to cause condensation on the surface to be painted.

(g) The dry film thickness (DFT) after the painting shall not be less than 150microns.

A.4.0 Other requirements

(a) Paint manufacturer's instructions shall be followed in method of application, handling, drying time etc.

(b) The colour of the finish paint shall be as per approved colour coding scheme.

(c) If finish paint was applied in shop, one coat of finish paint shall be applied at site.

(d) Protection of other surfaces adjacent to the surface being painted is the responsibility of the Contractor.

(e) The dry film thickness of the finish paint shall not be less than 0.15mm.

(f) All painting materials such as paints, varnishes, primer, solvents, thinners shall be supplied by the Contractor. All the services, tools etc. required for preparation/cleaning and painting shall be provided by the Contractor. The Contractor shall be required to estimate the quantity of painting material required.

A.5.0 Application

The paint manufacturer's instructions covering thinning, mixing, method application, handling, and drying time shall be strictly followed and considered as a part of this specification. Paint shall not be applied to damp surfaces or in rainy weather or when temperature is below 130C or above 360C, except when specifically permitted to do so as per manufacturer's instructions. The prime coat shall be applied by brushing, rolling or spraying and on the same day as the surface is prepared. Under coats, intermediate coats and finish coats shall be applied by brush, roller or spray method with the specified amount of time allowed between coats . The colour of each coat shall contrast with the previous coats's colour to avoid skip and holidays. Apart from surface preparation of the piping etc. attention should be of paid to the details, particularly the following :

(a) Sharp edges that may have a deleterious effects on coatings should be removed.

(b) Burrs caused by removal of temporary lugs etc. should be ground flat.

(c) Welds should be dressed and weld spatter removed by grinding.

(d) Nuts and bolts should be properly treated.

(e) Fasteners, such as pipe hangers, clamp etc., should be treated before being fixed to the main structure.

Painting Schedule

A. Surface preparation	Commercial blast clean.
B. Primer	Conforming to BS-5493, table-4F, part-2, Reference FP-3A. IS2074/12744 (For primer) / IS2937 (For enamel).
Main pigment	Zinc phosphate/Zinc chromate.
Nominal coating thickness	70 microns.
C. Under Coats	Conforming to BS-5493, Table-4F, Part-3, Reference FU2A. /IS2937.
	Main pigment Coloured pigments (full colours) suitably extended.
Nominal coating thickness	30 microns.
D. Finish coats	Conforming to BS-5493, Table-4F, Part-4, Reference FF3B /IS2937.
Main pigment	Fade-resistant coloured pigments.
Nominal coating thickness	50 microns.
E. Dry film thickness	150 microns(minimum)

B.0.0 PAINTING SCHEDULE FOR LDO STORAGE TANKS



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C' -
ANNEXURE-V

REVISION 00

DATE:

PAGE 3 of 3

B.1.0 After erection of tanks all surfaces shall be cleaned thoroughly by wire brushing and sand blasting to remove completely all loose dirt, rust, mill scales and any deleterious material. The surface shall then be prepared in accordance with manufacturers recommendations for applying an approved primer. After preparation of the surfaces in strict conformance to the specification the painting shall be applied.

B.2.0 Interior surface of the tanks shall be coated with the primer and finish paint as noted below :

i) LDO storage tank, and Drain oil tank primer (a) Epoxy red oxide - 2 coats of 30 microns each
zinc phosphate

(b) Epoxy high build - 2 coats of 100 microns each.
coating

B. 3.0 All external surfaces (non insulated) of the tanks shall be painted with primer coat of Epoxy resin based zinc phosphate (1x100 microns), one intermediate coat of epoxy resin based paint pigmented with titanium dioxide (1x100 microns) and finish coat of epoxy paint of approved shade (1x75 microns).

B.4.0 Outside surface of bottom plates of all tanks resting on ground shall be given one (1) coat of coal tar epoxy enamel.



TITLE
 TECHNICAL SPECIFICATION FOR
 FUEL OIL UNLOADING & STORAGE SYSTEM

SPECIFICATION NO. **PE-TS-392-166-A001**

VOLUME II B

SECTION -D

REV 0

DATE

SHEET OF

ANNEXURE-VI



TITLE

TECHNICAL SPECIFICATION FOR
FUEL OIL UNLOADING & STORAGE SYSTEM

SPECIFICATION NO. **PE-TS-389-166-A001**

VOLUME II - B

SECTION -C

REV 0

DATE

SHEET 1 OF 1

ANNEXURE-VI**DRAWINGS/ DOCUMENTS TO BE SUBMITTED WITH THE BID**

Bidder shall submit the following drawings / documents along with their bid

- a) Copy of pre-bid clarification, if any, duly signed and stamped.
- b) ~~Manual calculation for total steam, in case steam required is more than 16 T/Hr.~~
- c) Total Instrument Air Consumption
- d) Technical details of Oil & Condensate Hoses
- e) List of special maintenance tools & tackles, if any
- f) Approved piping layout of fuel oil unloading area and P/H of similar project.
- g) Copy of Electrical Scope between BHEL & Vendor duly signed & stamped
- h) Electrical Equipment Specification (1 sheet) for Fuel Oil System duly signed & stamped
- i) Electrical load list duly filled up
- j) **Deviation schedule** with reference to specific clauses of the specification along with reason for such deviation.
- k) Copy of un priced bid indicating "QUOTED" / "NOT QUOTED"/ "NOT APLLICABLE" as the case may be.

OFFER WILL BE CONSIDERED AS INCOMPLETE IN ABSENCE OF ANY OF ABOVE DOCUMENTS.

DOCUMENT OTHER THAN ABOVE, IF ANY, SUBMITTED WITH THE OFFER WILL NOT FORM PART OF CONTRACT AND ACCORDINGLY WILL NOT BE CONSIDERED FOR BID EVALUATION.

SPECIFICATION NO. PE-TS-389-166-A001

SECTION 'C'-
ANNEXURE-VII

DATE:

ANNEXURE-VII

DRAWING / DOCUMENT REQUIRED DURING DETAIL ENGINEERING

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

Sl. No.	Customer Drawing No.	BHEL Drawing No.	Drawing Title	Submission on Schedule from LOI date	Resubmission After Incorporating Comments
VENDOR GENERATED DWGS/ DOCS					
A	P&ID DRAWINGS				
1		PE-V0-389-166-A101	P&I DIAGRAMS FOR HFO, LDO, STEAM & CONDENSATE SYSTEM.	4 WEEKS FROM LOI	with in 1 week
2		PE-V0-389-166-A102	OPERATION PHILOSOPHY & CONTROL WRITE UP	4 WEEKS FROM LOI	with in 1 week
B	DESIGN CALCULATION				
1		PE-V0-389-166-A201	DESIGN CALCULATION OF LDO TANK	6 WEEKS	with in 1 week
2		PE-V0-389-166-A202	FOHS SIZING CALCULATION (PIPE SIZING)	4 WEEKS	with in 1 week
3		PE-V0-389-166-A203	FO PUMP SIZING CALCULATIONS	12 WEEKS	with in 1 week
C	DATA SHEETS				
1		PE-V0-389-166-A301	PAINTING SCHEDULE	6 WEEKS	with in 1 week
2		PE-V0-389-166-A302	DATA SHEET, GAD & CROSS SECTIONAL DETAILS, PERFORMANCE CURVES OF SCREW PUMPS & MOTORS	14 WEEKS	with in 1 week
4		PE-V0-389-166-A304	DATA SHEETS OF PIPES & FITTINGS	8 WEEKS	with in 1 week
5		PE-V0-389-166-A305	DATA SHEETS & GAD OF VLAVES	12 WEEKS	with in 1 week
6		PE-V0-389-166-A306	DATA SHEETS & GA OF FLAME ARRESTOR, HOSES & ANY OTHER MECHANICAL BOI AS APPLICABLE FOR THE PROJECT	14 WEEKS	with in 1 week
7		PE-V0-389-166-A307	FOHS- ELECTRICAL AND C&I DATASHEETS (ALL GAUGES, INDICATORS, SWITCHES, TRANSMITTERS, JUNCTION BOXES, TEMPERATURE, CONTROL CIRCUIT DIAGRAM & SOLENOID VALVE DETAILS, ACTUATORS, ANY OTHER ELECTRICAL AND C&I BOIs)	12 WEEKS	with in 1 week
D	LAYOUT DRAWINGS				
1		PE-V0-389-166-A401	PIPING LAYOUT DRAWING INCLUDING PIPE SUPPORT DETAILS IN & AROUND OIL UNLOADING AND OIL STORAGE AREA	12 WEEKS	with in 1 week
2		PE-V0-389-166-A402	PIPING LAYOUT DRAWING INCLUDING PIPE SUPPORT DETAILS IN & AROUND UNLOADING/ TRANSFER PUMP HOUSE	11 WEEKS	with in 1 week
5		PE-V0-389-166-A405	LAYOUT DRAWING FOR CCOE APPROVAL	8 WEEKS	with in 1 week
6		PE-V0-389-166-A406	FOHS- ELECTRICAL AND C&I ITEM LAYOUT & CABLE ROUTING	11 WEEKS	with in 1 week
E	GA & FABRICATION DRAWINGS				
1		PE-V0-389-166-A501	GA OF LDO STORAGE TANKS INCLUDING GA OF ROOF STRUCTURE	10 WEEKS	with in 1 week
2		PE-V0-389-166-A502	NOZZLE ORIENTATION FOR LDO STORAGE TANK	18 WEEKS	with in 1 week
3		PE-V0-389-166-A503	FABRICATION DWG FOR LDO STORAGE TANKS	18 WEEKS	with in 1 week
H	CIVIL INPUT DRAWINGS				
1		PE-V0-389-166-A601	FOPH GA, EQUIPMENT FOUNDATION, LOAD DETAILS PIPE SUPPORT & TRENCH DETAILS	16 WEEKS	with in 1 week
2		PE-V0-389-166-A602	TANK FARM AREA- EQUIPMENT FOUNDATION, LOAD DETAILS, PIPE SUPPORT & TRENCH DETAILS	16 WEEKS	with in 1 week
3		PE-V0-389-166-A603	UNLOADING AREA- EQUIPMENT FOUNDATION, LOAD DETAILS, PIPE SUPPORT & TRENCH DETAILS	16 WEEKS	with in 1 week
G	QUALITY ASSURANCE PLANS				

1		PE-V0-389-166-A701	Q A PLANS FOR , PLATES & STRUCTURES, PIPES & FITTINGS,	9 WEEKS	with in 1 week
4		PE-V0-389-166-A704	Q A PLAN FOR VLAVES	13 WEEKS	with in 1 week
5		PE-V0-389-166-A705	QA PLANS OF FLAME ARRESTOR, HOSES & ANY OTHER MECHANICAL BOI AS APPLICABLE FOR THE PROJECT	15WEEKS	with in 1 week
6		PE-V0-389-166-A706	QA PLANS FOR ELELCTRICAL AND C&I ITEMS (ALL GAUGES, INDICAOTRS, SWITCHES, TRANSMITTERS, JUNCTION BOXES, TEMPERATURE CONTROL VALVES, ACTUATORS, ANY OTHER ELELCTRICAL AND C&I BOIs)	13 WEEKS	with in 1 week
9		PE-V0-389-166-A709	QA PLAN FOR MOTORS	14 WEEKS	with in 1 week
1	MISC.DOCUMENTS				
1		PE-V0-389-166-A801	VALVE , INSTRUMENT ,PIPES & JUNCTION BOX SCHEDULE.	20 WEEKS	with in 1 week
2		PE-V0-389-166-A802	POWER & CONTROL CABLE SCHEDULE.	18 WEEKS	with in 1 week
3		PE-V0-389-166-A803	ELECTRICAL LOAD DATA.	16 WEEKS	with in 1 week
4		PE-V0-389-166-A804	ISOMETRIC DRAWINGS WITH COMPLETE BOQ	10 WEEKS	with in 1 week
5		PE-V0-389-166-A805	SUB-VENDOR LIST WITH INSPECTION CATAGORISATION PLAN.	4 WEEKS	with in 1 week
6		PE-V0-389-166-A806	INSTRUMENT INSTALLATION/ HOOK UP DIAGRAM	20 WEEKS	with in 1 week
7		PE-V0-389-166-A807	HAZARDOUS AREA CLASSIFICATION DWG	10 WEEKS	with in 1 week
8		PE-V0-389-166-A808	STRESS ANALYSIS FOR PROVISION OF EXPANSION JOINTS & ANCHOR POINTS IN LDO LINES	10 WEEKS	with in 1 week
13		PE-V0-389-166-A813	COMMISSIONG PROCEDURE	20 WEEKS	with in 1 week
14		PE-V0-389-166-A814	PG TEST PROCEDURE	16 WEEKS	with in 1 week
15		PE-V0-389-166-A815	O& M MANUAL	20 WEEKS	with in 1 week
16		PE-V0-389-166-A816	COMPLETE BOQ- DRAWING WISE	20 WEEKS	with in 1 week
1		--	Handling Over Protocal	--	--
2		--	Erection Manual	3 months before schedule of erection	--
	NOTES				
	1. Finally approved documents/drawings to be provided in editable format(micro soft office /Autocad format) for onword submission to end customer.				
	2. Bidder to note that during detailed engineering, drg/doc will be submitted through web based document management system in addition to hard copies to be submitted as per drawing /document distribution schedule .procedure for the same will be informed after award oof contract.				
	COMPANY SEAL				
	SIGNATURE:_____				
	NAME:_____				
	DESIGNATION:_____				
	COMPANY:_____				
	DATE:_____				



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X500MW VINDHAYACHAL STPP, STAGE- V**

SPECIFICATION NO. PE-TS-389-166-A001

VOLUME II-B

SECTION 'C' -
ANNEXURE-VIII

REVISION 00

DATE:

ANNEXURE-VIII

GENERAL TECHNICAL REQUIREMENT

GENERAL TECHNICAL REQUIREMENTS

PART - C

CONTENTS

Clause No.	Description	Page No.
1.00.00	Introduction	1
2.00.00	Brand Name	1
3.00.00	Base Offer & Alternate Proposals	1
4.00.00	Completeness of Facilities	1
5.00.00	Codes & Standards	2
6.00.00	Equipment Functional Guarantee	4
7.00.00	Design of Facilities / Maintenance & Availability Considerations	4
8.00.00	Documents, Data and Drawings to be Furnished by Contractor	5
9.00.00	Technical Co-ordination Meeting	15
10.00.00	Design Improvements	16
11.00.00	Training of Employer's Personnel	16
12.00.00	Equipment Bases	17
13.00.00	Protective Guards	17
14.00.00	Lubricants, Servo Fluids and Chemicals	18
15.00.00	Lubrication	18
16.00.00	Material of Construction	18
17.00.00	Rating Plates, Name Plates & Labels	18
18.00.00	Tools and Tackles	19
19.00.00	Welding	20

20.00.00	Colour Code for all Equipments/ Pipings / Pipe Services	20
21.00.00	Protection and Preservative Shop Coating	20
22.00.00	Project Manager's Supervision	21
23.00.00	Quality Assurance Programme	22
24.00.00	This clause is not used	31
25.00.00	This clause is not used	31
26.00.00	Pre-commissioning and Commissioning Facilities	31
27.00.00	Taking over	33
28.00.00	Guarantee Tests	34
29.00.00	Noise Level	34
30.00.00	Packaging and Transportation	35
31.00.00	Electrical Enclosure	35
32.00.00	Electrical Noise Control	35
33.00.00	Instrumentation and Control	35
34.00.00	Instrument Air System	36
35.00.00	Tapping Points for Measurements	36
36.00.00	Electronic Module / Component Details	37
37.00.00	Safety Aspects During Construction and Erection	37

Annexure - I

Annexure - II


Annexure-III


Annexure-IV

Annexure-V

Annexure-VI

Annexure-VII

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
1.00.00	INTRODUCTION This part covers technical requirements which will form an integral part of the Contract. The following provisions shall supplement all the detailed technical requirements brought out in the Technical Specifications and the Technical Data Sheets.		
2.00.00	BRAND NAME Whenever a material or article is specified or described by the name of a particular brand, manufacturer or vendor, the specific item mentioned shall be understood to be indicative of the function and quality desired, and not restrictive; other manufacturer's products may be considered provided sufficient information is furnished to enable the Employer to determine that the products proposed are equivalent to those named.		
3.00.00	BASE OFFER & ALTERNATE PROPOSALS The Bidder's proposal shall be based upon the use of equipment and material complying fully with the requirements specified herein. It is recognized that the Contractor may have standardized on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice may also be considered, provided the base offer is in line with technical specifications and such proposals meet the specified design standards and performance requirement and are acceptable to the Employer. Sufficient amount of information for justifying such proposals shall be furnished to Employer alongwith the bid to enable the Employer to determine the acceptability of these proposals.		
4.00.00	COMPLETENESS OF FACILITIES		
4.01.00	Bidders may note that this is a Contract inclusive of the scope as indicated elsewhere in the specification. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure that a completely engineered plant is provided.		
4.02.00	All equipments furnished by the Contractor shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation & maintenance of the equipment and for the safety of the operating personnel, as required by applicable codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions. All similar standard components/ parts of similar standard equipment provided, shall be interchangeable with one another.		
VINDHYACHAL STPP-V (1X500 MW) STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOCUMENT NO.: CS-2260-101-2	PART-C (GTR) Page 99 of 277 PAGE 1 OF 37

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
5.00.00 5.01.00	CODES & STANDARDS <p>In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India, NTPC rules/codes of practices as well as of the locality where they will be installed, including the following:</p> <ul style="list-style-type: none"> (a) Bureau of Indian Standards (BIS) (b) Indian electricity act (c) Indian electricity rules (d) Indian Explosives Act (e) Indian Factories Act and State Factories Act (f) Indian Boiler Regulations (IBR) (g) Regulations of the Central Pollution Control Board, India (h) Regulations of the Ministry of Environment & Forest (MOEF), Government of India (i) Pollution Control Regulations of Department of Environment, Government of India (j) State Pollution Control Board. (k) Rules for Electrical installation by Tariff Advisory Committee (TAC). (l) Building and other construction workers (Regulation of Employment and Conditions of services) Act, 1996 (m) Building and other construction workers (Regulation of Employment and Conditions of services) Central Rules, 1998 (n) Explosive Rules, 1983 (o) Petroleum Act, 1984 (p) Petroleum Rules, 1976, (q) Gas Cylinder Rules, 1981 (r) Static and Mobile Pressure Vessels (Unified) Rules, 1981 		
VINDHYACHAL STPP-V (1X500 MW) STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOCUMENT NO.: CS-2260-101-2	PART-C (GTR) Page 100 of 272	PAGE OF 37