

**GUJARAT STATE ELECTRICITY CORPORATION
LTD
1X800 MW SUPERCRITICAL THERMAL POWER
PROJECT**

VOLUME IIB & III

***TECHNICAL SPECIFICATION
FOR
FUEL OIL HANDLING SYSTEM***

SPECIFICATION NO. : PE-TS-408-166-A001



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA (INDIA)**



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME – IIB & III

SECTION -

REVISION 00

DATE: 12/10/2015

PAGE 1 of 2

INDEX

SECTIONS	TITLE	Page No		
SECTION-A	INTENT OF SPECIFICATION	1		
SECTION-B	PROJECT INFORMATION WITH WIND AND SEISMIC DESIGN CRITERIA	4		
SECTION-C	TECHNICAL SPECIFICATIONS			
	SECTION-C1	SPECIFIC TECHNICAL REQUIREMENT	24	
	SECTION-C2	CUSTOMER SPECIFICATION		
		C2 - A	TECHNICAL REQUIREMENT	40
		C2 - B	PROJECT SPECIFIC GENERAL REQUIREMENTS INCLUDING:	75
		C2 - C	FUNCTIONAL / PERFORMANCE / DEMONSTRATION / GUARANTEE TESTS	268
	C2 - D	QUALITY ASSURANCE	270	
SECTION-C3	TECHNICAL SPECIFICATION (ELECTRICAL PORTION)	271		
SECTION-C4	TECHNICAL SPECIFICATION (C&I PORTION)	339		
SECTION-D	STANDARD TECHNICAL SPECIFICATIONS	497		

SECTION-E	ANNEXURE-I	LIST OF MAKES OF SUB-VENDOR ITEMS	546
	ANNEXURE-II	MANDATORY SPARE LIST	561
	ANNEXURE-III	PAINTING & COLOUR SCHEME	566
	ANNEXURE-IV	-VOID-	575
	ANNEXURE-V	FUEL OIL ANALYSIS	576
	ANNEXURE-VI	DRAWINGS / DOCUMENTS SUBMISSION PROCEDURE	577
	ANNEXURE-VII	-VOID-	578
	ANNEXURE-VIII	MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION	579
	ANNEXURE-IX	FORMAT FOR OPERATION AND MAINTENANCE MANUAL	584
	ANNEXURE-X	SITE STORAGE AND PRESERVATION	588

VOLUME-III

SECTION	TITLE	Page No		
1	LIST OF DOCUMENTS TO BE SUBMITTED WITH BID	604		
2	COMPLIANCE CUM CONFIRMATION CERTIFICATE	605		
3	PRE BID CLARIFICATION SCHEDULE	607		
4	SCHEDULE OF TECHNICAL DEVIATION	608		
5	ELECTRICAL LOAD DATA	610		
6	LIST OF RECOMMENDED SPARES	613		
7	LIST OF COMMISSIONING SPARES	615		
8	SUGGESTIVE PRICE FORMAT INCLUDING MANDATORY SPARES ALONG WITH PERCENTAGE BREAKUP	617		
9	DRAWINGS			
		DRG TITLE	DRG NO	
	a	Plot plan	PE-DG-408-100-M001	629
	b	Process & Instrumentation Diagram of HFO	PE-DG-410-166-A101	630
	c	Process & Instrumentation Diagram of LDO	PE-DG-410-166-A102	631
	d	Process & Instrumentation Diagram of steam & condensate	PE-DG-410-166-A103	632



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME – IIB & III

SECTION -

REVISION 00

DATE: 12/10/2015

PAGE 2 of 2

	e	Routing of fuel oil pipes & other utilities from fuel oil transfer pump house to CT-7	PE-DG-410-166-A104	633
	f	Layout of Fuel Oil Transfer Pump House	PE-DG-410-166-SK001	634
	g	Layout of Day Tank Farm Area	PE-DG-410-166-SK002	635

SECTION-A

INTENT OF SPECIFICATION

1.0 INTENT OF SPECIFICATION

- 1.1 The specification covers design, engineering, manufacture, supply / procurement, inspection and testing at vendor's / sub vendor's / manufacturer's works, painting, forwarding, proper packing and shipment and delivery at site, unloading, handling & transportation, storage, preservation , security / safety at site , Erection & Commissioning, minor civil & structural (as applicable) works as required on FOR site basis, demonstration testing and handing over to BHEL's customer of **Fuel Oil Handling System** as per details in different sections / volumes of this specification and various pre award agreements for **1X800 MW WANAKBORI STPS**.
- 1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve the contractor of the responsibility of providing such facilities to complete the supply, erection and commissioning, demonstration testing of **Fuel Oil Handling 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 highest 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. Similarly, the extent of supply also includes all items required for completion of the system and not withstanding that they may have been omitted in drawings / specifications or schedules.
- 1.5 The general term and conditions, instructions to tenderers 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.

- 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 along with cost of withdrawal in the enclosed schedule (in Vol – III); otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification. If no cost of withdrawal is given against the deviation, it will be presumed that deviation can be withdrawn without any cost to BHEL/its customer.
- 1.9 In the event of any conflict between the requirements of two clauses of this specification documents or requirements of different codes and standards specified, Section - C shall prevail over section – D, however more stringent requirement as per the interpretation of the owner shall apply.
- 1.10 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.11 For definition of word like Contractor, bidder, supplier, vendor, Customer/ Purchaser / Employer, consultant, please referred relevant clause(s) of GCC.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI STPS**

SPECIFICATION NO. PE-TS-408-166-A001	
VOLUME II-B	SECTION 'B'
REVISION 00	DATE: 12/10/2015
PAGE 1 of 1	

SECTION: B

**PROJECT INFORMATION WITH WIND AND SEISMIC DESIGN
CRITERIA**

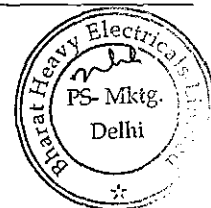
CONTENT

CLAUSE NO.	DESCRIPTION
1.00.00	INTRODUCTION
2.00.00	APPROACH TO SITE
3.00.00	LAND
4.00.00	SOURCE OF COAL
5.00.00	SOURCE OF WATER
6.00.00	ASH DISPOSAL AREA
7.00.00	SALIENT DESIGN DATA



DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-1&2)

030



VOLUME : IIA

SECTION-II

PROJECT SYNOPSIS AND GENERAL INFORMATION

1.00.00 INTRODUCTION

The proposed 1x800 MW Supercritical Thermal Power Project would be set up by Gujarat State Electricity Corporation Limited (GSECL) at Kheda district of Gujarat.

The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on the Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder.

2.00.00 APPROACH TO SITE

The proposed site is located in Kheda district about 13 kilometers from the nearest commercial town of Balasinor & 10 kilometers from Sevalia town. The National Highway, NH-08, connecting Dakor – Godhra is about 10 kilometers from the site. The State Highway SH – 59 connecting Balasinor – Sevalia is about 2 Kilometers from the site. Nearest railway station to the existing site is Sevalia, located about 8 kilometers from the site on Anand – Godhara main broad gauge line of Western Railway.

Nearby Air Ports are Ahmedabad at a distance of about 110 kilometers from the site and Vadodara at a distance of about 85 kilometers from the site.

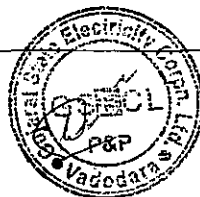
3.00.00 LAND

The proposed extension unit will be developed in the existing Wanakbori Thermal Power Station and will be located north east side of the existing plot in the Kheda District of Gujarat. The land of the proposed plant will be filled in upto a desired level. Existing Ash Pond/ Dyke area will be utilized for the extension unit.

4.00.00 SOURCE OF COAL

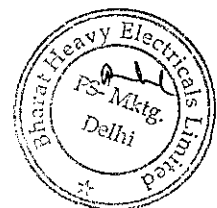
Indian coal would be sourced from captive mines Machha Kata in Talcher, State – Orissa which are situated about 1800 Kms from the project site. GSECL will arrange for transportation of the coal required for the extension unit from these captive mines by the existing railway facilities for delivery of coal supply to the Wanakbori power station.

DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-1&2)



029

V IIA/S-2 : 1



5.00.00 SOURCE OF WATER

The water required for the new unit shall be obtained from River Mahi, flowing by the side of the existing Wanakbori Power Station.

One (1) new jackwell will be installed on Mahi river for supply of water for new plant. In addition, existing Canal Water and Jackwell Water will have interconnection with new plant to cater plant water requirement of new plant.

6.00.00 ASH DISPOSAL AREA

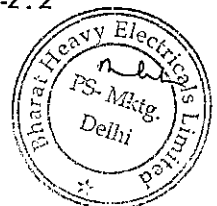
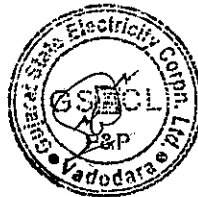
Existing Ash Pond / Dyke area will be utilized for the extension unit. Fly ash silos will be located outside plant boundary wall (but within GSECL land) in the vicinity of the Ash Dyke area.

7.00.00 SALIENT DESIGN DATA

7.01.00 Meteorological data of site is given below:-

Elevation above MSL	:	72 M
Max. daily average temp	:	34 °C
Min. daily average temp	:	11.7 °C
Max. Ambient air temp. (daily)	:	34°C
Max. Ambient air temp. (yearly)	:	30°C
Max. Ambient air temp.	:	42°C
Wet bulb temperature	:	28°C
Relative Humidity	:	RH varies within a range from 50% to 95%.
Average annual rainfall	:	750 mm

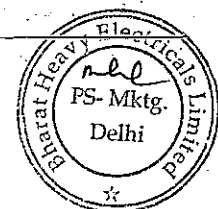
[Metrological data of Vadodara is attached for reference].



VOLUME : IIA
SECTION-IX
SALIENT DESIGN DATA
[TABLE-I TO TABLE-VII]



DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)



177

CONTENT

TABLES	DESCRIPTION
TABLE-I	CLARIFIED WATER ANALYSIS
TABLE-II	RAW WATER ANALYSIS
TABLE-III	ESTIMATION OF CONSUMPTIVE WATER REQUIREMENT
TABLE-IV	ANALYSIS OF COAL
TABLE-V	ASH ANALYSIS
TABLE-VI	FUEL OIL ANALYSIS
TABLE-VII	CLIMATOLOGICAL TABLE OF BARODA



DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)

178

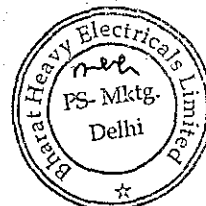


TABLE-I

CLARIFIED WATER ANALYSIS
(As Received)

Page 1 of 2

CONSTITUENTS	As	CONTENT	Jan-March	April-June	July-Sept	Oct-Dec
Calcium Hardness	CaCO3	ppm	70	62	57	64
Magnesium Hardness	CaCO3	ppm	63	78	52	65
Sodium + Potassium	CaCO3	ppm	-	-	-	-
Iron in Solution.	CaCO3	ppm	0.032	0.030	0.025	0.032
Manganese in Solution	CaCO3	ppm	-	-	-	-
Hydrogen (FMA)	CaCO3	ppm	64	68	36	40
TOTAL CATIONS	CaCO3	ppm	180	197	147	165
Bicarbonate	CaCO3	ppm	137	145	105	123
Carbonate	CaCO3	ppm	0	0	0	0
Hydroxide	CaCO3	ppm	-	-	-	-
Sulphate	CaCO3	ppm	14	16	18	14
Chloride	CaCO3	ppm	29	35	24	28
Nitrate	CaCO3	ppm	-	-	-	-
Fluoride	CaCO3	ppm	-	-	-	-
TOTAL ANIONS	CaCO3	ppm	200	215	160	185
Colloidal Silica	SiO ₂	ppm	-	-	-	-
Dissolved Silica	SiO ₂	ppm	18	16	12	20
Conductivity at 25°C	-	Micro siemens/cm (maximum)	367	400	302	321
pH value at 25°C	-		7.87	7.76	7.71	7.75
Total Suspended solids	-	ppm (maximum)	294	320	242	257
Turbidity		NTU (maximum)	2	2	5	2



DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)

V.IIA/S-9 : 1

179

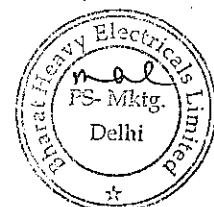


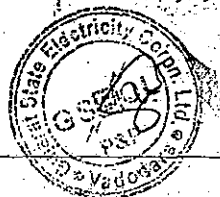
TABLE-I
CLARIFIED WATER ANALYSIS

Page 2 of 2

CONSTITUENTS	As	CONTENT
Calcium	CaCO ₃	85.0 ppm
Magnesium	CaCO ₃	94.0 ppm
Sodium + Potassium	CaCO ₃	75.0 ppm
	CaCO ₃	
Iron in Solution.	Fe	0.05 ppm
Hydrogen (FMA)	CaCO ₃	- ppm
TOTAL CATIONS (except iron)	CaCO ₃	254.0 ppm
Bicarbonate	CaCO ₃	160.0 ppm
Carbonate	CaCO ₃	- ppm
Hydroxide	CaCO ₃	- ppm
Sulphate	CaCO ₃	20.0 ppm
Chloride	CaCO ₃	52.0 ppm
Nitrate	CaCO ₃	22.0 ppm
Phosphate		- ppm
Fluoride	CaCO ₃	0.0 ppm
TOTAL ANIONS	CaCO ₃	254.0 ppm
Reactive Silica	SiO ₂	22.0 ppm
Colloidal Silica	SiO ₂	0.0 ppm
Conductivity at 25°C	-	440 Micro siemens/cm (maximum)
pH value at 25°C	-	7.5 – 8.0
Turbidity		Not to exceed 15 NTU (maximum)

Note: The above Clarified Water Analysis shall be considered for DM Plant Design.

DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)



180

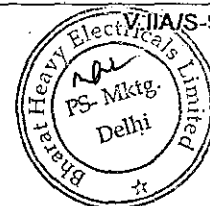


TABLE-II

RAW WATER ANALYSIS
(As Received)

Source : River Mahi (Jack-well/ canal)

Page 1 of 2

(1) Jack-well/Canal Water Parameters

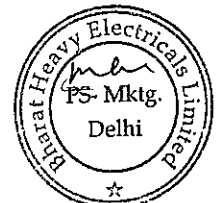
Sl. No.	Parameter	Unit	Result
1	pH	Unit	8.42
2	Turbidity	NTU	2.2
3	Conductivity	μ Mhos/cm	440
4	Total alkalinity as CaCO ₃	ppm	152
5	Chloride as Cl	ppm	33
6	Total hardness as CaCO ₃	ppm	134
7	Calcium Hardness as CaCO ₃	ppm	52
8	Magnesium Hardness as CaCO ₃	ppm	82
9	Silica as SiO ₂	ppm	20
10	Total Dissolved solids as such	ppm	308.42
11	Sulphate as SO ₄	ppm	12
12	Iron as Fe	ppm	0.031
13	Potassium		Not present
14	TSS	ppm	1-2



DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)

V.IIA/S-9: 3

181



(2) Hypothetical Combination of Ions

Page 2 of 2

Sl. No.	Parameter	As	CONTENT ppm
1	Calcium Hardness	CaCO ₃	52
2	Magnesium Hardness	CaCO ₃	82
3	Sodium	CaCO ₃	79
4	Iron in Solution.	Fe	-
5	Manganese in solution	CaCO ₃	-
6	Total Cations	CaCO ₃	213
7	Bicarbonate	CaCO ₃	152
8	Carbonate	CaCO ₃	2
9	Hydroxide		-
10	Sulphate	SO ₄	12.5
11	Chloride	CaCO ₃	46.48
12	Nitrate	NO ₃	-
12	Fluoride	-	-
13	Total Anions	-	213



DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)

V.IIA/S-9: 4

182

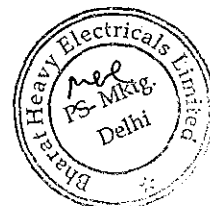
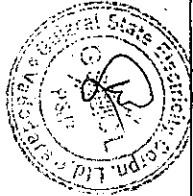


TABLE-III

ESTIMATION OF CONSUMPTIVE WATER REQUIREMENT

Sl. No.	Consumption Points	DM Water (m3/hr)	Filtered Water (m3/hr)	Clarified Water (m3/hr)	Raw Water (m3/hr)	REMARKS
1.	a. Heat Cycle Make-up	72*				*Note: Heat Cycle Make-up is 3% of BMCR steam flow.
	b. Make-up Requirement for DMCW System	0.5				
	c. Chemical Feed System	4				
	d. Condensate Polishing Unit	6				
	e. Neutralisation Pit					
	Sub-Total (a to e)	83	83			
2.	a. Potable Water Requirement		2			
	b. Backwash of Filter		2			
	Sub-Total (1 + 2)		87	87		
3.	a. Ventilation System Requirement			17		C.O.C : 5 CTBD : 372
	b. AC Plant Requirement			10		
	c. Fire Water System			-		
	d. AHP Gland Sealing System			90		
	e. Backwash Return			(-) 2		
	Sub-Total (1 + 2 + 3)			202	202	
4.	a. Service Water				25	
	b. CT Make-up requirement				1884	
GRAND TOTAL (1 to 4)					2111	(Say 21.0 Cusec)



183

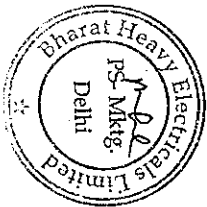


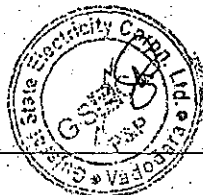
TABLE-IV
ANALYSIS OF COAL
PROXYMATE ANALYSIS

No.	Description	Designed Coal	Worst Coal
1.	Fixed Carbon	28.83%	26%
2.	Volatile Matter (VM)	26.61%	22.00%
3.	Moisture	10.80%	10.0%
4.	Ash	33.76%	42.00%
5.	Gross calorific value	3850 Kcal/kg	3500 Kcal/kg

ULTIMATE ANALYSIS

No.	Description	Designed Coal	Worst Coal
1.	Carbon	40.34%	35.87%
2.	Hydrogen	2.61%	2.66%
3.	Sulphur	0.80%	0.90%
4.	Nitrogen	0.97%	0.72%
5.	Oxygen (by diff.)	10.72%	7.85%
6.	Moisture	10.8%	10%
7.	Ash	33.76%	42.00%
8.	Grindability Index (HGI)	66	50
9.	Ash Fusion Temperature (deg C) (IDT)	1350	1160

DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)



V.IIA/S-9 : 6

184

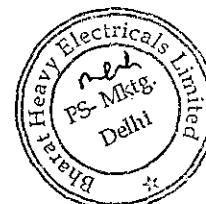


TABLE-V

ASH ANALYSIS
(As Received)

Sl. No.	Characteristic	Result
1.	Silicon dioxide (SiO ₂) plus Aluminium Oxide (Al ₂ O ₃) plus Iron Oxide (Fe ₂ O ₃) present by mass Min.	93.3 – 95.7
2.	Silicon dioxide (SiO ₂), percent by mass Min.	58.4 – 63.0
3.	Total sulphur as sulphur trioxide (SO ₃) percent by mass Max.	0.31 – 0.76
4.	Available alkalis as sodium Oxide (Na ₂ O) in percent by mass Max.	Nil
5.	Loss on ignition, in percent by mass Max.	0.31 – 0.87
6.	Moisture content %	0.026 – 0.132
7.	Ash fusion temp. (Deg C) (IDT)	1350 / 1160
8.	Hemispherical (Deg C)	1400
9.	Fusion temp. (Deg C)	1400
10.	Lead (as pb)	0.14 µg/g
11.	Arsenic (as As)	0.01 µg/g
12.	Mercury (as Hg)	0.04 µg/g



DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)

V.IIA/S-9 : 7

185

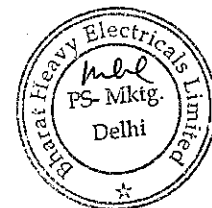
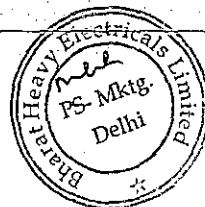
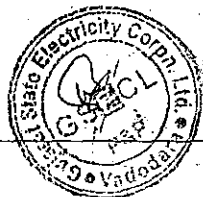


TABLE-VI
FUEL OIL ANALYSIS

Page 1 of 2

Sl. No.	Parameters	Unit	LDO	LSHS	HSD
1.0	Density at 15 degC	gm/l	0.8682	0.9708	0.8297
2.0	Water Content	%v/v	0.15	0.10	0.05
3.0	Sediment	%w/w	0.06	0.04	0.02
4.0	Total Sediment	mg/100ml	—	—	0.94
5.0	Redwood Vis. 37.8	Second	30.0	—	—
6.0	Kinematics Vis 38	cst	6.80	—	—
7.0	Kinematics Vis 100 C	cst	—	68.00	—
8.0	Kinematics Vis 40 C	cst	—	—	2.08
9.0	Flash Point (PMCC)	Deg. C	75	>93	41
10.0	Pour Point	Deg. C	9	27	6
11.0	Acidity -Inorganic	mg KOH/g	Nil	—	Nil
12.0	Acidity -Total	mg KOH/g	—	—	0.13
13.0	Ash	%wt	0.01	0.01	—
14.0	Sulphur Cont. Total	%Mass	0.46	1.14	0.11
15.0	C RES RAMSBOTT. MTD	%Mass	0.53	—	0.21
16.0	Smoke Point	Mm	7.00	—	—
17.0	Gross C.V	Kcal/Kg	—	—	—

DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)



V.IIA/S-9 : 8

186

TABLE-VI

FUEL OIL ANALYSIS – FURNACE OIL FO

Page 2 of 2

Sl. No.	Parameters	Unit	FO
1.0	Acidity –Inorganic in mg. KOH/g	mg. KOH/g	0.0000
2.0	Ash	Wt%	0.059
3.0	Density at 15 degC	Kg/m ³	954.8
4.0	Flash Point (PMCC)	Cell	69.0
5.0	Calorific Value Net in	Kcal / Kg	9818
6.0	Gross Calorific Value	Kcal/kg.	10402
7.0	Water Content	Vol%	0.20
8.0	Kinematics Viscosity @50°C summer	cst	134.0
9.0	Pour Point Summer	Cel	18.0
10.0	Sediment	Wt%	0.10
11.0	Sulphur Total	Wt%	0.680



DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)

V:IIA/S-9:9

187

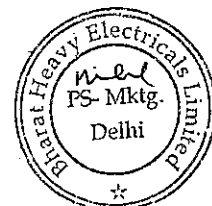


TABLE-VII
CLIMATOLOGICAL TABLE OF BARODA

STATION : Baroda 42747 LAT: 22 18 N LONG: 73 15 E HT. ABOVE M.S.L. 34 METERS DATA 1951 TO 1980

MN	SLP	Mean Temperature				Extremes				Cloud				Rainfall					WS
		DB	WB	MAX	MIN	HIGH	LOW	MAX DT	MIN DT	RH	VP	TOT	LOW	TOT RAINY	WET	DRY	HEAVY	DAY	
1	1011.8 1008.5	13.8 27.9	10.9 17.8	30.3	12.0	34.3	7.5	36.2 25 1961	-1.1 15 1935	67 10.7 33 12.4	1.1 0.3 1.1 0.1	1.2	0.1	53.6 1920	0.0	33.0	05	4.0	
2	1010.3 1006.7	16.2 31.4	12.3 18.7	33.0	13.8	37.9	8.9	41.7 28 1953	1.7 10 1950	61 11.2 25 11.3	0.9 0.2 0.9 0.2	0.6	0.1	33.0 1898	0.0	33.0	10	4.1	
3	1008.5 1004.3	22.1 35.8	16.3 20.5	37.1	18.4	41.5	13.1	44.4 26 1973	6.7 03 1936	53 13.8 20 11.7	1.1 0.2 1.2 0.2	2.2	0.2	44.3 1967	0.0	21.0	23	4.2	
4	1005.9 1001.4	27.3 39.1	20.7 22.5	40.2	22.9	43.9	18.4	45.9 25 * 1979	11.7 16 1955	53 19.2 20 14.1	1.1 0.2 1.2 0.2	0.9	0.1	83.3 1947	0.0	71.4	18	4.8	
5	1003.1 998.3	29.9 39.8	24.6 24.9	40.9	26.5	44.5	23.2	46.7 11 1960	18.9 05 1939	64 26.8 27 19.3	1.7 1.2 0.7 0.3	4.4	0.3	153.9 1917	0.0	59.7	29	8.7	
6	999.4 995.4	29.3 35.3	26.0 26.6	37.1	27.0	41.5	23.5	45.6 06 * 1979	20.2 19 1978	76 30.9 51 27.8	4.5 2.9 3.4 2.0	146.8	5.6	527.8 1913	0.0	177.4	06	10.3	
7	998.1 995.3	27.4 30.8	25.8 26.5	32.7	25.7	36.9	23.5	40.6 05 1962	21.1 19 1943	88 31.8 72 31.1	6.5 4.0 6.4 4.0	297.6	13.8	899.0 1950	4.8	247.4	24	8.4	
8	999.8 997.0	26.4 29.9	25.1 26.1	31.5	25.0	34.6	23.4	37.4 30 1979	22.2 01 1976	90 30.9 74 30.6	6.7 3.8 6.5 3.9	284.7	12.0	748.5 1933	0.3	250.7	05	7.1	
9	1003.6 1000.2	26.3 31.5	24.5 25.7	33.2	24.3	37.0	22.4	41.1 30 * 1951	18.9 29 1938	86 29.4 63 28.2	4.3 2.4 4.0 2.4	141.7	7.1	575.4 1945	0.0	372.1	24	5.1	
10	1007.5 1004.0	25.0 33.3	21.5 23.9	36.0	21.3	38.5	16.7	41.7 13 1951	11.7 30 1955	72 22.9 44 22.2	1.5 0.6 1.4 0.6	22.0	1.3	272.3 1917	0.0	153.2	29	3.0	
11	1010.5 1007.2	20.4 30.5	16.4 21.2	34.3	16.7	37.2	12.9	39.6 02 1966	7.2 30 1938	64 15.5 41 17.8	1.3 0.4 1.3 0.4	16.2	0.7	212.4 1979	0.0	64.6	22	3.0	
12	1011.9 1008.7	15.6 28.0	12.7 19.1	31.4	13.4	34.5	9.6	36.8 01 1980	3.3 22 1937	70 12.5 40 15.1	1.3 0.2 1.3 0.2	4.4	0.2	43.4 1978	0.0	43.4	01	3.6	
YR	1005.9	23.3	19.7	34.8	20.6	44.8	6.9	46.7	-1.1	70 21.3	2.7 1.4	922.7	41.5	1666.0	133.1	372.1		5.5	
LY	1002.3	32.8	22.8							43 20.1	2.5 1.2			1976	1899				
YRS	30 30	30 30	30 30	30	30	30	30	48	48	30 30	29 29	30 30	22 22	30	30	93	93	93	30

* Occurred More Than Once

DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-III-Sec-9)

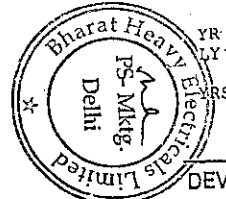
V.II/A/S-IX: 10

STATION : Baroda 42747 .. contd

MN	Weather						Wind speed				% Wind Direction					Total Cloud					Low cloud					Visibility									
	PPT	HAIL	THUN	FOG	D.STM	SQUA	62	61	19	0	N	NE	E	SE	S	SW	W	NW	0	0	T-2	3-5	6-7	8	0	T-2	3-5	6-7	8	F8	<1	1-4	4-10	10-20	>20
1	0.3	0.0	0.1	0.5	0.0	0.0	0	0	19	12	13	39	2	2	1	3	1	3	36	20	5	3	2	1	28	2	1	0	0	0	0.3	1.7	2.0	25.6	1.4
2	0.3	0.0	0.1	0.2	0.0	0.0	0	0	17	11	10	31	1	2	2	7	2	4	41	20	4	3	1	0	26	1	1	0	0	0.2	1.6	2.3	23.9	0.0	
	0.2	0.0	0.2	0.0	0.0	0.0	0	0	19	12	7	15	1	3	5	16	5	7	41	20	5	4	2	0	29	1	1	0	0	0.0	0.5	0.7	29.8	0.0	
	0.2	0.0	0.5	0.0	0.0	0.0	0	0	22	8	5	5	1	2	6	29	10	12	30	19	5	3	2	1	27	2	1	0	0	0.0	0.1	0.1	29.7	0.1	
5	0.4	0.0	0.6	0.0	0.3	0.0	0	0	28	3	1	1	1	1	5	57	17	7	10	15	6	7	3	0	19	4	6	2	0	0.0	0.0	0.0	30.8	0.2	
6	7.6	0.0	3.3	0.0	0.1	0.2	0	0	28	2	0	1	0	2	10	61	16	1	9	2	6	9	7	6	6	8	12	4	0	0.0	0.0	0.3	29.6	0.1	
7	18.8	0.0	2.1	0.0	0.0	0.1	0	0	27	4	0	0	0	1	8	62	14	0	15	0	2	5	8	16	4	4	14	8	1	0.0	0.0	0.2	30.8	0.0	
8	17.8	0.0	1.8	0.0	0.0	0.0	0	0	26	5	1	0	0	0	7	55	20	1	16	0	1	4	8	18	4	4	13	9	1	0.0	0.1	0.8	29.2	0.9	
9	10.2	0.0	2.6	0.0	0.0	0.0	0	0	23	7	2	3	0	2	5	37	18	6	27	4	6	6	6	8	12	4	8	5	1	0.0	0.1	0.2	29.3	0.4	
10	1.6	0.0	1.4	0.2	0.0	0.0	0	0	17	14	6	16	3	6	4	12	3	3	47	17	7	4	2	1	26	2	2	1	0	0.0	0.2	0.3	29.7	0.8	
11	1.1	0.0	0.3	0.2	0.0	0.0	0	0	17	13	11	33	4	3	1	2	0	1	45	18	6	3	2	1	27	1	2	0	0	0.1	0.3	0.4	28.3	0.9	
12	0.3	0.0	0.2	0.2	0.0	0.0	0	0	20	11	12	43	3	1	1	1	0	1	38	19	5	4	2	1	29	1	1	0	0	0.0	1.3	1.3	27.4	1.0	
YR	58.8	0.0	13.2	1.3	0.4	0.3	0	0	263	102	6	16	1	2	5	29	9	4	28	154	58	55	45	53	237	34	62	29	3	0.6	5.9	8.6	344.1	5.8	
RS							0	5	297	63	6	12	2	1	2	26	16	17	18	150	78	43	53	41	219	67	53	24	2	0.0	1.1	1.1	22.6	340.2	
			26						24					29																					
									24					29																					
														29																					
														26																					



189



DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)

V.II/A/S-IX : 11

Gujarat State Electricity Corporation Ltd
1x800 MW Supercritical Thermal Power Project

EPC Bid Document
K9213R-EPC-SPC-001

STATION : Baroda (A) 42748 LAT: 22 20 N LONG: 73 16 E HT. ABOVE M.S.L. 38 METERS DATA 1952 TO 1980

MN	SLP	Mean Temperature						Extremes		Cloud		Rainfall							
		DB	WB	MAX	MIN	HIGH	LOW	MAX DT	MIN DT	RH	VP	TOT LOW	TOT RAINY	WET	DRY	HEAVY	DAY	WS	
1	1011.5 1008.1	15.2 27.6	11.3 17.3	29.4	12.2	33.4	7.2	35.8 13 1979	2.8 22 1962	59 10.3 31 11.5	1.2 0.1 1.2 0.1	1.3 0.1 1953	0.1	15.8 1953	0.0	14.0	07 1953	7.6	
2	1010.0 1006.3	17.8 30.9	12.4 17.8	32.1	13.9	36.6	8.8	40.6 28 1953	3.9 10 1950	50 10.2 23 9.9	1.0 0.3 1.0 0.3	0.7 0.1 1961	0.1	11.0 1961	0.0	6.0	02 1961	7.6	
3	1008.1 1003.9	23.2 35.1	16.5 20.0	36.4	18.2	40.5	13.0	43.9 29 1977	9.3 08 1979	48 13.4 21 11.2	1.1 0.2 1.3 0.2	1.2 0.2 1967	0.2	21.4 1967	0.0	11.5	25 1967	7.5	
4	1005.6 1000.9	27.8 38.5	20.8 21.8	39.5	22.8	42.9	18.2	45.9 29 1979	14.4 15 1955	51 19.0 19 12.8	1.2 0.3 1.5 0.3	0.3 0.0 1978	0.0	8.2 1978	0.0	8.2	25 1978	8.3	
5	1002.7 997.7	29.9 39.0	24.6 24.5	40.3	26.5	43.7	22.9	46.1 20 1955	19.4 27 1974	64 26.6 29 19.0	1.9 1.6 0.9 0.5	3.7 0.2 1974	0.2	50.1 1974	0.0	40.9	29 1956	14.6	
6	999.0 994.9	29.3 34.6	26.1 26.6	36.7	26.8	40.9	23.2	45.6 06 1979	17.1 03 1980	77 31.0 54 28.1	4.9 3.4 3.9 2.5	129.7 5.0 1976	5.0	439.0 1976	0.0	187.3	06 1976	18.0	
7	997.7 994.7	27.4 30.2	25.8 26.5	32.4	25.6	36.2	23.5	39.6 02 1968	22.2 28 1952	88 32.0 75 31.6	6.6 4.1 6.5 3.9	290.7 12.6 1976	12.6	605.6 1976	60.8	162.0	11 1976	15.2	
8	999.5 996.5	26.5 29.3	25.2 26.0	31.3	24.9	34.4	23.2	39.1 16 1969	21.7 16 1956	90 31.0 76 30.8	6.8 3.9 6.5 3.8	274.4 11.8 1978	11.8	657.4 1978	38.5	277.1	05 1956	12.6	
9	1003.2 999.7	26.5 30.9	24.6 25.4	32.7	24.2	36.5	22.2	41.1 29 1951	18.1 25 1972	85 29.4 65 28.1	4.7 2.6 4.5 2.6	147.0 7.2 1958	7.2	456.4 1958	0.3	221.6	07 1970	9.1	
10	1007.2 1003.7	26.0 32.9	21.7 23.0	35.4	21.1	37.9	16.5	41.2 15 1980	12.8 27 1960	67 22.6 41 20.2	1.7 0.6 1.8 0.8	21.6 1.3 1956	1.3	143.9 1956	0.0	71.1	01 1954	6.2	
11	1010.3 1006.9	21.7 30.2	16.7 20.2	33.4	16.7	36.2	12.4	39.4 01 1980	6.0 26 1968	58 15.0 37 15.6	1.6 0.4 1.5 0.5	16.5 0.7 1979	0.7	190.1 1979	0.0	61.4	04 1962	6.7	
12	1011.7 1008.3	17.3 28.0	13.3 18.3	30.7	13.7	33.5	9.5	37.2 06 1968	6.4 30 1977	61 12.1 36 13.3	1.5 0.1 1.6 0.2	3.3 0.2 1978	0.2	34.2 1978	0.0	34.2	01 1978	7.0	
YR	1005.5	24.1	19.9	34.2	20.6	44.1	6.8	46.1	2.8	67 21.1	2.9 1.5	911.1 39.4	1721.7	314.9	277.1		10.0		
LY	1001.8	32.3	22.3							42 19.3	2.7 1.3	1976	1976	1972					
YRS	29 29	29 29	29 29	29	29	29	29	31	31	29 29	28 28	29 29	16 16	30	30	31	31	31	29

DEVELOPMENT CONSULTANTS
(K9213R-EPC-SPC-001-Vol-IIA-Sec-9)

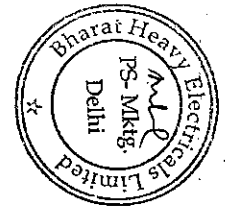
V.IIA/S-IX: 12

STATION : Baroda (A) 42748 .. contd

MN	Weather						Wind speed				% Wind Direction					Total Cloud					Low cloud					Visibility									
	PPT	HAIL	THUN	FOG	D.STM	SQUA	62	61	19	0	N	NE	E	SE	S	SW	W	NW	0	0	T-2	3-5	6-7	8	0	T-2	3-5	6-7	8	F8	<1	1-4	4-10	10-20	>20
1	0.2	0.0	0.1	0.2	0.0	0.0	0	1	20	10	34	20	2	4	2	1	1	4	32	19	6	4	2	0	30	1	0	0	0	0	0.3	2.8	14.2	13.1	0.6
							0	2	27	2	26	14	2	0	1	4	11	34	8	19	6	4	2	0	28	2	1	0	0	0	0.0	0.1	2.3	18.9	9.7
2	0.2	0.0	0.1	0.2	0.0	0.0	0	1	18	9	25	18	4	8	5	4	2	5	29	19	4	3	2	0	26	1	1	0	0	0	0.1	2.1	12.1	13.1	0.6
							0	3	24	1	20	13	1	1	1	7	17	36	4	17	6	3	2	0	24	3	1	0	0	0	0.1	0.1	0.9	15.2	11.7
3	0.2	0.0	0.3	0.1	0.1	0.0	0	2	22	7	14	12	4	9	11	12	6	8	24	18	7	4	2	0	28	2	1	0	0	0	0.1	1.3	10.8	18.0	0.8
							0	4	26	1	11	5	2	1	1	11	24	41	4	16	8	5	2	0	26	4	1	0	0	0	0.0	0.1	0.9	17.0	13.0
4	0.1	0.0	0.5	0.0	0.1	0.0	0	2	24	4	12	5	1	2	10	25	14	20	11	19	6	4	1	0	27	2	1	0	0	0	0.0	0.4	9.8	18.9	0.9
							0	3	26	1	7	2	0	0	1	12	32	43	3	17	7	4	2	0	25	4	1	0	0	0	0.1	0.0	1.8	15.5	12.6
5	0.4	0.0	0.9	0.0	0.3	0.2	0	8	22	1	4	1	0	0	8	46	26	10	5	13	7	8	3	0	16	6	7	2	0	0	0.0	0.1	6.1	23.5	1.3
							0	10	20	1	2	1	0	0	4	38	33	19	3	17	9	3	2	0	23	7	1	0	0	0	0.0	0.1	1.7	17.4	11.8
6	7.1	0.0	4.1	0.0	0.2	0.2	0	10	20	0	1	1	0	2	15	51	25	3	2	1	3	10	11	5	4	6	15	5	0	0	0.0	0.7	9.0	19.3	1.0
							0	19	11	0	1	1	1	1	13	59	19	5	0	4	6	7	8	5	7	11	10	2	0	0	0.1	0.7	5.7	14.3	9.2
7	16.7	0.0	3.5	0.0	0.1	0.2	0	6	25	0	0	1	0	2	14	56	22	2	3	0	0	6	13	12	1	6	17	6	1	0	0.0	1.5	14.4	14.5	0.6
							0	16	15	0	0	0	0	2	17	59	17	2	3	0	0	6	14	11	1	7	17	5	1	0	0.1	1.0	8.3	16.1	5.5
8	17.0	0.0	2.7	0.0	0.0	0.0	0	3	27	1	1	0	0	1	9	55	27	4	3	0	1	3	12	15	2	6	16	6	1	0	0.0	1.4	14.2	14.8	0.6
							0	10	20	1	2	1	0	0	11	56	21	5	4	0	1	5	14	11	1	7	16	6	1	0	0.0	0.7	7.2	17.7	5.4
9	9.9	0.0	3.0	0.2	0.0	0.1	0	1	25	4	4	3	1	3	9	32	27	10	11	3	5	7	10	5	9	7	10	4	0	0	0.0	0.9	11.3	15.3	2.5
							0	4	24	2	5	6	1	1	6	28	31	14	8	1	7	9	9	4	3	13	11	3	0	0	0.0	0.3	3.3	13.3	13.1
10	1.7	0.0	1.6	0.3	0.0	0.0	0	1	23	7	11	15	8	14	11	6	5	6	24	13	8	5	4	1	23	4	3	1	0	0	0.1	0.7	8.5	18.3	3.4
							0	1	25	5	17	16	5	2	2	6	14	24	14	10	12	6	3	0	16	11	4	0	0	0	0.0	0.0	1.4	13.9	15.7
11	1.0	0.0	0.3	0.1	0.0	0.0	0	1	21	8	25	26	11	5	2	0	1	2	28	15	7	4	3	1	26	2	2	0	0	0	0.1	1.0	7.8	18.2	2.9
							0	0	25	5	21	19	11	1	1	2	4	26	15	15	7	4	3	1	23	5	2	0	0	0	0.0	0.1	0.9	15.8	13.2
12	0.3	0.0	0.2	0.1	0.0	0.0	0	1	22	8	33	27	5	4	1	0	0	3	27	16	7	5	2	1	29	1	1	0	0	0	0.1	1.2	11.9	15.9	1.9
							0	1	26	4	25	17	6	2	1	2	6	27	14	16	7	5	3	0	28	2	1	0	0	0	0.0	0.0	0.8	17.7	12.5
YR	54.8	0.0	17.3	1.2	0.8	0.7	0	37	269	59	14	11	3	5	8	24	13	6	16	136	61	63	65	40	221	44	74	24	2	0	0.8	14.1	130.1	202.9	17.1
LY							0	73	269	23	11	8	2	1	5	24	19	23	7	132	76	61	64	32	205	76	66	16	2	0	0.4	3.2	35.2	192.8	133.4
YRS			27					24							26							19				19						19			
								25							27							19				19						19			



191



SECTION: C

TECHNICAL SPECIFICATIONS



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 1 of 14

SECTION: C1

SPECIFIC TECHNICAL REQUIREMENT



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 2 of 14

1.0.0 SYSTEM DESCRIPTION

Light Diesel Oil (LDO) shall be used for initial startup (upto 10% BMCR) while Heavy Fuel Oil (HFO) shall be used upto 30% BMCR and for flame stabilization. The Fuel Oil Handling System to be considered comprises unloading & storage of HFO and LDO.

This system write up is to be read in conjunction with the flow schemes enclosed.

1.1.0 Heavy Fuel Oil System

HFO from existing storage tanks shall be pumped to 2 nos. HFO Day tanks (Unit-8) with the help of two (2) nos. (1W+1S) HFO transfer pumps of capacity 125 m³/hr each. The HFO transfer pumps are of rotary positive displacement, twin screw type and provided with one (1) no. matching capacity duplex type strainers at their suction with interconnecting piping and valves. The HFO transfer pumps and strainers, valves and transfer header shall be electric traced, insulated and cladded.

Two (2) nos. HFO Day tank having **fuel oil storage capacity of 500 m³** shall be provided. The tank shall be provided with steam floor coil heaters to initially raise the temperature of full tank capacity of HFO oil from 5 degree centigrade temperature to the handling / tank maintenance temp of 50 °C in 32 hrs and for compensating the heat loss from the insulated tank in order to maintain the temperature as 50°C. The floor coil heater for the Fuel oil Day tank shall have adequate nos. of sections. Steam flow to the floor coil heater shall be controlled by providing pneumatically operated control valve in the common header of half segments of heater coils to maintain the desired level of temperature (**50°C**) and the other half sections to be used during initial heating shall be provided only with isolation valve as shown in P&I diagram. This shall be actuated from tank temperature.

HFO Day tank shall also be provided with one no. of suction heater (shell and tube type suction heater) with capacity suitable to meet maximum requirement of pressurizing pump for one unit. The suction heater will raise the temperature of oil by approx. 20°C to meet the pressurizing pump suction temperature requirement. Steam flow to Suction heater shall be regulated through one pneumatically operated control valve on the steam supply line to the suction heater and the same shall be actuated from heater outlet temperature. Initial and final temperature for suction heater shall be 50 deg. C and 60 deg. C respectively. However, suction heater will be designed for a temperature rise of 20 deg. C. All modulating control valves shall be of SMART type.

HFO Day tank shall be insulated and cladded on the shell only. Roof will not be insulated.

Interconnecting piping, valves and instruments as required for the system shall be provided as shown in P & ID. The requirements furnished in the P&ID attached with the specification shall be considered as a minimum. Any additional instrument/valves etc or any change in sizes of the items indicated, based on the system requirement, shall be provided by the successful bidder without any price implication.

4.2.0 Light Diesel System (LDO)

LDO from existing storage tanks shall be pumped to one (1) no. LDO Day tank (Unit-8) with the help of two (2) nos. (1W+1S) LDO transfer pumps of capacity 125m³/hr each. The LDO transfer pumps are of rotary positive displacement, twin-screw type, and provided with one (1) no. matching capacity duplex strainer at their suction with interconnecting piping and valves.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 3 of 14

One (1) no. LDO Day tank **having fuel oil storage capacity of 500 m3** shall be provided.

Interconnecting piping, valves and instruments as required for the system shall be provided as shown in P & ID. The requirements furnished in the P&ID attached with the specification shall be considered as a minimum. Any additional instrument/valves etc or any change in sizes of the items indicated, based on the system requirement, shall be provided by the successful bidder without any price implication.

1.3.0 Steam & Condensate System

The aux. steam pressure for tank floor coil heater, suction heater shall be 4.0 kg/ cm² (a) or more as decided by FO System vendor. Design calculations and final tank layout drawings including the no. of coils shall be submitted by the successful bidder during detail engineering.

A pressure reducing and de-superheating station of adequate capacity consisting of self-regulating type control valves with safety relief valve and by pass arrangement shall be provided to reduce the pressure of aux steam available at 16 kg/cm² (a) and 290 Deg.C to 4.0 kg/ cm² (a) or to pressure as required from process point of view for HFO Day tank heating and to bring steam temperature to saturated temperature.

The condensate from heating coil & suction heater shall be collected in condensate header and will be taken to condensate flask tank provided by BHEL-Trichy (located near P & H unit).

A condensate flash tank shall be provided in the tank farm for collecting condensate from tank (floor coil heater and Suction heater) before discharging it to Oil Water Separator pit.

Condensate formed in fuel oil transfer pump house i.e. pumps, strainers, drain oil tank shall be fed to sump in the pump house.

1.4.0 Drain Oil System, Sump water & Oil Water Separation

The fuel oil drains from different equipment and piping etc. in Fuel Oil Transfer pump house shall be collected by gravity in a drain oil tank of capacity 4 m³ to be located in the transfer pump house area. Two (2) nos.(1W+1S) rotary positive displacement type drain oil pump of capacity 5 m³/hr each shall be provided to transfer the drained oil to the LDO Pump header. The drain oil tank shall be fitted with steam tracing arrangement to maintain the temperature inside the tank from at about 50 (°C) and shall be insulated.

All oil drain lines will have a size not less than 25 NB and HFO drain lines will be electric traced.

Two (2) Nos. (1W+1S) Vertical centrifugal type sump pumps of 10 m³/hr capacity each are also envisaged in the Fuel Oil Transfer Pump House to pump the oil water mixture to existing oil water separator pit in FO storage area.

A single chamber gravity type oil water separator with heating arrangement and its accessories is envisaged for receiving oil water mixture during normal operation from the Day tanks dyke area and fuel oil transfer pump house. The separated oil collected in oil pit, through an 80 NB perforated skimmer MS pipe, shall be returned back to the HFO day tank and drain oil tank (in the transfer pump house) by the help of Two sets of two(2) nos.(1W+1S) of vertical single screw recovery pumps of capacity 5 m³/hr each, respectively. For the OWS pit near the dyke area, the separated water with traces of oil shall be pumped to the retention pit for oily waste water storage area through two (2) nos.(1W+1S) Vertical centrifugal type pump of 10 m³/hr each. The pumps along with the piping to the nearest retention pit shall be provided by the bidder. The retention pit shall be located approximately



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 4 of 14

50M from the OWS pit. For the OWS pit near the transfer pump house area, the separated water with traces of oil shall be pumped to the nearest drain through two (2) nos.(1W+1S) Vertical centrifugal type pump of 10 m³/hr each. The Oil Water Separator pits shall be provided with steam coil to pass steam manually on need basis in order to heat the oil water mixture to facilitate their separation. The OWS pit will not to be designed for oil water separation during rains. During rainy season, water from unloading area drain trench and from tank dyke area having very little or no trace of oil shall be diverted to nearest plant drain without letting it go to the OWS facility. Two valves in catch pit will be provided. Opening one valve, water inside dyke area will be routed to Oil water separator pit and from other valve it will be channeled towards plant drain (rainy season). These valves shall be provided with limit switch for monitoring.

All valves in the system except the tank inlet and outlet valves (as marked in P&ID) and HFO & LDO discharge valve shall be manually operated. Unloading pumps will start manually. However, pump tripping will be automatic on reaching high level of oil in the storage tank. Sump pumps in unloading pump house, Oil pit of OWS shall start manually on generating alarm for high level or if the level is visually found high. However, the pumps shall trip automatically on reaching low level in the tank / sump / pit as the case may be.

2.0.0 Instrumentation & Control

The control of Fuel oil transfer, storage, heating system shall be DCS based. One no. Local control panel shall be provided for operation and monitoring of this system. Remote I/O panel will be used for monitoring important parameters i.e. tank levels, oil flow, temperature, pressure, flow etc. Instrumentation shall be as shown in Process & Instrumentation Diagram for FOHS.

The Control Panel is envisaged to achieve the following functions:

- a) Filling of the storage tanks to be started after ensuring that the inlet valve of tanks is open. Signals from Limit switches provided at tank inlet shall be used.
- b) Operation (start / stop) of transfer pumps, recovery oil pump, sump.
- c) Interlocking of operation of transfer pumps, drain oil pump, recovery oil pump, sump pumps with start / running and stop interrupts.
- d) Signals (annunciation & indication) from various instruments / transmitters as shown in flow diagram.
- e) Trip status (annunciation and indication) of transfer pumps.
- f) Low level in storage tanks will be used for annunciation purposes in the transfer pump house to alert the operator for tank inventory.
- g) Level signals from HFO/LDO day tank shall be connected to DCS via hardwired link for control of HFO/LDO transfer pumps.
- h) Hardware connectivity for alarm and monitoring with DCS shall be provided.
- i) Fuel Oil Unloading & Storage System operation and control instrumentation shall also be governed by the details mentioned in the C&I specifications (Section C-4).

Local control panel (without any control system) shall be provided by vendor and shall have provision for hardwired annunciation facia, push button lamps, colored mimics etc. Bidder shall connect the same up to terminal box (panel itself). Further at least 10% spare channels and window facia shall be provided in each annunciator group in the local control panel. Also, cabling with DCS panel shall be in BHEL scope.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 5 of 14

3.0.0 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 Diagram 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.

3.1.0 SCOPE OF SUPPLY

Scope of supply by bidder shall comprise of but not necessarily limited to the following. P&I Diagrams may please be referred.

- 1) Two (2) (1W+1S) nos. LDO twin screw unloading pump motor set each of capacity 120 cum/hr. with duplex type strainers of matching capacity at the suction of each pump.
- 2) Two (2) (1W+1S) nos. HFO twin screw unloading pump motor set each of capacity 125 cum/hr. with duplex type strainers of matching capacity at the suction of each pump.
- 3) One (1) no. fixed roof type M.S storage tank for storage of LDO of capacity 500 m³ duly fitted with appurtenances, accessories, instrumentation, control and fittings etc.
- 4) Two (2) no. of fixed roof type M.S storage tank for storage of HFO of capacity 500 m³ duly fitted with steam heated floor coil heaters and outflow suction heater and other appurtenances, accessories, instrumentation, control and fittings etc. The HFO tank shall be insulated on shell. However, the roof will not be insulated.
- 5) One no. suction heater on each HFO tank of required size.
- 6) Floor coil heater for the tank.
- 7) Control valves for controlling steam flow to Floor coil heating and Suction heater installed on FO storage tank and Drain oil tank inside FO unloading pump house
- 8) Pressure reducing and De-Superheating station of required size.
- 9) Traps for separating condensate from steam.
- 10) Coriolis type mass flow meter in HFO and LDO discharge header.
- 11) Suitable oil water separation with disposal arrangement of water to nearest plant drain through two sets of two (2) nos.(1W+1S) Vertical centrifugal pump motor set of capacity 10 m³/hr each with all its accessories & two sets of two (2) (1W+1S) Nos. vertical single screw recovery pump each of capacity 5 m³/hr for transferring oil to HFO day tank. This OWS shall be located near fuel oil day tank area and fuel oil transfer pump area.
- 12) Instrumentation & control System including instruments, interlocking & protection devices complete in all respects required for safe, efficient and reliable operation of the plant and to be read in conjunction with C&I portion of specification. Minimum instrument and control system requirement is mentioned in the P&ID.
- 13) Two (2) nos. (1W+1S) Vertical Single screw type Drain oil pump motor set of capacity 5 m³/hr. in Drain oil tank.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 6 of 14

- 14) Two sets of Two (2) nos. (1W+1S) Vertical Single screw type recovery oil pump motor set of Capacity 5 m³/hr. in Oil pit of Oil Water Separator.
- 15) Two sets of Two (2) nos. (1W+1S) sump pump motor set in of capacity 10 m³/hr. in fuel oil dyke area and fuel oil transfer pump house area for the water pit of the respective OWS pits in the fuel oil dyke area and fuel oil transfer pump house area.
- 16) Two (2) nos. (1W+1S) sump pump motor set in of capacity 10 m³/hr. in Fuel Oil Transfer Pump House.
- 17) One no. (1) Drain oil tank (20 cum) along with floor coil heater in FO unloading pump House
- 18) Complete electrical tracing [Self Limiting-Self Regulating type heat tracing cables] shall be provided for HFO pipes, valves fittings etc. and steam tracing shall be provided for Pumps, Strainers & drain oil tank etc. Insulation and cladding shall be also be provided for all the above items.
- 19) Drain and vent connection in lines along with isolation valve at every low and high point as per layout requirement of FOHS.
- 20) Traps for separating condensate from steam.
- 21) All foundation bolts/ anchor bolts required for any equipment foundation under the package. For HFO and LDO tank, minimum 24 nos. and 20 nos. anchor bolts (M33 grade) to be considered irrespective of calculation.
- 22) Complete Fuel oil piping, auxiliary steam piping, drain piping, vent piping, condensate piping, instrument air piping, water piping and valves etc as applicable to Fuel oil transfer & storage system.
- 23) Pipe-supporting structures over the insert plates for pedestal supported pipes and also on pipe rack supported pipe.
- 24) Nozzle for foam pourer, heat detector on tank roof & pad plates welded to the tanks as per details to be furnished to the successful bidder for welding supports for water piping and hydrant piping.
- 25) Platform and approach ladder to the platform for foam pourer.
- 26) Wrapping and coating of any buried MS pipes as required.
- 27) All MS structures for cross overs, valve / instruments / equipment operating & maintenance platforms, approach ladders for access to platforms, trench/pit.
- 28) Painting of equipment along with their accessories within battery limit.
- 29) Electrical scope as per enclosure elsewhere in the specification.
- 30) C&I Scope as per enclosure elsewhere in the specification.
- 31) Erection & commissioning spares as required for the complete system.
- 32) One set of special maintenance tools & tackles, if any. These tools shall not be used for erection/ commissioning purposes and shall be in an unused and new condition when they are handed over to the customer at site. Each tool shall be stamped so as to be identified easily for its use. The tools shall be supplied in a steel toolbox. This list shall be reviewed during detail engineering.
- 33) Mandatory spares as per enclosure elsewhere in the specification.
- 34) Initial charge of all lubricants and fluids except LDO / HFO
- 35) All valves, counter- flange with nuts, bolts and gaskets at all the terminal points.
- 36) Flowable non- shrink grout of one grade higher than concrete used for civil work grouting below base plate for all structure/ equipment & for grouting of foundation / anchor bolts.
- 37) Any other item covered in specification for Fuel Oil Handling System



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 7 of 14

- 38) Relevant scope of supply as per GTR, GCC & SCC.
- 39) Valves in pit outside dyke as required as per latest OISD recommendation complying with requirement whichever is more stringent.
- 40) Any other instrument, equipment / item required for making the installation complete in all respect and for satisfactory operation of the system for the scope within the terminal point, as well as to meet any statutory requirement relevant to the package, unless specifically EXCLUDED from scope of supply.

3.2.0 SCOPE OF SERVICES

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

- 1) Unloading, Storage, handling and transportation at site.
- 2) 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.
- 3) Bidder shall include site survey before finalizing the coordinates/routing of the pipe rack for fuel oil pipe corridor from fuel oil transfer pump house to the day oil tank dyke area before submitting the civil assignment drawing. A preliminary survey was conducted by BHEL and the suggestive routing has been attached with this specification (Doc. No. PE-DG-408-166-A004). Any additional pipework required w.r.t change in the routing/elevation etc shall be provided by bidder without any price implication to BHEL.
- 4) Bidder shall include in their scope the site survey for the piping from the existing fuel oil dyke area to the fuel oil transfer pump house for the finalization of the piping from the existing dyke area up to the fuel oil transfer pump house. Also the pipe supports including the pedestals, minor civil works like wall openings, excavation back-filling etc. from/within the existing dyke area to the fuel oil transfer pump house shall be in bidder's scope.
- 5) 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.
- 6) Erection & Commissioning of Fuel Oil System.
- 7) 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.
- 8) Inspection & testing, Performance Requirements and Performance Guarantees.
- 9) Painting of tank and all other items within scope of supply. Final coat of paint on all the equipment's / item covered under the package shall be done at the time of handing over of package
- 10) Making Good/Repairing/replacement of and damaged done by bidder to adjacent structure, pipes etc. while erecting equipment's related to Fuel Oil system
- 11) Electrical scope as per enclosure elsewhere in the specification
- 12) Preparation of drawing showing common facilities, if any, between BHEL & Vendor supplied equipment.
- 13) 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



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 8 of 14

already done based on civil inputs given by vendor, rework shall be done at the cost and risk of the vendor.

- 14) Preparation of all drawings as per list enclosed under Annexure IX.
- 15) Preparation of drawings / document / P&ID's in 3D modelling software and providing soft copy of same to BHEL.
- 16) Preparation of all necessary drawings/data/ documents for obtaining necessary Approval of statutory authorities like CCOE , IBR , Weight & Measures Department and any other agency/ competent authority related to installation of Fuel Oil Handling System on behalf of the customer. All expenses required to obtain the approval shall also be borne by the successful bidder. 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.
- 17) 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.
- 18) Supply of temporary equipment and services for chemical cleaning, steam blowing, energization, testing etc. as applicable.
- 19) Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance.
- 20) All other facilities/ services as described in section on site services in specification and related to Fuel Oil Handling System scope of work within terminal point.
- 21) Relevant requirements as per GTR, GCC, ECC & SCC.
- 22) 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.

4.0.0 EXCLUSION

- a) Civil work for fuel oil transfer & storage system including
 - i. Civil work within transfer pump house
 - ii. Tank & Pump foundations
 - iii. Fuel Oil Transfer 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.
 - x. Pipe rack/trestle (refer definition of pipe rack/ trestle elsewhere in the specification) outside pump house and dyke area.

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.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 9 of 14

- b) Fire Protection system for storage tanks,
- c) Air Conditioning / ventilation of Fuel Oil pump houses.
- d) Control/IO panel for Fuel Oil pump houses.
- e) Service water pipes mentioned in the specification
- f) 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 7.0 m. Bidder to confirm adequacy of the same.
- g) DCS control. However, all logic for implementation of control and monitoring from DCS shall be provided by successful bidder during detail engineering.
- h) Exclusion as indicated in Electrical & C&I portion of technical specification
- i) Relevant exclusion as per GTR, GCC, SCC & ECC.

5.0.0 SERVICES TO BE PROVIDED BY THE CUSTOMER

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

6.0.0 TERMINAL POINT

LDO/HFO	:	<p>At the existing fuel oil dyke area:</p> <p>Outlet flange of LDO nozzle located in the LDO tank in the existing dyke area. Tapping from the existing HFO line within the existing dyke area. Shutdown of the fuel oil handling system/plant shall be provided by customer. Minor modification work shall be in bidder's scope.</p> <p>To Supply of pressurizing pump:</p> <p>Up to 1000 mm outside pressurizing pump house wall for suction & return lines. Piping from this TP is being done by Trichy.</p> <p>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 1.0 Kg/cm² (a) limiting the tank foundation height for storage tanks to 1 m and the P&H unit FFL approx. 500 mm above ground level</p> <p>From Return of Pressurizing Pump – From 1000 mm outside P& H pump house, Pressure – 3.0 kg/cm² (g); Elevation- Approx. 4 m above FFL.</p> <p>LDO supply to Aux. Boiler – At a point on the pipe rack nearest to the auxiliary boiler.</p>
Effluent from Oil Water Separator (OWS)	:	<p>Upto the ETP retention pit near the oil water separator pit. Pumps, piping and accessories shall be bidder's scope.</p>



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 10 of 14

Drain from dyke area : To OWS 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. In case the tanks are provided with intermediate dyke wall of height 0.6m, separate draining arrangement for dykes independent of each other shall be provided.

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.

7.0.0 ADDITIONAL 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 confirm 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 PLOT PLANS and drawings of FOHS. 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) 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, BHEL scope will be limited to pedestal with insert plates (except from the existing dyke area to the fuel oil transfer pump house, which shall be in bidder's scope). Maximum height of pedestal to be provided by BHEL 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 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.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 11 of 14

- i) Expansion bellows / pipe loops shall be provided in the steam line and HFO lines to accommodate pipe expansions at suitable distances as per calculation to be furnished by the successful bidder during detail engineering.
- j) 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, pipe supports, and instruments etc. for the same shall be included by bidder in their scope.
- k) Straight length required before and after flow element/ flow meters shall be provided as per latest standard/ applicable codes.
- l) 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.
- m) 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.
- n) 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.
- o) 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.
- p) Instrument/ LIE/LIR shall not be located in space meant for walkway & maintenance space across the equipment, maintenance bay of building. Location of all instruments shall be marked in tipping layout drawing to ensure correct location of the same.
- q) Requirement given under relevant clause of specification shall also be followed.
- r) Nozzle at tank outlet and wherever blind flange should provide be fitted with spectacle blind.

8.0.0 PAINTING / CORROSION PROTECTION REQUIREMENT

This will be as per specification given under **section C1-E**. 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.

9.0.0 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 given under Annexure - II. 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/



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 12 of 14

consultant approval during detail engineering. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

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

- a) The Quality plans / checklist for the previous executed jobs for the equipment's / instruments are attached under **section C2 – D**.
- b) The successful bidder shall furnish Quality Plans/ Inspection Check Lists for various item for the package in line with minimum requirement indicated in specification during detail engineering for Customer's approval.
- c) For other items for which any specific inspection requirement is not indicated in the specification but the same included in scope of work , vendor specific QPs / CLs shall be furnished by the successful bidder for Customer/Consultant's review and approval. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.
- d) 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.
- e) 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-III 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 BHEL'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 have 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 one year 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.

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.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 13 of 14

12.0.0 DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH THE BID

The drawings and documents to be submitted with the bid shall strictly document mentioned in Document to be submitted with the bid in Vol-III. Any documents other than those indicated in Vol. III 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 Vol-III. 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 ENCLOSED WITH THE SPECIFICATION

Following drawings enclosed will form part of the specification.

- a) Plot plan, **PE-DG-408-100-M001**
- b) Process & Instrumentation Diagram of HFO, **PE-DG-410-166-A101**
- c) Process & Instrumentation Diagram of LDO, **PE-DG-410-166-A102**
- d) Process & Instrumentation Diagram of steam & condensate, **PE-DG-410-166-A103**
- e) Routing of fuel oil pipes & other utilities from fuel oil transfer pump house to CT-7, **PE-DG-410-166-A104**
- f) Layout of Fuel Oil Transfer Pump House, **PE-DG-410-166-SK001.**
- g) Layout of Day Tank Farm Area, **PE-DG-410-166-SK002.**

The P&ID 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 FOHS 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.

15.0.0 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 w.r.t existing facility at site. Customer approval on any drawing having details of existing facility shall not be cited by the successful bidder a valid reasons 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.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI TPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C1'

REVISION 00

DATE: 12/10/2015

PAGE 14 of 14

iii) The O&M Manual to be submitted by the successful bidder will necessarily address the points mentioned in the checklist.

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>

viii) Bidder to review the Electrical Load list enclosed with the tender specification and give their concurrence on the same. In case of change in any load data, bidder to brought out same in their offer. 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.

ix) 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”.

x) Site storage and preservation manual has been placed under Annexure-X. Bidder to note down all the requirement of storage and preservation required for several items given under this manual. Bidder shall necessarily follow all the practices given in the manual as applicable for its items/ equipment's under scope of supply.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI STPS**

SPECIFICATION NO. PE-TS-408-166-A001	
VOLUME II-B	SECTION 'C2'
REVISION 00	DATE: 12/10/2015
PAGE 1 of 1	

**SECTION: C-2
CUSTOMER SPECIFICATIONS**



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI STPS**

SPECIFICATION NO. PE-TS-408-166-A001	
VOLUME II-B	SECTION 'C2A'
REVISION 00	DATE: 12/10/2015
PAGE 1 of 1	

**SECTION: C-2A
TECHNICAL REQUIREMENT**



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI STPS**

SPECIFICATION NO. PE-TS-408-166-A001	
VOLUME II-B	SECTION 'C2A'
REVISION 00	DATE: 12/10/2015
PAGE 1 of 1	

**SECTION: C-2A
TECHNICAL REQUIREMENT**

CONTENT

CLAUSE NO.	DESCRIPTION
1.00.00	GENERAL INFORMATION
2.00.00	CODES & STANDARDS
3.00.00	SHORT DESCRIPTION OF THE SYSTEM
4.00.00	SCOPE OF SUPPLY
5.00.00	SYSTEM DESIGN CRITERIA
6.00.00	DESIGN AND CONSTRUCTION
7.00.00	INSTRUMENTATION AND CONTROL
8.00.00	INSPECTION AND TESTING
9.00.00	DRAWINGS, DATA AND MANUALS

ANNEXURES

ANNEXURE-I	HFO TANK HEATERS - DESIGN PARAMETERS
ANNEXURE-II	DATA SHEET FOR FUEL OIL TRANSFER PUMPS

VOLUME : IIB

SECTION-III B

**TECHNICAL SPECIFICATION
FOR
FUEL OIL TRANSFERRING SYSTEM**

1.00.00 GENERAL INFORMATION

1.01.00 The Fuel Oil transferring System shall include all plants and equipments for transferring both HFO and LDO from the existing storage tanks to the day tanks.

1.02.00 For the design of the transferring and storage, the properties of HFO & LDO shall be considered as indicated in Tables enclosed in Lead Specification.

2.00.00 CODES AND STANDARDS

2.01.00 The design, manufacture and testing of the equipment or any item as specified in this section shall comply with the requirements of the latest revisions of one or more of the following standards as applicable :

2.01.01 IS-1593 : Code for Heavy fuel Oil (HFO)

2.02.00 IS-1460 : Code for light Diesel Oil (LDO)

2.03.00 IS-817 : Code of practice for training & testing of metal arc welders.

2.04.00 IS-823 : Code of procedure for manual metal arc welding of mild steel.

2.05.00 API- 620 : Recommended rules for design and construction of large welded low pressure storage tanks.

2.06.00 API- 650 : Welded steel tank for oil storage.

2.07.00 ASME Boiler & Pressure Vessel (B & PV) Code : Section VIII, Division I, Pressure Vessel.

2.08.00 ASME Boiler & Pressure Vessel (B & PV) Code : Section IX, Welding & Brazing qualification.

2.09.00 API-12D : Large welded production tanks.

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

2.11.00 IS-816 : Code of practice for use of metal arc welding for general construction in mild steel.

- 2.12.00 IS-4503 : Code for design & manufacture of Heater
- 2.13.00 ANSI B31.1 : Design of power piping system
- 2.14.00 API-600 : Code for design & construction of gate valve for sizes 50 NB or above
- 2.15.00 API-602 : Code for design & construction of gate valve for sizes below 50 NB
- 2.16.00 API-598 : Code for testing of gate valve
- 2.17.00 BS-1873 : Code for design & testing of globe valve
- 2.18.00 BS-1863 : Code for design & testing of check valve
- 2.19.00 BS-5351 : Code for design & testing of ball valve
- 2.20.00 API-599 : Code for design & testing of plug valve
- 2.21.00 IS-8183 : Specification for Bonded Mineral Wools Group 4
- 2.22.00 IS-9842 : Specification for Preformed Fibrous Pipe Insulation, Group 3
- 2.23.00 IS-277 : Specification for Galvanized Steel Sheet
- 2.24.00 IS-7413 : Code of practice for the Application and Finishing of Thermal Insulating Materials at temperatures between 40 Deg.C and 700 Deg.C.
- 2.25.00 If the equipment supplied does not conform to the above codes and standards, but is manufactured to the Bidder's own standard developed from his experience, it shall be clearly identified in the Bid, with sufficient data to support his design. The design shall be accepted by the Owner/Consultants only if the Owner is satisfied that sufficient experience exists with the design proposed.
- 2.26.00 In addition to the above requirements, all equipment and procedure shall comply with applicable laws regulations and requirements of the State and Central Authorities.
- 3.00.00 **SHORT DESCRIPTION OF THE SYSTEM**
- 3.01.00 Both HFO & LDO shall be pumped from the existing storage tanks to day tanks by transfer pumps. HFO & LDO transfer pumps alongwith strainers etc. will be located in the Fuel Oil Transfer Pump House adjacent to Fuel Oil Pressurising Pump House. Necessary Interconnection shall be provided inside dyke area of existing HFO & LDO storage tanks for supply of HFO/ LDO to respective transfer pump suction.

- 3.02.00 Suitable provision shall be provided for drainage of oil pumps, strainers, piping, etc. There shall be a drain oil tank located near FO transfer pump house, to receive the miscellaneous drains and wastes from the system, and this oil shall be returned to the HFO tanks by the help of drain oil pumps, provided the oil so collected is reasonably clean. All additions/modifications, as required, to get approval of the explosive authority and Pollution Control Boards shall be done.
- 3.03.00 The HFO lines shall have electric tracing. HFO pumps and strainers shall, however, be steam-jacketed type. Steam for tracing shall be arranged by the Bidder from auxiliary steam header.
- 3.04.00 Steam lines shall be provided with necessary control stations and traps as shown. Condensate drain from traps shall be disposed to the nearest station drain/pipe trench.
- 3.05.00 Suitable drainage shall be provided as required to get the approval of the Explosive Authority and Pollution Control Board.
- 3.06.00 ~~The scheme for Fuel Oil Handling is shown in Drawing No. K9213R-DWG-M-001T.~~
- 4.00.00 **SCOPE OF SUPPLY**
- The scope of work under this section shall include the entire Fuel Oil transferring & storage system as detailed below, elsewhere in this section and in the tender drawing.
- The list is by no means exhaustive and the items though not specifically mentioned but needed for safe, efficient, trouble-free and coordinated operation of the system shall be provided by the bidder under this section.
- 4.01.00 **HFO Transferring System**
- 4.01.01 Two (2) (1 working + 1 standby) nos. positive displacement pumps with drives and other accessories as required and as specified in data sheets enclosed for transferring HFO from existing storage tank to HFO day tank near 800 MW unit.
- 4.01.02 One (1) duplex heavy duty fuel oil pump suction strainer with isolating valves, drain valve and vent valve with pipe.
- 4.02.00 **LDO Transferring System**
- 4.02.01 Two (2) nos. Light diesel oil (LDO) pumps (1 working + 1 standby) with drives, base plates, support plates, grounding pads, lifting lugs, eye-bolts, anchor bolts & nuts and accessories for transferring LDO from existing storage tank to day tank near 800 MW unit
- 4.02.02 One (1) duplex heavy duty LDO pump suction strainer with isolating valves, drain valve and vent valve with piping.

- 4.03.00 Two (2) nos. HFO day tank each of capacity suitable for one day consumption (minimum 500 m³ each) complete with mat coil heater and suction heaters, each of capacity as per the guidelines explained in with accessories as specified in the Annexure enclosed and as required. One (1) no. 500 m³ LDO day tank along with necessary accessories as specified shall be provided.
- 4.04.00 **Tracing of HFO Pipe Lines**
- 4.04.01 For HFO pipelines, complete electrical heat tracing system and necessary equipment for tracing shall be provided.
- 4.04.02 For steam tracing necessary steam/condensate drain line, control stations and trap assembly as required shall be provided by the bidder.
- 4.05.00 One drain oil tank with necessary heater (steam heated) shall be provided to receive the miscellaneous drains of HFO, LDO.
- 4.06.00 Two nos. drain oil pumps shall be provided to re- circulate oil from drain oil tank to HFO tank.
- 4.07.00 Portable hand pumps of suitable design complete with discharge spout for removal of oil from the dyke area drain sumps.
- 4.08.00 One oil water separator for the fuel oil day tank dyke area & transfer pump house area is to be provided.
- 4.09.00 **Pipe, Fittings, Specialties and Valves**
- 4.09.01 Complete pipes, fittings, specialties and valves for HFO & LDO line for interconnection at existing HFO/ LDO lines inside existing storage tank dyke area upto and including HFO & LDO Day Tank. For details, refer Cl. No. 4.05.00 of Sec. IIIA of Vol-IIB.
- 4.10.00 **Thermal Insulation**
- Refer Cl. No. 4.06.00 of Sec. IIIA of Vol-IIB.
- 4.11.00 All access platforms for various valves & all pipe cross-over platforms, as required for necessary approach and crossings.
- 4.12.00 Anchor Bolts, Sleeves, Inserts, Foundation Plates, Lifting Lugs, Eye Bolts etc. shall be supplied.
- 4.13.00 **Instrumentation & Control**
- 4.13.01 Refer volume IIE
- 5.00.00 **SYSTEM DESIGN CRITERIA**
- 5.01.00 Fuel oil system and its facilities shall be designed as per Pollution Control/Petroleum/Explosive/Fire rules of Govt. of India.

5.02.00 HFO Transferring System

5.02.01 Transfer pumps :

- a) Design flow capacity, each : shall be minimum 125 Cu.M/hr .
- b) Normal inlet temperature : 60 Deg.C within \pm 5 Deg.C

5.03.00 HFO Day Tank Capacity : 500 Cu.M Effective capacity (b/w high & low fluid level)

5.04.00 LDO Transferring System

5.04.01 Transfer Pumps :

- a) Design flow capacity each : shall be minimum 125 Cu.M/hr.
- b) Normal inlet temp : 8 - 45 Deg.C

5.04.02 LDO Day Tank Capacity : 500 Cu.M Effective capacity (b/w high & low fluid level)

5.05.00 Pipe, Fittings & Specialties

5.05.01 Determination of diameters of various pipes in the F.O. Handling system shall be done based on the velocity indicated in Annexure-III of Sec. IIIA of Vol-IIB and the flow rates established by the system designer/ bidder.

5.05.02 Thickness calculation of the pipes shall be done based on the allowable stress of the pipe material (material for various pipe lines indicated in Annexure-III of Sec. IIIA of Vol-IIB) at design temperature and the pressure determined by the system designer/bidder.

5.05.03 Piping system should withstand the maximum operating temperature and pressure. The forces & moments at terminal/equipment due to thermal expansion should be kept under permissible limit. Piping system shall meet other requirements of the relevant codes & standards.

5.05.04 All valves shall function smoothly without sticking rubbing vibrating etc. during operation.

5.05.05 Drain pipe size shall be 25mm NB as minimum.

5.06.00 Oil Water Separator

Oil water separation should separate oil to the extent of max. 10 ppm oil left in the water.

5.07.00 One (1) no. Drain oil tank shall be provided near FO transfer pump house. The tank capacity shall be 4 Cu.m.

5.08.00 The tank shall have 2x100% capacity drain oil pumps. Each pump capacity shall be 5 Cu.M/hr. (minimum).

6.00.00 **DESIGN & CONSTRUCTION**

6.01.00 **Pumps**

6.01.01 Refer Cl. No. 6.01.00 in Sec. IIIA of Vol-IIB.

6.02.00 **HFO and LDO Storage & Day Tanks**

The tanks shall be constructed to IS-803 and API-650 as applicable. The oil tanks shall be vertical cylindrical type, installed outdoors; site fabricated and welded construction type with butt-welded bottom plate. Steel shall conform to IS-2062. Oil shall be stored at atmospheric pressure. The tank foundation shall be high enough to reduce idle storage volume of tanks. The fuel oil tanks shall be located adjacent to the fuel oil pressurizing pump house in a common dyke.

6.02.01 Since the tanks are for storage of inflammable liquids they shall be in accordance with the requirement specified in Indian Petroleum and Explosive rules. Before commencing the erection/construction, the relevant drawings/documents shall be got approved by Directorate of Explosive, Govt. of India.

6.02.02 For cylindrical tanks, the plates shall be cold rolled through plate bending machine by several number of passes to true curvature.

6.02.03 Vessel seams shall be so positioned that they do not pass through vessel connections. For cylindrical vessels consisting of more than two sections, longitudinal seams shall be offset.

6.02.04 Where possible, the inside seam weld shall be ground smooth, suitable for application of corrosion resistant primer.

6.02.05 Proper means shall be provided against the chance of over-turning effect of wind on an empty vertical cylindrical tank having a shell height greater than the diameter. Anchorage of tanks shall be done when 'C', a dimensionless figure exceeds 0.66 where :

$$C = \frac{2M}{dw}, \text{ for vertical cylindrical tank}$$

where, M = Overturning moment due to wind, kilogram - metre.

d = Diameter of shell, metre

w = Weight of Shell and portion of roof supported by shell, kilograms.

6.02.06 Due consideration for wind load and/or earthquake effect shall be given by the Contractor in the design of tanks. Data for wind load and earthquake shall be taken as indicated in Vol-IIA. Maximum allowable stresses for design loadings combined with wind or earthquake shall not exceed 133% of stress permitted for the design loading condition but in no case shall exceed 80% of specified minimum yield strength of the material.

- 6.02.07 For tanks of diameter 4.75 M and thickness less than 6 mm or of diameter larger than 4.75 M added structural supports in the form of rafters shall be provided.
- 6.02.08 Reinforcement pads in tank connections shall be provided as per applicable code & the reinforced connection shall be completely pre-assembled into a shell plate. The completed assembly including the connection shall be thermally stress-relieved as per API Standard 620.
- 6.02.09 The joint efficiency factor to be adopted for design calculation shall be in accordance with the applicable standard.
- 6.02.10 All welding shall be done as per IS:816, latest revision. All welds are to be continuous welds.
- 6.02.11 Sufficient air space is to be provided in the tank. Temperature expansion of oil shall be taken into account.
- 6.02.12 The supply and return pipes shall be extended well inside the tank and wear plates shall be provided.
- 6.02.13 Tank Connections
- Tanks shall be provided with necessary connections like-oil inlet and outlet, steam inlet & condensate outlet (in case of HFO tank only), different drains, vents and return oil lines water draw off etc. as indicated in drawing. Facility for connecting the road tanker hose to the LDO tanks shall be provided.
- 6.02.14 Tank Accessories
- The tanks shall be provided with necessary accessories. All the accessories shall conform to relevant Indian Standard and as specified. The following broad guidelines are given for some of the accessories.
- a) Heating Coils/Floor Heater
- As specified, heating coils in one or more tiers shall be provided at the bottom of the HFO Storage tanks to maintain oil within the tank at specified temperature with steam as the heating medium.
- The tubes shall be seamless steel as per indicated standard. Arrangement for supporting the coil within the tank shall be made. Connections for steam inlet and condensate outlet shall be provided.
- The floor heater shall be installed inside the tank such that oil is uniformly heated without possibility of local overheating and over-straining the tank body. All connection flanges shall be outside the tank. The coils shall be guaranteed to be submerged under sufficient level of oil to avoid flashing of oil.
- The Bidder shall furnish with his proposal the design calculations for arriving at steam consumption, coil heat transfer area etc. The Bidder shall also indicate the maximum time required to liquefy the stored material and bring it to the storing temperature under the extreme

condition when the heating coil is turned on after prolonged shutdown with material stored in the tank, at the lowest ambient temperature.

Refer Annexure III.

b) Suction Heater

As specified, suction heater of duty conditions as indicated in Annexure shall be furnished on the outlet of HFO storage tank.

The heater shall be shell and tube construction. Material of shell and tube shall be as specified Annexure. Heaters shall be designed as per TEMA or equivalent code.

The heater shall be mounted on the sidewall of the tank and properly supported. The design shall be such as to allow inspection and/or maintenance of the heater with the tank completely filled.

All heaters shall have oil in the shell side and steam in the tube side.

Refer Annexure II.

c) Steam Trap

Steam trap shall be provided for floor coil heaters and suction heaters at the condensate outlet lines.

d) Flame Arrestor

Each vent connection on tanks shall be provided with a flame arrestor design of which shall meet the approval of the Inspector of Explosives. The Bidder shall furnish the materials of construction and detail cross-sectional drawing along with his proposal.

e) Conservation Vent Valve

Where continuous venting to atmosphere directly is not permitted for the stored liquid, a conservation vent valve or a breather of approved make and design shall be provided on each of the vent/ overflow connections of the tanks as specified. The conservation vent valves where provided, shall be designed to relieve the pressure or vacuum corresponding to plus or minus 65mm water gauge in the space above liquid in the tank. Detail cross-sectional drawing indicating materials of construction shall be submitted along with the proposal.

f) Instrumentations

Instrumentations as shown in P&I diagram shall be provided. For their specification refer Vol-II D.

- g) Level Transmitter
Each tank shall be provided with a radar type level transmitter to ensure safe and reliable operation.
- h) Each tank shall be provided with spiral stairway with handrail and an internal vertical ladder.
- i) Each tank shall have one roof manhole and one shell manhole of not less than 600mm diameter.
- j) All other accessories, fittings and tank connections including level switches, etc. as required for sound engineering practice shall be provided.

6.02.15 Installation of HFO & LDO Tanks

When installation of tank is specified, the recommendation regarding installation in IS:803 shall be followed in general. In addition to those recommendations, the following shall also be taken care of.

- a) All fabricated part, before assembly, shall be transported by the Contractor by his own arrangement to the tank installation site. All preliminary work and fabrication in part or full shall be done at the Contractor's fabrication yard or shop as much as possible to suit his transportation arrangement subject to Purchaser's approval.
- b) All material before final installation over the foundation at the respective locality shall be inspected and repaired as necessary to ensure that any damage received during transportation is corrected before erection to the satisfaction of the Engineer. Particular attention shall be given towards removal of buckles and other form of distortion in shell and bottom plates. Irregularities and dirt, which would prevent metal-to-metal contact at the jointing faces, shall be removed.
- c) The sloping factor shall be taken as 1 : 36 for the Cylindrical tank head. Sufficient number of plugged holes shall be provided in the bottom plate of the vertical tanks for bottom testing as specified in IS:803.
- d) Welding
Welding sequence shall be adopted in such a way so as to minimize the distortion due to weld shrinkage. Bidder shall indicate in his drawing the sequence of welding proposed by him which should meet prior approval of Purchaser.
- e) During construction period, the tanks and the sections shall be suitably anchored and tied by guy-wires etc. to avoid blowing/toppling/Sliding due to gusty wind.

6.02.16 Surface preparation and painting

Primer for internal surface shall be double boiled. Linseed oil and that for external shall be synthetic red lead. Finish coat for both internal and external surface shall be of synthetic enamel. For bottom surface protection, one coat of bitumastic paint shall be applied.

6.03.00 **Pipes, Fittings, Valves and Specialties**

6.03.01 Refer Cl. No. 6.02.00 of Sec. IIIA of Vol-IIIB.

7.00.00 **INSTRUMENTATION AND CONTROL**

7.01.00 Refer Sec. IIIA of Vol-IIIB and Vol-IIIE.

8.00.00 **INSPECTION AND TESTING**

The manufacturer shall conduct all tests required to ensure that the equipment furnished shall conform to the requirements of this section of specification in compliance with requirements of applicable codes. In addition to the testing requirements spelt in Vol. IIA, for material, piping systems, pumps etc. the following tests are also to be done.

8.01.00 **Fuel Oil Pump Performance Test**

8.01.01 Each pump shall have to be tested to determine the performance curves of the pumps. These tests are to be conducted in presence of Purchaser/Consultant's representative as per the requirements of the Hydraulic Institute Standards.

8.01.02 Test shall be conducted with actual drive motors being furnished.

8.01.03 After installation, pumps offered may be subjected to testing at field also by Purchaser. If the performance at field is found not to meet the requirement, then the equipment shall be rectified by the supplier without any extra cost.

8.02.00 **Fuel Oil Storage Tank**

8.02.01 The supplier shall provide inspection to establish and maintain quality of workmanship to ensure the mechanical accuracy of components, compliance with drawings, identity and acceptability of all materials supplied by him.

8.02.02 Performance Tests

a) Vertical Cylindrical Storage Tanks shall be tested generally as per IS:803 including the following :

i) Spot radiography.

ii) Bottom plate testing by air or vacuum box.

- iii) Shell testing by filling with water or by air as applicable.
- iv) Fixed roof testing by air.
- b) For all tanks tests shall be conducted to prevent uneven settlement of tanks on the foundation by initially filling the tanks to one third of its capacity and leaving in this condition for a period to be decided by the Purchaser. After checking for settlement another one third of the tank shall be filled up and the procedure as above shall be followed till the tank is fully filled up. After testing, the water shall be suitably drained off in the nearest drain without flooding or endangering the surrounding areas/equipment.

8.03.00 Valves

Gate Valves shall be subjected to shop tests in accordance with API 598 including high-pressure closure list. Globe valve shall be tested in accordance with BS:1873 and Check valve shall be tested in accordance with BS:1868. Hydraulic test, fire safe etc. for ball valve shall be done as per relevant standard and code. For the items called for steam service IBR Certificate shall be furnished for the valves as well as the counter flanges.

8.04.00 Piping System

Hydraulic test of pipelines shall be conducted at site after erection, at 150% design pressure. Subsequent steam blowing shall be done before commissioning.

9.00.00 DRAWINGS, DATA AND MANUALS

9.01.00 Technical Information and Data to be submitted by the Bidder with the Proposal as indicated herein and elsewhere in this specification.

9.01.01 Single line schematic drawing of the entire system with all instrumentations showing sizes, capacities and rating of all equipment and accessories.

9.01.02 General layout of the entire Fuel Oil transferring system with emphasis on interconnection with existing facilities.

9.01.03 General arrangement drawings relevant Manufacturer's catalogues of HFO/LDO tanks, pumps, strainers, different valves etc.

9.01.04 Calculations for capacity selection of HFO/LDO pumps, tanks, mat coil and suction heaters of HFO tank.

9.01.05 Characteristic curves of all pumps and motors.

9.02.00 Technical Data and Information to be submitted after award of Contract in addition to the requirements said in Vol.II-A

- 9.02.01 Final version of all schematic, layout, general arrangement and cross-sectional drawings and data enclosed with the proposal and as asked for against clause no.: 9.01.00 above.
- 9.02.02 Detail drawings of important units, assemblies, parts, etc. as deemed necessary.
- 9.02.03 Design calculations of pipe sizing, control valve sizing etc.

ANNEXURE-I

HFO TANK HEATERS - DESIGN PARAMETERS

1. FLOOR COIL HEATER IN HFO DAY TANKS

Design Data

- a) Heating medium at the inlet of control valve : Steam from Auxiliary steam pipe
- b) Capacity of the floor coil heater shall be determined for following conditions :
- i) Maximum capacity : To raise the temperature of full tank capacity of HFO oil from 5 Deg.C. to 50 Deg. C. in not more than 32 hours.
- ii) Normal capacity : To compensate heat loss from the unlagged tank completely filled with oil at 50 Deg.C.
- iii) Wind Speed : 1.0 metre/sec.
- iv) Margin to be provided on calculated surface area of floor coil : 25%
- c) Tube side design pressure (Kg./Sq.cm) & temperature (Deg.C) : Bidder to indicate Pressure, 250 Deg.C
- d) Material Heating element : Seamless steel tubes to ASTM, A 106, Group B or equivalent

2. SUCTION HEATER IN HFO TANKS

The heavy fuel oil storage tanks shall be fitted with shell and tube type suction oil heaters for supplying oil at the pump suction. "U" type steel seamless tubes shall be used for the tube bundle.

The suction heaters shall be designed to the following parameters :

- a) Oil flow rate for each suction heater : Shall be to two pump capacity (2400 LPM)
- b) Heating medium : Steam from Auxiliary Steam Pipe
- c) Initial temperature of oil : 50 ± 5 Deg.C

- d) Final temperature of oil : 60 ± 5 Deg.C
- e) Maximum range of temperature rise : 20 Deg.C
- f) For establishing the area required for heat transfer, a fouling resistance of :
$$.005 \frac{(hr.)(Deg.F)(Sq.ft)}{BTU}$$
shall be assumed on the outside surface of heater tubes.
- g) Following material of construction shall be used :
- i) Shell : MS Plate to IS:2062
- ii) Shell head and tube sheets : Steel plates of IS-2002 Grade 2A or IS-2062 Gr, B
- iii) Heating elements : Seamless steel tubes to ASTM, A-106, Group-B / ASME SA-179 Gr. C or equivalent
- iv) Nozzles : Seamless steel tubes

ANNEXURE-II
DATA SHEET
FOR
FUEL OIL TRANSFER PUMPS

Sl. No.	Description	Pumps	
		HFO transferring Pump	LDO transferring Pump
1.0	Service	Fuel Oil	Fuel Oil
2.0	Duty	Intermittent	Intermittent
3.0	Location	Indoor	Indoor
4.0	No. of Pumps	Two (2)	Two (2)
	• Working	1	1
	• Standby	1	1
5.0	Type of Oil to be Handled	Heavy Fuel Oil	Light Diesel Oil
6.0	Characteristics of Oil	As per relevant section of spec.	As per relevant section of spec.
7.0	Site Working Condition	As per relevant section of spec.	As per relevant section of spec.
8.0	Handling temperature	60°C ± 5°C	7°C to 50°C
9.0	Installation	Horizontal with external bearing	Horizontal with external bearing
10.0	Type	Rotary positive Displacement (Gear/screw) type	Rotary positive Displacement type
11.0	• Design Capacity at lowest viscosity	Bidder to indicate	Bidder to indicate
	• Rated capacity at handling temperature	125 m3/hr	125 m3/hr
12.0	• Differential Pressure corresponding to rated capacity	Bidder to indicate	Bidder to indicate
	• Pump rated TDH	Bidder to indicate	Bidder to indicate
13.0	Pump Speed (rpm max.)	1500	1500
14.0	Suction Condition	Flooded	Flooded

Sl. No.	Description	Pumps	
		HFO transferring Pump	LDO transferring Pump
15.0	Accessories to be provided		
15.1	* Relief valves * Type	Yes Inbuilt adjustable set pressure type	Yes Inbuilt adjustable set pressure type
15.2	• Value of set pressure of relief valve	1.1 times of rated differential pressure	1.1 times of rated differential pressure
15.3	Mechanical Seal	Yes	Yes
15.4	Lubrication	External grease lubricated	External grease lubricated
15.5	Body steam jacketed	Yes	No
15.6	Timing gear	Yes	Yes
15.7	Suction & discharge pressure gauge connection	Yes	Yes
15.8	Suction temperature gauge connection	Yes	Yes
	Other accessories if required for cooling/ ealing/lubrication etc.	Yes	Yes
15.9	Bearing	Yes	Yes
15.10	Base plate	Yes	Yes
15.11	Lifting lug/eye bolts etc.	Yes	Yes
15.12	Tools & tackle and spare parts	Yes	Yes
15.13	Shop Painting	Yes	Yes
16.0	Material of Construction		
16.1	Casing	Carbon Steel	
16.2	Casing liner	Carbon Steel	Carbon Steel
16.3	Rotor	ASTM-A-276 type 431	CS

Sl. No.	Description	Pumps	
		HFO transferring Pump	LDO transferring Pump
16.4	Rotor housing	Carbon Steel	ASTM-A-276 type 431
16.5	Shaft	EN 24	Carbon Steel EN 24
16.6	Mechanical seal	30% chrome steel	30% chrome steel
16.7	Reduction gear		
	• Body	EN-8	EN-8
	• Gears	Alloy Steel	Alloy Steel
16.8	Screw	SS304	SS304
16.9	Coupling	Cast iron	Cast iron
16.10	Base plate	Mild steel	Mild steel
16.11	Relief valve body	INTEGRAL TO PUMP	INTEGRAL TO PUMP
16.12	Relief valve spring	SS	SS
16.13	Gasket	By Bidder	By Bidder
16.14	All fasteners	SS-304	SS-304

NOTE : All material shall conform to relevant ASTM Standard.

HYDROTEST PRESSURE: 1.5 TIMES DISCHARGE PRESSURE
DURATION: 30 MINUTES

ANNEXURE-III

PIPES, FITTINGS & VALVES : DESIGN PARAMETERS

1. For pipe sizing velocity of fluid in various pipe lines shall be considered as follows unless otherwise stated in the specification :

a) Fuel Oil Pipe	Pipe Size (mm)	Velocity (M/Sec)	
		HFO	LDO
Pump Suctions	250 & above	0.4	0.9
	200	0.35	0.7
	150	0.30	0.6
	100	0.30	0.5
	80	0.30	0.5
	50 & below	0.28	0.4
Pump Discharge	250 & above	1.3	2.0
	200	1.1	1.7
	150	1.1	1.5
	100	1.00	1.3
	80	1.00	1.3
	50 & below	1.08	1.0
b) Steam Pipe	Below 50 50 - 150	15-22}For 20-33} Satu- } rated } steam	20-30 } For Super 25-40 } heated steam
c) Condensate pipe	For all sizes	2.0	
d) Compressed air pipe	For all sizes	30	

2. While calculating pressure drop, the effect of deposition of sediment in piping shall be taken into consideration.

3. Tracer Size : Bidder to indicate

4. Material of Construction

- a) Fuel Oil Pipe Lines

Pipe : API 5 L Gr. B or ASTM 106 Gr. B Butt welded ends of pipe sizes 65 mm NB and above as per ANSI B 16.25 and socket welded ends for lower sizes as per ANSI B 16.11.

Pipe Fittings : ASTM A 234 Gr. WPB for 65 mm NB size ASTM A 105 for 50 mm NB size and above and lower. Butt welded ends as per ANSI B 16.9 for all sizes.

- b) Steam/Condensate Pipe : Refer Section-I of Vol-II-D.
- c) Compressed air line : Refer Section-III, Vol-II-D.
- d) Hoses
- Oil Lines : As per BS-1435 or equivalent, wire reinforced, type-S smooth bore along with quick acting coupling fitting standard Indian Railway Tanker Wagons.
- Steam/Condensate Lines : Refer Section I, Vol.II-D
- e) Gate Valve
- Gate valve shall be in accordance with API-600 for sizes 50 mm NB or above and shall be as per API-602 for sizes below 50 mm NB.
- Body and Bonnet : ASTM A-216 Gr.WCB for sizes above 50 mm NB
- : ASTM A-181 Gr. II for size 50 mm NB and below
- Seat/Trim : 11-13% Chrome steel
- Bolts for bonnets : ASTM A-193 Gr. B7
- Nuts for bonnet : ASTM A-194 Gr. 2H
- f) Globe Valve
- Globe valve shall be in accordance with BS-1873.
- Body & Bonnet : ASTM A-216 Gr. WCB for sizes above 50 mm
- : ASTM A-181 Gr.II for sizes 50 mm and below
- Bolts for bonnets : ASTM A-193 Gr.B7
- Nuts for bonnets : ASTM A-194 Gr. 2H
- Trim : Chromium Steel (Br. hardness B 250 min.) as per AISI-431
- g) Check Valves
- Check valve shall be in accordance with BS-1868. Material for body cover, bolts and nuts for bonnets shall be same as that of globe valve. The seating surface of swing check valve shall be Chromium steel (Br. hardness B-250 min) as per AISI-431.

h) Ball Valves

Ball valves shall be as per BS:5351 or approved equivalent.

Ball valve shall be teflon seated full bore. All the valves shall be of fire safe type.

Body material : ASTM A-216 Gr. WCB for sizes 65 NB and above and
ASTM A 181 Gr.II for 50 NB and below

Ball : SS, AISI-316

i) Plug valve shall conform to API-599.

Plug valve shall be of self-lubricated wrench operated. It shall also incorporate an easy visible port position indicator.

Body : ASTM A-216 WCB for sizes 65 NB and above.
ASTM A-181 Gr.II for sizes 50 NB & below.

Plug : Hardened Carbon Steel

5. Tolerances

Dimension and tolerance for fabrication shall be as given below :

- | | | | |
|----|--|---|---|
| a) | Internal Misalignment | : | 1.5 mm or less |
| b) | External Misalignment | : | 3.0 mm or less |
| c) | Length | : | ± 3 mm |
| d) | Inclination of flange face
(i.e. angle between pipe axis
and flange face) | : | ± 1/2 Deg. (but not exceed
2 mm at flange end) |
| e) | Perpendicularity | : | 2 mm in 1000 mm |
| f) | Horizontality | : | 2 mm in 1000 mm |
| g) | Misalignment between pipe
Center and flange Center | : | ± 1.6 mm |
| h) | Rotation of flange | : | ± 1.0 mm |
| i) | Depression depth of pipe | : | 6.0 mm |
| j) | Tolerances for piping which connects with machinery like pumps etc. shall have accordance with the requirements of that machine. | | |

CONTENTS

CLAUSE NO.	DESCRIPTION
1.00.00	GENERAL INFORMATION
2.00.00	CODES AND STANDARDS
3.00.00	SCOPE OF SUPPLY
4.00.00	MATERIAL SPECIFICATIONS
5.00.00	THERMAL INSULATION APPLICATION PROCEDURE
6.00.00	INSPECTION AND TESTING
7.00.00	DRAWINGS, DATA & INFORMATION TO BE FURNISHED

VOLUME : IID

SECTION-II

THERMAL INSULATION

1.00.00 GENERAL INFORMATION

This section of specification covers thermal insulation, cladding sheet and other auxiliary materials required for thermal insulation on piping and equipment.

1.01.01 The thermal insulation shall be applied on the outer surface of equipment, piping, valves, fittings, having skin temperature more than 60 Deg.C, to conserve the thermal energy and also to maintain the outside surface temperature of the insulation below or at 60 Deg.C.

1.01.02 Insulation thickness shall be computed on the basis of the following data :

- a) Design ambient temperature: 45 Deg.C
- b) Surface temperature of insulation jacket: 60 Deg.C. (max.)
- c) Emissivity of Aluminium sheet: 0.2
- d) Thermal conductivity of insulating material at different temperatures shall be as stipulated in IS:9842 & IS:8183 as applicable.
- e) Surface Wind velocity = 1.0 metre/sec.
- f) Pipe/Equipment wall temperature =Maximum fluid design temperature
- g) Overall heat transfer coefficient and insulation thickness shall be calculated as per ASTM C 680-89.

The minimum insulation thickness, however, shall not be less than 75 mm for Steam Generator and Electrostatic Precipitator surfaces and 25 mm for other surfaces.

1.01.03 Necessary hydrostatic pressure testing of piping, equipment shall be completed prior to the application of insulation.

1.01.04 All permanent and temporary covering necessary to protect insulation from the weather, shall be supplied and included in Bidder's scope.

1.01.05 Insulation shall not be applied over nameplates of equipment. A neat opening shall be left in the insulation and jacketing around nameplates and the opening suitably flushed to prevent the entrance of moisture.

2.00.00 **CODES AND STANDARDS**

In addition to the requirements spelt out in Vol-IIA, all items covered under this section of specification shall conform to the latest edition of the following codes and standards :

1. IS-8183 : Specification for bonded mineral wool.
2. IS-3144 : Methods of test for mineral wool thermal insulation materials.
3. IS-3346 : Methods for the determination of thermal conductivity of thermal insulation materials (two slab, guarded hot plate method).
4. IS-280 : Mild Steel wire for general engineering purposes
5. IS-6528 : Stainless Steel wire.
6. IS-3150 : Specification for hexagonal wire netting for general purposes.
7. IS-4826 : Hot-dipped galvanised coatings on round steel wires.
8. IS-737 : Specification for sheet and strip of wrought Aluminium and Aluminium Alloys (for General Engineering purposes)
9. IS-460 : Specification for test sieves.
10. IS-3677 : Specification for unbonded rock & slag wool for thermal insulation.
11. IS-9842 : Specification for Preformed Fibrous Pipe Insulation.
12. IS-5688 : Specification for Methods of test for preformed block-type and pipe covering type thermal insulation.
13. IS-14164 : Code of practice for the Industrial Application and Finishing of Thermal insulation material at temperatures above -80 Deg.C and up to 750 Deg.C.
14. ASTM B206 : Standard specification for Aluminum and Aluminum alloy sheet and plate.

3.00.00 SCOPE OF SUPPLY

The following materials in required quantities shall be supplied under this section:

- 3.01.00 Thermal insulating Materials - preformed bonded mineral wool sections, bonded mineral wool mattresses, loose mineral wool and lightly resin bonded glass wool shall be provided.
- 3.02.00 Hexagonal wire netting of galvanised steel/stainless steel in the form of rolls.
- 3.03.00 Binding wires, stitching wires and lacing wires of galvanised steel/stainless steel in the form of coils.
- 3.04.00 Mild steel flats, lugs etc.
- 3.05.00 Joint sealing compound of self-setting paste type for making cladding joints vapour tight.
- 3.06.00 Cladding sheets
- 3.07.00 Cadmium/zinc coated self-tapping type screws with washers for cladding sheet joints.
- 3.08.00 Heat resistant paints conforming to IS-161.
- 3.09.00 All other materials i.e. bolts, nuts, rivets, 3 mm thick mill board, aluminum pigment sealant, white glass cloth, insulating cement, neoprene washer etc.

4.00.00 MATERIAL SPECIFICATIONS

- 4.01.00 The insulating materials to be supplied under this specification shall be lightly resin bonded mineral wool of best grade conforming to IS:8183. Hand made mattresses is not acceptable. Material shall be rock wool only. Slag wool or slag wool inclusion shall not be accepted.
- 4.02.00 Lightly resin bonded glass wool mattress, having density 64 Kg/m³ (min.), self stitched in shop can also be accepted for temperature less than 400°C.
- 4.03.00 The bonded mineral wool shall be secured by means of galvanised steel wire (as per IS:280 or equivalent) of at least 24 SWG in the form of hexagonal netting of 10 mm to 13 mm aperture.
- 4.04.00 The Mineral wool shall :
 - a) Pass standard combustibility test both immediately after application and after subjected to maximum operating temperature for not less than 100 hrs.
 - b) Not suffer permanent deterioration as a result of contact with moisture due to condensation and shall be free from objectionable odor.
 - c) Not cause corrosion of the surface being insulated or of cladding on it under normal site conditions.

- d) Not suffer any quality deterioration under specified service conditions (both cold/hot face temp.) of use.

4.05.00 The mattress insulation shall be machine made, stitched at factory and should retain their form under ordinary handling conditions.

4.06.00 The Insulation mattress shall be rated incombustible when tested by the method prescribed in clause 15 of IS:3144 and shall meet the requirement of the Mercantile Marine department, Lloyd's Register of shipping, underwriter, fire hazards codes and other International standards.

4.07.00 Insulation mattress/section shall be supplied in thickness of 25, 40, 50 and 75 mm. Insulation of higher thickness shall be made up in multiple layers using mattress/slabs of thickness specified above. However, if the required thickness is such that by using above mattress/slabs the calculated thickness is not achieved, the mattress/slabs in increment of 5 mm shall be acceptable for outer layers. The min. thickness however, shall not be less than 25 mm and number of layers shall be minimum and innermost layer shall be thickest.

4.08.00 Binding and lacing wires shall be provided in line with following :

Temperature Range	Material	Thickness of wire
(a) Upto 400°C	Galvanised Steel	20 SWG
(b) Above 400°C	Stainless Steel	20 SWG

4.09.00 Sheathing material for all insulated surfaces, equipments, piping etc. confirming to ASTM B-209-1060 temper H-14 or IS:737 Gr 19000/H2, shall be provided as per following :

Bonded Mattress	With Lightly	With Preformed pipe sections
(a) For dia of insulated surfaces of 450 mm & above and for flat surfaces	(16 SWG)	-
(b) For dia of insulated surfaces upto 450 mm	0.914 mm (20 SWG)	0.914 mm (20 SWG)
(c) For Steam Generator and ESP outer casing	16 SWG corrugated Aluminium for SG and plain for ESP	-

4.10.00 Straps and bands shall conform to materials as under :

Temperature Range	Material
a) Upto 400°C	Galvanized Steel
b) Above 400°C	Stainless Steel

Bands shall be 20 mm wide and 0.6 mm thick. For securing Aluminum sheathing material, stainless steel or anodized aluminum bends shall be used.

4.11.00 Screws shall be of galvanized steel, check headed, self-tapping type. Above 400 degree Celsius temperature, screws shall be stainless steel.

4.12.00 Hexagonal wire mesh shall be conforming to following:

Temperature Range	Material	Mesh size
(a) Upto 400°C	Galvanized Steel	10-13 mm aperture 0.71 mm diameter
(b) Above 400°C	Stainless Steel	-do-

4.13.00 All other materials, e.g. insulation supports, expansion joints, washers, etc. shall be of standard design of the contractor duly approved by the Purchaser and/or Consultant.

4.14.00 Insulating material shall be suitable for the pipe/equipment listed in attached Annexure. For bonded mineral wool insulation, the bonding substance shall retain its binding property upto 600 Deg.C.

4.15.00 The insulating material whether dry or wet shall:

- a) Be fresh, incombustible, rust proof, non hygroscopic and free from asbestos.
- b) Be capable of withstanding continuously and without deterioration the maximum temperature to which they will be subjected.
- c) Not react chemically, either to itself or with other components.
- d) Not sustain any fungi, or vermin and must not pose health hazards.

5.00.00 **THERMAL INSULATION APPLICATION PROCEDURE**

Contractor shall apply thermal insulation at site. Based on Contractor's proven practice and latest design, he will follow his own recommended thermal insulation application procedure. However, the details of method of application and finishing inclusive of all details of insulating materials and supporting arrangements shall be furnished for approval of Owner and/or Consultant.

5.01.00 **General**

5.01.01 All surfaces to be insulated shall be cleaned of all foreign materials such as dirt, grease, rust etc. and shall be dry before the application of insulation.

5.01.02 The insulation material shall be chemically inert, non-combustible and shall be harmless.

- 5.01.03 Before applying the insulation the contractor shall check that all instrument tapping, clamps, lugs and other connections on the surface to be insulated have been properly installed as per the relevant erection drawing.
- 5.01.04 The insulation shall be applied to all surfaces when they are at ambient temp. Ample provision shall be made for the maximum possible thermal movement and the insulation shall be applied so as to avoid breaking/telescoping due to alternate periods of expansion and contraction.
- 5.01.05 All cracks voids and depressions shall be filled with finishing cement, suitable for the equipment operating temp. so as to form a smooth base for the application of cladding.

5.02.00 Piping

- 5.02.01 Pipe insulation shall be so arranged as to allow for expansion of pipe. Insulation expansion joints shall be provided on all pipelines to allow movements and expansion of the pipe without producing random cracking of the insulation. The recommended intervals of expansion joints are:

Pipe Temperature	Spacing of Insulation Expansion Joint
Upto 200 Deg.C	5.5 M
201 - 300 Deg.C	3.5 M
301 - 400 Deg.C	3.0 M
Above 400 Deg.C	2.0 M

Before application of any insulating material, it is important to ensure that the surface to be insulated is dry and free from rust, dirt and grease and extraneous matter.

- 5.02.02 The mattress type insulation shall be formed to fit the pipe and applied with the mattress edges drawn together at the longitudinal joints and secured by lacing wire. Pipe section insulation shall be fitted on pipe using binding wires (tie wires).
- 5.02.03 Longitudinal joints of insulation mattress sections of horizontal piping shall be on the bottom or at the sides of the pipe.
- 5.02.04 Where insulation is applied in two or more layers, each layer of mattress shall be backed with hexagonal wire mesh. For the first layer of insulation and in case of single layer insulation, hexagonal wire mesh shall be provided on both the surface of the mattress. For pipe sections, the sections shall be held in place by binding wires without any wire mesh.
- 5.02.05 The insulation shall be secured to pipes by means of circumferential tie wires of 1.6 mm to 1.0 mm (16 to 19 SWG) for insulation surface with diameter up to and including 550 mm and with metal bends for insulation surfaces with diameter over 550 mm. The fastening shall be done at intervals of 250 mm except where specified otherwise. The ends of the tie wires shall be hooked and embedded in the insulation. The straps shall be mechanically stretched and fastened with metallic clamping seals of the same materials as the strap.

- 5.02.06 The ends of all wire loops shall be firmly twisted together with pliers, bent over and carefully pressed into the surface of the insulation. Any gap in the insulation shall be filled with loose mineral wool or finishing cement.
- 5.02.07 For multiple layer of insulation, the multiple layers shall be applied so that the circumferential joints on adjacent layers are staggered by at least 150 mm and longitudinal joints by at least 50 mm. At the joint of each layer of insulation, suitable packing material shall be firmly applied where necessary.
- 5.02.08 Insulation mattress/section ends shall be terminated at a sufficient distance from the flanges to facilitate removal of bolts.
- 5.02.09 The final layer of insulation shall be backed up by galvanised wire netting stitched with G.I. wire and this shall be anchored to the securing attachments by means of wire ties.
- 5.02.10 Preformed insulation on vertical or near vertical piping with a difference of elevation of 4 meters or above, must be supported in position by means of metal rings, part rings or studs at intervals not greater than 3.0 m and also immediately above each expansion break in the insulation. The support attachment may be welded or clamped to the pipe subject to approval of the Owner.
- 5.02.11 The mat insulation for vertical & near vertical piping shall also be suspended from above, and for this purpose securing attachments must be used which may be of metal rings or studs. The confining wire netting of the mattress shall be anchored to the securing attachments by means of wire ties.
- 5.02.12 Piping bends shall be insulated in the same way as the adjacent straight piping. Where preformed material is used, it should be cut lobster-back fashion and wired and strapped into position.
- 5.02.13 Insulation for application on bends and elbows shall be cut into mitred segments, sufficiently short to form a reasonably smooth internal surface. After the application of insulation material, insulating cement shall be applied as required to obtain a smooth surface.
- 5.02.14 Protrusions through insulations, which themselves do not require insulations, such as pipe clamps, supports of small pipings (except hanger rods), instrument take-offs, etc., shall be covered to the same thickness as the adjacent insulation.
- At outdoor locations and where necessary, the hanger rod protrusions shall be suitably shielded with metal flashing to deflect rain and protect the insulation from moisture while permitting the movement of the hanger rod.
- 5.02.15 All insulation shall be protected by means of an outer covering of aluminum sheathing. All insulation/cladding joints shall be sealed and made effectively weather and waterproof. All flat surfaces shall be given suitable slope to prevent collection of pools of water on the cladding surface. All sheathing shall be protected internally by the application of two coats of bitumastic paint.

- 5.02.16 Aluminium sheet jacketting on piping shall be screwed with self- tapping screws on longitudinal joints only. In case of insulating horizontal pipes, these joints shall be arranged approximately 30 Deg. below horizontal centre line to avoid water ingress. The sheets shall be overlapping by 50 mm on both longitudinal and circumferential joints.
- 5.02.17 Arrangement for securing the metal finish over the insulation shall ensure that direct metal contact between the insulating surface and outer metal cladding is reduced to minimum. All joints shall be vapour tight and shall be able to accommodate thermal movements.
- 5.02.18 All openings and joints in outdoor cladding for piping connections, supports of access shall be suitably flashed and weatherproofed. Where such flushing or weather-proofing cannot effectively control the entry of moisture, then such openings and joints shall be weather-proofed by application of aluminum pigmented sealer.
- 5.02.19 For bends, fittings etc. the cladding shall be provided in segments as to ensure a smooth finish of the cladding.
- 5.02.20 For cladding on vertical pipes/equipment, provision for load take up shall be made at every 2 to 4 meters along pipe/equipment axis.
- 5.02.21 Galvanic corrosion shall be prevented by carefully avoiding permanent contact of aluminum cladding with copper, copper alloys, tin, lead, nickel or nickel alloys including monel metal.
- 5.02.22 All joints shall be sealed with acrylic emulsion weather barrier.
- 5.02.23 Weather hoods shall be provided for insulated piping passing through floors/walls.
- 5.02.24 Upstream of all drain lines and the lines connected to steam traps, shall be insulated up to and including first isolating valve for heat conservation. Rest of such lines such as downstream of the drain valves, traps etc. and other lines such as safety valve discharges; vents, etc. shall be insulated for personnel protection.
- 5.03.00 **Valves and Flanges**
- 5.03.01 All valves fittings and specialties shall be insulated with the same type and thickness of insulation as specified for the connected piping with the special provisions and or exceptions as given below.
- 5.03.02 All valves and flanges shall be provided with removable box type of insulation covered with box fabricated from aluminum sheets of thickness same as the connected pipe cladding. Adjoining pipe insulation shall be bevelled back to permit removal bolts and nuts or bands. The portion of the valve, which cannot be covered by box type insulation, shall be filled by loose insulating material of packing density at least equal to that of the insulating material of adjoining pipe. The insulation for valves/flanges shall be applied after the finishing has been applied over the connected piping. The cladding shall be applied in such a manner that the bonnet flange can be exposed easily without disturbing the complete insulation and cladding.

- 5.03.03 Removable box type cladding for valves and flanges shall be fitted on the connected pipe cladding, with bands.
- 5.03.04 Flanges on lines having temperature up to and including 150 Deg.C shall not be insulated.
- 5.03.05 Union shall not be insulated.
- 5.03.06 Expansion joints, metallic or rubber, shall not be insulated unless otherwise specifically indicated.
- 5.03.07 Safety valves shall be insulated.
- 5.03.08 All flanged joints shall be insulated only after the final tightening and testing.
- 5.04.00 **Equipment**
- 5.04.01 Equipment insulation supports shall be welded to the vessel to support vertical insulation. The material of the supports shall be similar to the vessel, as far as practicable. The supports shall be uniformly pitched at 500 mm (approx.). A support shall be located above each vessel flange at a sufficient distance above the flange bolts to allow for easy removal. The top and bottom supports shall be slotted suitably for attachment of straps or wire.
- 5.04.02 Dished ends of the related equipment shall be insulated by welding studs or cleats to the surface at approximately 300 mm intervals. Insulation application procedure shall be otherwise similar to that for piping.
- 5.04.03 All longitudinal joints shall have a minimum overlap of 50 mm and shall be located at 45 degree or more below the horizontal for horizontal equipment. Joints shall be made with cheese headed self tapping galvanized steel screws at 150 mm centers.
- 5.04.04 All circumferential joints shall have a minimum overlap of 100 mm and shall be held in position by stainless steel or anodized aluminum bands, stretched and clamped.
- 5.04.05 Insulation to various areas shall be applied as under:
- | Insulation Area | Form of Insulation |
|--|--|
| a) SG and ESP surfaces, hot air and gas ducts | Mineral wool block or Mineral wool blankets. |
| b) All other surfaces (not enclosed as per (a) by boiler casing) | Calcium silicate block or above. |
- 5.04.06 For the Steam Generator furnace, if provided with skin casing and the super heater, reheater and economiser casings where water cooled walls are involved, a first covering of refractory material shall be applied to the external tube surfaces before the application of any further heat resistant insulating material.
- 5.04.07 The access doors and inspection doors in the Boiler and ESP shall be lined with refractory material. The access doors in other portions of the Steam

Generator and ESP shall be insulated in a similar manner corresponding to any casing, flue-ducts or air, ducts where such openings and access doors occur.

- 5.04.08 While applying mineral wool blanket insulation :
- a) Expanded metal or hexagonal wire mesh shall be provided on both sides for single layer mattress and on first layer in case of multilayer insulation. Subsequent layers of multilayer insulation shall have only one side wire netting.
 - b) The edges of adjacent blankets shall be leased together, by appropriate lacing wire.
 - c) Any gap between joints between insulation layers shall be filled by loose mineral wool conforming to IS:3677.
 - d) All insulation shall be secured by 1.63 mm diameter wire netting over blankets with ends of wire tightly twisted, and pressed in to insulation surface.
 - (e) Impelling pins shall be placed on centers not exceeding 300 mm.
- 5.04.09 Aluminum cladding shall not come directly into contact with either the equipment surface or with the supporting arrangement on the equipment surface. To this end, adequate layers of 3 mm thick ceramic board shall be provided between the cladding and any supporting arrangement or equipment surface, and fitted with self tapping screws/metal bands, as applicable.
- 5.04.10 Weatherproof flushing shall be installed where the panels intersect with columns and at other similar joints.
- 5.04.11 Removable insulated covers shall be provided over the Separator manholes.
- 5.04.12 Cladding on top surface of Steam Generator and ductwork and equipments shall be suitably reinforced to prevent damage by personnel walking thereon.
- 5.04.13 All cladding for outdoor application shall be with neoprene washers.
- 5.04.14 Cladding shall have sufficient strength to withstand forces generated in boiler, without any rupture or damage.
- 5.04.15 Air & Flue Gas ducts with external stiffeners shall have first layer of insulation between the stiffeners and a second layer of insulation over stiffeners so that stiffeners are also insulated and a level surface is achieved.

6.00.00 **INSPECTION AND TESTING**

6.01.00 The Contractor shall furnish test certificates from any one of the independent authorities listed below or any other reputed body subject to Purchase's/ Consultant's prior approval for all the tests as mentioned later.

- a) National Test House - Calcutta/Bombay
- b) Central Glass & Ceramic Research Institute, Calcutta
- c) National Metallurgical Laboratory, Jamshedpur
- d) Central Mechanical Engineering Research Institute, Durgapur
- e) National Physical Laboratory, Delhi
- f) Central Building Research Institute, Roorke, U.P.
- g) Any other Internationally reputed Test House.

6.02.00 The Contractor shall carry out all the tests according to IS:8183/3144 or according to any other internationally accepted standards. The tests shall be done on representative samples drawn from the insulating material supplied under this section of specification. All the tests mentioned in IS:3144 shall be carried out for establishing various chemical and physical properties (as mentioned below) in accordance with the procedure laid down therein. Owner shall have the right to witness any or all of the tests conducted by the contractor at the shop or laboratory.

Following shall be met by testing as per relevant clauses of IS:3144.

- | | | |
|----|---|---|
| a) | Shot content | 5% by weight (maxm.), size of any shot not to exceed 5 mm diameter |
| b) | Bulk density | 100 Kg/m ³ (For use upto 400°C)
150 Kg/m ³ (For use above 400°C) |
| c) | Weight gain by moisture absorption | 2% (max.) |
| d) | Sulphur Content | Not exceeding 0.6% |
| e) | Alkalinity as percentage of Na ₂ O | Not exceeding 0.6% |
| f) | Maximum oil content | Not exceeding 0.3% by weight |
| g) | Total carbon content | Not exceeding 0.3% by weight |
| h) | Settlement | Nil (When tested as per Cl. 21.1 & 21.2 of IS:3144) |

- i) Handability Fully handable, without any lump formation and disintegration of material
- j) Loss of weight after Not exceeding 5% by weight combustibility test

6.03.00 The Bidder shall furnish the following test reports along with the offer:

- a) Thermal conductivity of the insulating material at various mean temperature.
- b) Retention of binder at elevated temperature
- c) All other tests as per IS:9842/8183.

6.04.00 The Contractor shall guarantee that if, on actual measurement, the specified maximum insulation surface temperatures are exceeded, the contractor shall either replace the insulation with a superior material or provide additional insulation thickness at no extra cost.

7.00.00 DRAWINGS, DATA AND INFORMATION TO BE FURNISHED

7.01.00 The certificates/reports for various properties of thermal insulation materials offered.

7.02.00 Manufacturer's descriptive literature and illustrative catalogues for the materials offered.

7.03.00 A comprehensive write-up on the tests to be conducted for thermal insulating, materials, inspection methods, testing facilities.



**TECHNICAL SPECIFICATION FOR
FUEL OIL HANDLING SYSTEM
1X800 MW WANAKBORI STPS**

SPECIFICATION NO. PE-TS-408-166-A001

VOLUME II-B

SECTION 'C2B'

REVISION 00

DATE: 12/10/2015

PAGE 1 of 1

SECTION: C-2B

PROJECT SPECIFIC GENERAL REQUIREMENTS (GTR)

CONTENT

CLAUSE NO.	DESCRIPTION
1.00.00	CODES AND STANDARDS
2.00.00	RESPONSIBILITY FOR DESIGN
3.00.00	NAME PLATES (RATING PLATES)
4.00.00	SAFETY AND SECURITY
5.00.00	GUARDS
6.00.00	LOCATION AND LAYOUT REQUIREMENTS
7.00.00	OPERATION, MAINTENANCE & AVAILABILITY CONSIDERATIONS
8.00.00	MATERIALS
9.00.00	LUBRICATION
10.00.00	LUBRICANTS & CONTROL FLUIDS
11.00.00	OPERATION AND MAINTENANCE
12.00.00	PLANT LIFE AND MODE OF OPERATION
13.00.00	PACKAGING & MARKING
14.00.00	PROTECTION
15.00.00	PAINTING
16.00.00	COLOUR CO-ORDINATION AND FINISH
17.00.00	ENVIRONMENT PROTECTION AND NOISE LEVEL REQUIREMENT
18.00.00	INSPECTION AND TESTING
19.00.00	TRAINING OF OWNER'S PERSONNEL
20.00.00	DEVIATIONS
	ANNEXURES
ANNEXURE-I	LIST OF STANDARDS FOR REFERENCE
ANNEXURE-II	SCHEDULE OF PERMITS & CLEARANCES
ANNEXURE-III	CRITERIA FOR LAYOUT

VOLUME : IIA

SECTION-IV

GENERAL TECHNICAL REQUIREMENTS

1.00.00 CODES AND STANDARDS

1.01.00 Except where otherwise specified, the Plant shall comply with the appropriate Indian Standard or an agreed internationally accepted Standard Specification as listed in the annexure to this Section and mentioned in detailed specifications, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the Bidder shall give all particulars and details as necessary; to enable the Owner to identify all of the Plant in the same detail as would be possible had there been a Standard Specification.

1.02.00 Where the Bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each Standard Specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.

1.03.00 The plant will be designed in compliance with applicable National and International Codes and Standards such as ASME, ASTM, DIN, BS, IEC, IEEE, IS, etc. Wherever specified or required the Plant shall conform to various statutory regulations such as Indian Boiler Regulations, Indian Explosives Act, Indian Factories Act, Indian Electricity Act, Environmental Regulations, etc. Wherever required, approval for the plant supplied under the specification from statutory authorities shall be the responsibility of the Contractor.

1.04.00 In the event of any conflict between the codes and standards referred above, and the requirements of this specification, the requirements, which are more stringent, shall govern.

1.05.00 All latest codes & standards shall be considered upto the base date. The base date to be considered for codes and standards is fifteen (15) days prior to opening of price bid.

1.06.00 Successful Bidder to furnish two (2) sets of latest International Codes and Standards which have been used for their plants, equipments and system. IS Codes, ASME codes, ASTM codes need not to be furnished. However, International Performance Test Codes shall be furnished as applicable.

2.00.00 RESPONSIBILITY FOR DESIGN

2.01.00 The Contractor shall assume full responsibility for the design of the whole and every portion of the Plant, whether or not the design work was undertaken specifically in relation to the Contract and whether or not the Contractor was directly involved in the design work.

- 2.02.00 Notwithstanding the Owner's wish to receive the benefits of new, advanced and improved technologies, a prime requirement is that all the systems and components proposed shall have been already adequately developed and shall have demonstrated good reliability under similar, or more arduous conditions elsewhere, at least for continuous 2 years in two different power station.
- 2.03.00 The successful bidder shall have to carry out surge analysis, BFP transient analysis and other transient condition studies as may be necessary and as required by the Owner as per proven engineering practice.
- 2.04.00 Bidder shall comply with the requirements of CPCB and MOEF along with specification requirements whichever is stringent.
- 2.05.00 The Bid shall include a detailed discussion on the development status of, and the reasons for any changes made in proposed systems or components for the Plant, as compared with similar items previously supplied in other installations cited by the bidder as reference plants.
- 2.06.00 The Bidder may also make alternate offers, provided such offers are superior in his opinion in which case adequate technical information, operating feed back, etc. are to be enclosed with the offer, to enable the Owner to assess the superiority and reliability of the alternatives offered. In case of each alternative offer, its implications on the performance, guaranteed efficiency, auxiliary power consumptions, etc. shall be clearly brought out to the Owner to make an overall assessment. In any case, the base offer shall necessarily be in line with the specifications i.e. Base offer shall be as per the technical specifications and the same will be considered for techno-commercial evaluation.
- 3.00.00 **NAME PLATES (RATING PLATES)**
- 3.01.00 Instruction plates, name plates or labels shall be permanently attached to each main and auxiliary item of plant in a conspicuous position. These plates shall be engraved with the identifying name, type and manufacturers serial number, together with the loading conditions under which the item of plant has been designed to operate.
- 3.02.00 Items such as valves, etc. which are subject to hand operation, shall be provided with nameplates so constructed as to remain clearly legible throughout the life of the plant giving due consideration to the difficult climatic conditions to be encountered. Nameplates shall be securely mounted where they will not be obscured in service by insulation, cladding, actuators or other equipment. Direction of flow is also to be engraved.
- 3.03.00 All trade nameplates and labels shall be in English language. All measurements shall be in M.K.S. Units.
- 3.04.00 The size and location of nameplates shall be subject to Approval of the Engineer.

4.00.00 SAFETY AND SECURITY

4.01.00 The design shall incorporate every reasonable precaution and provision for the safety of all personnel and for the safety and security of all persons and property. The design shall comply with all appropriate statutory regulations relating to safety. All structures and equipment shall be designed and constructed to withstand every foreseeable static and dynamic loading condition, including loading under earthquake conditions, with an adequate margin of safety.

4.02.00 Ready and safe access with clear head room shall be provided to all parts of the plant for operation, inspection, cleaning and maintenance.

4.03.00 Escape routes and clear ways shall be provided to allow speedy evacuation of the plant in the event of fire or explosion, and the plant layout shall allow for ease of access to all parts of the Works by rescue and fire fighting teams. The plant layout shall be designed to localise and minimise the effects of any fire or explosion. The recommendations of NFPA, OSHA, and TAC etc. as necessary shall be followed in all respects.

4.04.00 The use of corrosive, explosive, toxic or otherwise hazardous materials shall be kept to a minimum during construction and the design of the plant shall minimise the requirement for such materials during operation and maintenance. Where such materials must be used, all necessary precautions shall be taken in the design, manufacture and layout of equipment to minimise the resulting hazard, and all equipment necessary for the protection and first-aid treatment of personnel in the event of accidents shall be provided. Particular attention is drawn to avoid the use of materials containing asbestos in any form.

5.00.00 GUARDS

5.01.00 Effective guards and fences must be provided to prevent injury to operators through accident or malpractice.

5.02.00 Mesh guards which allow visual inspection of equipment with the guard in place are generally preferable. The guards shall be constructed of mesh attached to a rigid framework of mild steel rod, tube, or angle and the whole galvanised to prevent loss of strength by rusting or corrosion. The guards shall be designed to facilitate removal and replacement during maintenance.

5.03.00 All drive belts, couplings, gears, sharp metallic edges and chains must be safely guarded. Any lubricating nipple requiring attention during normal running must be positioned where they can be reached without moving the guards.

5.04.00 Guards for couplings and rotating shafts shall be in accordance with BS 5304-1975 or similar approved standard. All rotating shafts and parts of shafts must be covered.

5.05.00 Suitable fencing shall be provided to enclose all openings or doorways used for the hoisting and lowering of machinery etc. This fencing must be securely fixed but quickly detachable when required. A secure hand hold must be provided on each side of the opening or doorway.

6.00.00 **LOCATION AND LAYOUT REQUIREMENTS**

The majority of plant and equipment (excluding steam generator and some other auxiliaries) shall all be of indoor installation. A broad list of buildings housing such equipment is given elsewhere in this specification. Layout should facilitate access for operation-maintenance and inspection of any one or more equipment/components at a time without disturbing the operation or installation of rest of the plant. Further, Bidder should comply with the criteria given under the various equipment and system specifications as well as those stipulated in Annexure-II attached to this section.

Enclosed General Layout and other tender layout drawings show the location of major installations and auxiliary buildings. The Bidder shall try to retain these locations as far as practicable. The layout of equipment within the power house as shown in the tender drawings is indicative. The Bidder may, subject to Owner's approval alter the same to suit the space requirement of the equipment offered.

Bidder may give as an alternative his own preferred layout clearly indicating the advantages and other implications, if any. Such alternative will not be considered for evaluating the bid, but may be considered with the successful Bidder if Owner/Engineer finds the proposal more attractive in terms of techno-economic consideration.

While developing the layout of buildings the following criteria shall be given effect :

- a) The minimum width of clear access corridors around equipment shall be one (1) meter.
- b) Each building shall have an identified vacant space for equipment unloading and maintenance and preferably a separate bay altogether in buildings housing heavy equipment. Provision for handling equipment by monorail hoist and/or overhead crane shall be made as specified.
- c) The minimum clear height available between two consecutive floor slabs shall not be less than five (5) meters. A clear head room of two (2) meters shall be maintained between the floor and any overhead piping/cables or other obstruction. Adequate provision for natural ventilation and illumination shall be made as per good engineering practices.
- d) There shall be at least two (2) nos. main access doors, one on either side of each building, of which one shall be minimum 3 meters wide with rolling shutters for equipment entry. For multistoried buildings, at least two (2) nos. regular staircases diagonally opposite to each other shall be provided connecting all the floors and roof. These minimum requirements shall be augmented as required depending on the floor area, statutory requirements and TAC recommendations.
- e) All buildings shall have provision for toilet and associated effluent discharge system together with facility for drinking water. The criteria for ventilation, fire protection and illumination of building spaces specified elsewhere in this specification shall be complied with.

- f) All rail/road crossings for pipe/cable racks shall be done with minimum 7 meters clear headroom. Similarly top cover over underground pipes/cables shall be minimum one (1) meter. For other detail refer to Annexure-II.
- g) Cubicle for operating personnel shall be located at safe place near the equipment.
- h) All underground cables in the plant shall be placed in covered reinforced concrete cable trenches. Pipes shall in general be routed above ground and on pedestals, and at road crossings, pipe racks shall be provided. Cable racks / pipe racks shall have hand railings in walkways on both sides at appropriate heights.
- i) Concept of various mechanical and electrical equipment location and building dimensions as shown in Plot Plan/Floor Plan drawing are to be adhered to.

However, size of buildings & facilities as stated above, shall be finalized by EPC Contractor considering the basic design criteria of layout as indicated in the specification.

7.00.00 **OPERATION, MAINTENANCE & AVAILABILITY CONSIDERATIONS**

7.01.00 Equipment/works offered shall be designed for high availability, high reliability, low maintenance and ease of operation & maintenance. The Bidder shall specifically state the design features incorporated to achieve high degree of reliability, availability, operability and ease of maintenance. He shall also furnish details of availability records in plants stated in his experience list.

7.02.00 Ample space for ease of operation and maintenance including equipment removal, tube bundle/cartridge/rotor pulling etc. shall be provided. All valves, gates, dampers and other devices shall be located and oriented in such a way that they are accessible from operating floor levels. Where this cannot be adhered to, platforms and walkways with access ladders shall be provided to facilitate operation and maintenance.

7.03.0 Motorised lifting devices, i.e. hoists, chain pulleys, jacks, etc. shall be provided for handling and carrying out maintenance of any equipment and/or part having weight in excess of 3000 Kg. Suitable beams, hooks etc. for this purpose shall be provided in the buildings.

No lifting arrangement is necessary for part having weight less than 500 Kg. Hoist shall be well protected by environment. Suitable painting and coating covering hoist at outdoor shall be provided.

Lifting devices like lifting tackles, slings, etc. to be connected to hook of the hoist/crane shall be provided by the Bidder for lifting the equipment, accessories covered under this specification.

7.04.00 All similar parts of the equipment shall be made to gauge and shall be interchangeable with and shall be made of same material and workmanship as the corresponding parts of the equipment. Where feasible common components shall be employed in different pieces of equipment in order to optimize the spares inventory and utilization.

8.00.00 **MATERIALS**

8.01.00 In selecting materials of construction of equipment, the Contractor shall pay particular attention to the atmospheric conditions existing at the Site and the nature of material/fluid handled. Wherever deviations are taken in respect of materials specified, the reasons shall be spelt out clearly in the proposal.

All materials shall be new, and shall be of the quality most suited to the proposed application.

8.02.00 In as far as is possible; materials shall be in accordance with Indian or international standard specifications and shall be used in accordance with Indian or international codes of practice. Where such standards or codes of practice are not available sufficient information shall be provided to allow the Engineer to assess the suitability of the material for the particular application.

All materials used shall have performed lengthy satisfactory service in similar or more arduous conditions to those proposed by the Contractor.

8.03.00 All parts which could deteriorate or corrode under the influence of the atmospheric, meteorological or soil conditions at the Site, or under the influence of the working conditions shall be suitably and effectively protected so that such deterioration or corrosion is a minimum over the life of the plant.

9.00.00 **LUBRICATION**

9.01.00 Provision shall be made for suitable efficient lubrication where necessary to ensure smooth operation free from undue wear.

9.02.00 Non ferrous capillary tubing shall be used throughout.

9.03.00 Gear boxes and oil baths shall be provided with filling and drain plugs, both of adequate size. An approved means of oil indication including level switches and temperature indication shall be provided.

9.04.00 All high speed gears shall be oil bath lubricated. Low speed gears shall be lubricated by means of soft grease. Removable and accessible drip pans shall be provided to collect lubricant which may drop from operating parts.

9.05.00 All lubrication points shall be conveniently situated for maintenance purposes. It must be possible to carry out lubrication from a gangway or landing and without the removal of guarding or having to insert the hand into it. Where accessibility to a bearing for oiling purposes would be difficult a method of remote lubrication shall be fitted.

9.06.00 The Contractor shall supply grease gun equipment suitable to service each type of nipple fitted.

10.00.00 **LUBRICANTS AND CONTROL FLUIDS**

10.01.00 The Contractor shall provide a detailed and comprehensive specification for all lubricating oils, greases and control fluids required for the entire plant. A sufficient supply of these shall be provided by the Contractor for initial commissioning, first fill and till COD of respective units.

10.02.00 The Contractor shall supply a detailed schedule giving the lubricant testing, cleaning and replacement procedures. All equipment and facilities necessary for the testing, cleaning and changing of lubricants and control fluids shall be provided. The Contractor shall endeavor to reduce the varieties and grades of required lubricants and control fluids to a minimum, matching them where possible to those already in use in the generating station in order to simplify procurement and minimise storage requirements. All lubricants and control fluids shall be of internationally recognised standards and shall be easily obtainable from a large number of Indian suppliers. Bidder shall also indicate the equivalent Indian Standard for the above for easy procurement in future.

10.03.00 No lubricant or control fluid shall have toxic or other harmful effects on personnel or on the environment.

11.00.00 **OPERATION AND MAINTENANCE**

11.01.00 The plant shall be designed and constructed so that operation and maintenance manpower requirements are minimised.

The design and layout shall facilitate inspection, cleaning, maintenance and repair. The importance of continuity of operation is second only to that of safety.

11.02.00 Spare parts for equipment shall be interchangeable with the original components and, so far as possible, be of common design and manufacture.

11.03.00 All similar standard components/parts of similar standard equipment provided shall be interchangeable with one another. Further identical equipments shall be provided for similar duties so that the same are interchangeable with one another in totality and component wise.

11.04.00 All heavy parts (500 Kg and above) must be provided with a convenient arrangement for slinging and handling during erection and overhaul. Any item of plant normally stripped or lifted during periods of maintenance and weighing one tonne or above, shall be clearly marked with its weight.

11.05.00 On completion of commissioning, a complete set of tools for the maintenance of the entire plant shall be provided by the Contractor. This shall include all necessary spanners, special wrenches, extraction equipment and any special tools reasonably required by the Engineer. Tools used during erection and commissioning shall not be accepted except with the specific approval of the Engineer.

11.06.00 All equipment and major valves should be provided with adequate maintenance approach and facility.

12.00.00 **PLANT LIFE AND MODE OF OPERATION**

The complete plant including all the equipment and systems individually and collectively shall be designed for continuous operation for an economic service life of thirty (30) years under the prevailing site conditions and for the type of duty intended.

The critical components of the Steam Generator, Turbine-Generator and Auxiliary equipment, the life of which is limited by time and temperature dependent mechanisms such as thermal stress, creep and low cycle fatigue, are to be designed considering expected (hot, warm and cold) start-up, shut-down and cyclic load variations.

The allowable stresses shall be reduced so that life expectancy to minimum 2,00,000 hours of operation can be achieved. The Bidder shall discuss this aspect in his technical proposal.

The unit would be operated on base load with cyclic load variation. The load variation is expected to be as per schedule depending on power demand.

The expected start-ups should be considered as minimum
(Based on HPT metal temperature)

Cold start-up (>50 hrs. shutdown)	:	20 per year
Warm start-up (between 10 to 50 hrs. of shutdown)	:	40 per year
Hot start-up (less than 10 hrs. shutdown)	:	180 per year

13.00.00 **PACKAGING & MARKING**

All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. While packing all the materials, the limitations from the point of view of availability of railway wagon sizes in India should be taken account of. The details of various wagons normally available with Indian Railways for transportation of heavy equipment shall be considered by the Bidder. The Contractor shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.

As per the information available, the dimensions of OD consignment for transportation of the equipment by rail (if any equipment to be handled through rail transportation) are as below :

a)	Width of the Package (from centre-line of rails - 1.6 metres on both sides)	:	3.2 Meters
b)	Height of the package from rail top	:	4.47 Meters

The above indicates the dimensions which can be normally transported on the wagons without infringement of the "moving gauge". This is however not indicative of the consignment which can be carried out with infringement of "moving gauge" duly authorised and approved by the Indian Railways. There may be difference between the "moving gauge" and the "fixed structure gauge" and consignments infringing the "moving gauge" can be moved after investigation regarding possible infringement with the fixed structures. As the critical fixed structures in each route are different, consignments infringing moving dimensions have to be individually investigated to select a route and also determine the restrictions under which such movement is to be carried out. Such routes selected or other mode of transport envisaged is to be clearly brought out in the proposal wherever transport of over dimensional equipment is involved.

Bidder to consider unloading of material delivered through rail transportation, at near by railway station/site unloading siding. The subsequent transportation up to project work place shall be considered by road only. All unloading and handling equipment both at railway station siding and at project site shall be arranged by the Bidder. Necessary arrangement to be organized with the railway authority for such purpose shall also be under the scope of services if the Bidder. Bidder may consider entire material delivered up to site through rail transportation only.

The identification marking indicating the name and address of the consignee shall be clearly marked in indelible ink on two opposite sides and top of each of the packages. In addition the Contractor shall include in the marking gross and net weight, outer dimension and cubic measurement. Each package shall be accompanied by a packing note (in weather proof paper) quoting specifically the name of the Contractor, the number and date of contract and names of the office placing the contract, nomenclature of contents and Bill of Material.

For imported equipment and material, suitable port facilities may be used in which case material may be transported from the port by tractor-trailer. Bidder may consider this aspect.

14.00.00 **PROTECTION**

Equipment having antifriction or sleeve bearings shall be protected by weather-tight enclosures. Coated surfaces shall be protected against impact, abrasion, discoloration and other damages. Surfaces that are damaged shall be repainted.

Electrical equipment, controls and insulations shall be protected against moisture and water damages. All external gasket surfaces and flange faces, couplings, rotating equipment shafts, bearings and like items shall be thoroughly cleaned and coated with rust preventive compound as specified above and protected with suitable wood, metal or other substantial type covering to ensure their full protection. All exposed threaded parts shall be greased and protected with metallic or other substantial type protectors.

All piping, tubing and conduit connections on equipment and other equipment openings shall be closed with rough usage covers or plugs. Female threaded openings shall be closed with rough usage covers or forged steel plugs. The closures shall be taped to seal the interior of the equipment. Open ends of piping, tubing and conduit shall be sealed and taped.

Returnable containers and special shipping devices shall be returned by the manufacturer's field representative at the Contractor's expense.

15.00.00 PAINTING

15.01.00 General

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. Surfaces not easily accessible after shop assembly shall be treated before-hand and protected for life of the equipment. Surfaces to be finish painted after installation shall be shop painted with at least two (2) coats of primer. Steel surfaces, which are not to be painted, shall be coated with suitable rust preventive compound subject to the approval of the Owner.

All paints shall be used in accordance with the manufacturer's instructions. No thinners or other substance shall be added to the coating material without the approval of the Engineer. The quality and vendor of the paints shall require approval of the Owner.

All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.

All primers shall be well marked into the surface, particularly in areas where pitting is evident, and the first priming coat shall be applied as soon as possible after cleaning, within four hours maximum. The paint shall be applied by brush, roller or airless spray, according to the manufacturer's instructions. Spray painting shall be carried out by operators trained and thoroughly experienced in the use of the equipment. If the drying interval between successive coats, which should not exceed one week, has been so long as to endanger the adhesion of the following coat, the paint already applied shall be lightly rubbed down with fine abrasive paper before putting on the next coat.

Paint spraying on large surfaces shall not normally be done indoors, except with the approval of the Engineer. Spray guns shall not be used outdoors in windy weather or near unprotected surfaces of a contrasting colour and under no circumstances shall spray guns be used where spray may be carried into or onto exposed electrical equipment.

Paint containers shall not be opened until required and the paint shall be mechanically mixed thoroughly before use, and agitated occasionally during use.

Electrical equipment shall be shop finished with one or more coats of primer and two coats of high-grade oil resistant enamel. The interior of all panels' cabinets and enclosures shall be finished with gloss white enamel.

The Contractor shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory surfaces of each item of equipment. The touch-up paint shall be of the same type and colour as the factory applied paint and shall be carefully packed to avoid damage during shipment. Complete painting instructions shall be furnished.

Shop primer for steel and iron surfaces which will have a continuous operating temperature below 35 Deg.C shall be selected by the Contractor, in accordance to the relevant standard. Special high temperature primer shall be used on surface exposed to operating temperature above 35 Deg.C.

The colour scheme shall be submitted during execution of contract for approval by the Purchaser/Engineer.

15.02.00 **Preparation**

Oil and grease shall be removed from the surface by washing with a suitable detergent, rinsing with clean water, and drying.

Surfaces to be shot blasted shall be cleaned to Swedish Standard SA 2.5 or equivalent, and all dust remaining after cleaning shall be removed.

The priming coat shall be applied without delay.

15.03.00 **Damaged Paintwork**

Any damaged paintwork shall be made good as follows :

- a) The damaged area, together with an area extending 25mm around its boundary, shall be cleaned down to bare metal.
- b) A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50mm around the perimeter of the original damage.
- c) The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming.

15.04.00 **Painting Systems**

The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as stated below, unless otherwise specified elsewhere in this specification.

a) Surfaces Subject To Weathering

All surfaces shall have a minimum of four coats of paint made up as follows :

Primer coat	:	35 micron DFT
Tie coat	:	35 micron DFT

Finishing coat (2 Nos.) : 35 micron DFT per coat

The total minimum DFT shall be 140 micron.

b) Surfaces Inside Buildings

All surfaces shall have a minimum of three coats of paint made up as follows:

Primer coat : 35 micron DFT

Tie coat : 35 micron DFT

Finishing coat (2 Nos.) : 25 micron DFT per coat

The total minimum DFT shall be 120 micron.

The type and colour of primer & finish coat shall be selected by the Contractor after approval by the Owner.

For detail painting on building & structural steel elements refer Section-IIG/1 & IIG/2 of this specification.

16.00.00 **COLOUR CO-ORDINATION & FINISH**

16.01.00 Exterior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and with the surrounding landscape.

16.02.00 Interior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and which will be conducive to; the comfort, well-being and high productivity of the operators. Operating plant and services provided shall be colour coded for ease of identification.

16.03.00 All finishes shall be durable and as far as possible maintenance free. Finishes shall be easily cleaned.

16.04.00 Final colours and finishes shall be to the Approval of the Engineer.

17.00.00 **ENVIRONMENT PROTECTION AND NOISE LEVEL REQUIREMENT**

17.01.00 **Environment Protection**

The plant shall be designed for installation and operation in harmony with the surrounding environment and all measures of pollution control shall be ensured by the Bidder to restrict pollution from the liquid effluent and stack emission within the limits as given below with due consideration of Environment (Protection) Rules 1986 as amended till date.

In case the Ministry of Environment & Forest stipulate any other conditions not specified hereunder while clearing the project shall be complied with the plant by the contractor.

17.01.01 For Liquid Effluent

- a) Provision laid down in schedule-I for Thermal Power Plants and also in Schedule-VI. General Standards for discharge of Environmental pollutants Part-A : Effects of Environmental (protection) Rules 1986, as amended till date.
- b) Any specific requirement of State Pollution Authorities over and above the above stipulation.

17.01.02 For Air Emission

- a) Suspended Particulate Matter i.e. dust burden at chimney outlet - Maximum 50 mg/Nm³ (with worst coal and one field out).
- b) NO_x - 365 ppm Max. or 750 mg/Nm³ (Equivalent NO₂).
- c) SO₂ - Concentration based standard 2000 mg/Nm³ Load based standard 0.2 metric tonne /MWe/day (for first 500 MW and 0.1 metric tonne/MWe/day for rest of the capacity above 500 MW)

NO_x and SO₂ limitations are based on the World Bank Norms.

In absence of Indian Standard for emission from power plants as on date, for certain gaseous effluents, the internationally accepted World Bank Standard is to be followed. Indian Standard for emission of power plants are under formulation. Should this standard is published before finalisation of the contract, the bidder has to comply the more stringent of the above norm or the new Indian Standard.

The bidder shall include in his scope all necessary equipment and measuring instruments to comply with above requirements. Location and accessibility of the instruments shall be properly coordinated.

17.02.00 **Noise Level Requirement**

The plant will be designed, constructed and provided with suitable acoustic measures to ensure the noise level criteria as per the following stipulations.

- a) Maximum noise level shall not exceed 85 dB (A) when measured at 1.0M away from the noise emission source.
- b) Maximum noise level from its source within the premises shall not exceed 70 dB (A) as per Environment (Protection) Rules 1986, Schedule-III, 'Ambient Air Quality Standards' in respect of noise.
- c) Any statutory changes in stipulations regarding noise limitation that may occur in future according to State Pollution Control Board or Central pollution Control Board or Ministry of Environment & Forest regulation during tenure of the contract, the contractor shall comply with the requirement.

An exception will be made for the plant at startup operations and other big pressure reducing devices operating during emergency periods and for the safety valves.

18.00.00 INSPECTION AND TESTING

18.01.00 Inspection and Tests during Manufacture

18.01.01 The method and techniques to be used by the Contractor for the control of quality during manufacture of all plant and equipment shall be agreed with the Owner prior to the Award of Contract.

18.01.02 The Owner's general requirements with respect to quality control and the required shop tests are set out elsewhere in this specification.

18.01.03 Before any item of plant or equipment leaves its place of manufacture the Owner shall be given the option of witnessing inspections and tests for compliance with the specification and related standards.

18.01.04 Advance notice shall be given to the Owner as agreed in the Contract, prior to the stage of manufacture being reached, and the piece of plant must be held at this stage until the Owner has inspected the piece, or has advised in writing that inspection is waived. If having consulted the Owner and given reasonable notice in writing of the date on which the piece of plant will be available for inspection, the Owner does not attend the Contractor may proceed with manufacture having forwarded to the Owner duly certified copies of his own inspection and test results.

The Contractor shall forthwith forward to the engineer duly certified copies of the Test Certificates in six copies (one to the Purchaser and five to the Consulting Engineer) for approval. Distribution of six (6) copies of Test Certificates for approval will be two(2) copies to owner and four(4) copies to consultant. These four(4) copies will be further distributed by consultant after approval to owner, site and bidder. One copy will be retained with the consultant for record purpose.

Further, nine (9) copies of Shop Test Certificates shall be bound with Instruction Manuals referred to elsewhere. Distribution of nine (9) copies of Shop Test Certificates for approval will be Two (2) copies to owner, Three (3) copies to site, Two (2) copies to consultant, Two (2) copies to owner's library / record.

18.01.05 Under no circumstances any repair or welding of castings be carried out without the consent of the Engineer. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Engineer.

18.01.06 All the individual and assembled rotating parts shall be statically and dynamically balanced in the works.

Where accurate alignment is necessary for component parts of machinery normally assembled on site, the Contractor shall allow for trial assembly prior to despatch from place of manufacture.

- 18.01.07 All materials used for the manufacture of equipment covered under this specification shall be of tested quality. Relevant test certificates shall be made available to the Purchaser as per Owner's approved QAP. The certificates shall include tests for mechanical properties and chemical analysis of representative material.
- 18.01.08 All pressure parts connected to pumping main shall be subjected to hydraulic testing at a pressure of 150% of shut-off head for a period not less than one hour. Other parts shall be tested for one and half times the maximum operating pressure, for a period not less than one hour.
- 18.01.09 All necessary non-destructive examinations shall be performed to meet the applicable code requirements.
- 18.01.10 All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section-IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination magniflux and ultrasonic testing shall be employed wherever necessary/ recommended by the applicable code. At least 10% of all major butt welding joints shall be radiographed.
- 18.01.11 Statutory payments in respect of IBR approvals including inspection for design and manufacturer of equipment shall be made by the Bidder. All payment for erection and testing at site (i.e. under IBR jurisdiction) shall also be made by the Bidder. In such case Contractor's scope shall also be extended to preparation of all necessary documents, co-ordination and follow-up with IBR authorities for above approval.
- 18.02.00 **Performance Tests at Site**
- 18.02.01 The full requirements for testing the system shall be agreed between the Owner and the Bidder prior to Award of Contract. The completely erected System shall be tested by the Contractor on site under normal operating conditions. The Contractor shall also ensure the correct performance of the System under abnormal conditions, i.e. the correct working of the various emergency and safety devices, interlocks, etc.
- 18.02.02 The Bidder shall provide complete details of his normal procedures for testing, for the quality of erection and for the performance of the erected plant. These tests shall include site pressure test on all erected pipe work to demonstrate the quality of the piping and the adequacy of joints made at site.
- 18.02.03 The Contractor shall furnish the quality procedures to be adopted for assuring quality from the receipt of material at site, during storage, erection, pre-commissioning to tests on completion and commissioning of the complete system/equipment.
- 18.03.00 For details of specific tests required on individual equipment refers to respective section of this specification.

19.00.00 **TRAINING OF OWNER'S PERSONNEL**

The Contractor shall extend all possible assistance and co-operation to the Purchaser regarding the transfer of technology and developing expertise in the area of engineering operation and maintenance of the Plant.

Number of man-days of training as mentioned below shall be included in his Tender.

19.01.00 **Training at Contractor's Premises**

The Contractor shall conduct training of sixty (60) engineers of the Owner on engineering, operation and maintenance of the Plant at the Contractor's or Associates or Sub-contractor's premises where adequate training facilities are available during the design and manufacturing stage of the Contractor.

The total man-months for training of engineers shall be maximum sixty (60), having following indicative break-up :

Discipline	No. of Engineers	No. of Man-month
Operation	20 heads	20
Maintenance Boiler, Turbine, Mechanical	20 heads	20
Electrical Maintenance	8 heads	4
Control & Instrumentation	8 heads	4
Maintenance Planning	4 heads	2
	----- 60 heads -----	----- 60 -----

However, the details of the training programme will be discussed and finalised with the successful Bidder.

The training may also be arranged by the Contractor in any Plant where the equipment manufactured by the Contractor or his Associates is under installation, operation or testing to enable the trainees to become familiar with the equipment being furnished by the Contractor. All expenses inherently related to the training shall be borne by the Contractor and shall include but not limited to travel expenses (international and inland fares), lodging and per diem charges as well as medical insurance, instructors fee, programme and miscellaneous cost to be incurred during the training.

The training programme shall be adequate for the trainees to acquire the necessary expertise and competence in the area of engineering, operation and maintenance and as trainers for in-house technology transfer programme of the Purchaser.

The Contractor shall be responsible for the development of the Training Module and Programme Schedule which shall be submitted to the Purchaser for approval.

The components of the training modules shall include but not be limited to the training procedures/methodology, instructional materials such as audio visual materials, CDs and slides and manuals for each trainee.

Three (3) sets of the materials included in the training modules shall be handed over to the Purchaser upon completion of the training. An evaluation shall be jointly undertaken by the Contractor and the Purchaser's representative on the adequacy, appropriateness and relevance of the training and the programme effectiveness after the training. The training material shall be in English language only.

The content of the training programme shall include but not be limited to :

1. Coal fired thermal plant principles in management and practice for operators, technicians and maintenance personnel.
2. Plant operation and systems training for operators including simulator training as applicable.
3. Maintenance training programme covering electrical, mechanical and instrumentation and control.

Said training programme shall be submitted to the Purchaser for approval.

The timing of the training should be such that the participants will be conversant with sufficient know-how to participate in the pre-commissioning and commissioning tests of the Plant.

The Contractor shall provide qualified English speaking instructors and training coordinator(s) during the tenure of the training programme.

19.02.00 Operation and Maintenance Training at Site

The Contractor shall provide a comprehensive training programme related to design application, plant management, operation and maintenance, including trouble shooting, of the Contractor's supplied system and equipment at the Site starting from Start of Commissioning and thereafter up to the Final Acceptance of the first Unit.

The following instructors shall be at the Site continuously during the training :

- a) One (1) for Steam Generator and Auxiliaries ;
- b) One (1) for Turbine Generator and Auxiliaries ;
- c) One (1) for Electrical Works ;
- d) One (1) for Instrumentation and Control (Boiler and Auxiliaries) ;
- e) One (1) for Instrumentation and Control (Turbine and Auxiliaries).

19.03.00 **On-the-Job Training**

During the period of pre-commissioning, commissioning and trial operation, the Purchaser shall provide operation and maintenance personnel to assist the Contractor in the operation and maintenance of his supply and work under the direction of the Contractor for the purpose of on-the-job training.

The Purchaser shall have the right to send to the Site his employees later intended to operate and maintain the equipment supplied under this Contract. The Contractor shall, without additional cost, use his site staff to instruct these employees on the operation and maintenance of the equipment. All instructions shall be in the English language.

20.00.00 **DEVIATIONS**

The Bidder is required to submit with his proposal in the relevant schedules a detail list of any and all deviations taken by him clearly without any ambiguity. In the absence of such a list it will be understood and agreed that the Bidder's proposal is based on strict conformance to this specification and no post-contract negotiations would be allowed in this regard.

Unless otherwise specifically indicated in the deviation list, it will be construed and agreed that details indicated in documents & drawings furnished by the Bidder along with the offer is in-line with the specification requirement.

ANNEXURE-I

LIST OF STANDARDS FOR REFERENCE

- a) International Standards Organisation (ISO).
- b) International Electro-technical Commission (IEC).
- c) American Society of Mechanical Engineers (ASME).
- d) American National Standards Institute (ANSI).
- e) American Society for Testing and Materials (ASTM).
- f) American Institute of Steel Construction (AISC).
- g) American Welding Society (AWS).
- h) Architecture Institute of Japan (AIJ).
- i) National Fire Protection Association (NFPA).
- j) National Electrical Manufacturer's Association (NEMA).
- k) Japanese Electro-technical Committee (JEC).
- l) Institute of Electrical and Electronics Engineers (IEEE).
- m) Federal Occupational Safety and Health Regulations (OSHA).
- n) Instrument Society of America (ISA).
- o) National Electric Code (NEC).
- p) Heat Exchanger Institute (HEI).
- q) Tubular Exchanger Manufacturer's Association (TEMA).
- r) Hydraulic Institute (HIS).
- s) International Electro-Technical Commission (IEC) Publications.
- t) Power Test Code for Steam Turbines (PTC).
- u) Applicable German Standards (DIN).
- v) Applicable British Standards (BS).
- w) Applicable Japanese Standards (JIS).
- x) Electric Power Research Institute (EPRI).

- y) Standards of Manufacturer's Standardization Society (MSS).
- z) Bureau of Indian Standards Institution (BIS).
- aa) Indian Electricity Rules.
- bb) Indian Boiler Regulations (IBR).
- cc) Indian Explosives Act.
- dd) Indian Factories Act.
- ee) Tariff Advisory Committee (TAC) rules.
- ff) Emission regulation of Central Pollution Control Board (CPCB).
- gg) Pollution Control regulations of Dept. of Environment, Govt. of India
- hh) Central Board of Irrigation and Power (CBIP) Publications.
- ii) The Air Prevention and Control of Pollution Act.
- jj) The Environmental Protection Act
- kk) The Public Liability Insurance Act.
- ll) The Forest Conservation Act
- mm) The Wildlife protection Act.
- nn) The EIA Notification, 1994.
- oo) IS: 14665-Specification for Electric Traction Lift
- pp) Any other statutory Codes/Standards/Regulations

ANNEXURE-II

SCHEDULE OF PERMITS & CLEARANCES

Sl. No.	Clearances	Authority	Responsibility
1.0	STATUTORY CLEARANCES		
1.1	Pollution clearance, water and air [Sec.25 of the Water (Prevention & Control of Pollution) Act, 1974 as amended in 1988, and Sec. 21 of the Air (Prevention & Control of Pollution) Act, 1981 as amended in 1987]	Gujarat State Pollution Control Board	Owner-Consent to establish the project. Contractor - Permission for operation
1.2	Environmental clearance	Ministry of Environment & Forest, Government of India	Owner
1.3	Aviation Clearance	Airport Authority of India, New Delhi.	Owner
2.0	NON-STATUTORY CLEARANCES		
2.1	Land availability at Plant area	Govt. of Gujarat / Private land Owner, if any	Owner
2.2	Land for Transportation of Coal	Govt. of Gujarat / Private Land Owner, if any	Owner
2.3	Transportation of Fuel (Secondary Fuel)	Department of Petroleum and Natural Gas, Ministry of Railways, Shipping and Surface Transport	Owner
2.4	Rights & right to access of all public roads from manufacturer's works to site,	Concerned Authorities	Contractor
3.0	OTHER CLEARANCES/ APPROVALS		
3.1	Approval and Registration of steam generator as per Indian Boiler Regulation	Chief Inspectorate of Boilers	Contractor
3.2	Approval as per Indian Electricity Act and Rules for Electrical Installation	Electrical Inspectorate	Contractor
3.3	Approval as per Indian Petroleum Act and Petroleum Rules for storage of petroleum products.	Chief Controller of Explosives	Contractor
3.4	Approval as per gas cylinder rules and handling and transport of compressed gases	Chief Controller of Explosives	Contractor
3.5	a) Collection, storage and disposal of waste during construction till handing over of the project.	Gujarat State Pollution Control Board	Contractor

Sl. No.	Clearances	Authority	Responsibility
	b) Site clearances, safe report and safety audit during construction till handing over of the project.	Gujarat State Pollution Control Board	Contractor
3.6	Approval of Fire Protection Scheme	Authorised Agencies approved by Insurance Regulatory Development Authority, New Delhi (IRDA)	Contractor
3.7	Consent for use of the site for the construction and operation of the Power Station and Fuel Facility	Directorate of Town and Planning of Government of Gujarat	Owner
3.8	Consent for the development of Project Site and the Township site	Directorate of Town and Planning of Government of Gujarat	Owner
3.9	Approval of the proposed design and construction of power station	Chief Inspector of Factories of Government of Gujarat	Contractor
3.10	Allocation / approval of electric supply for bulk construction power	Gujarat State Electricity Dept.	Owner
3.11	Carriage entrance to property	Municipal Corporation: Assistant Engineer, Roads or concerned authorities	Contractor
3.12	Approval of building layout with fire safety concerns and receipt of No Objection Certificate	Municipal Corporation: Chief Fire Officer or concerned authorities	Contractor
3.13	No Objection Certificate regarding air & fugitive emissions	Municipal Corporation: Executive Engineer and Gujarat Pollution Control Board	Contractor
3.14	No objection Certificate for Chimney and Registration	Inspector of Smoke Nuisance	Contractor
3.15	No Objection Certificate for sewage water treatment and associated plumbing	Municipal Corporation: Executive Engineer, Sewerage and Planning or concerned authorities	Contractor
3.16	To review the frequency used for Power Line Carrier Communication (PLCC) system to ensure no interference with other power line users	Postal Tele communication Coordination Committee (PTCC)	Owner-PLCC Contractor- Wireless equipment (postal telecommunication)
3.17	No objection certificate for plant layout with regard to electrical equipment, operational safety	Chief Electrical Engineer of Gujarat	Contractor
3.18	No Objection Certificate for storage of construction Materials and chemicals, etc.	Municipal Corporation: Assistant Engineer, Factory Department	Contractor

Sl. No.	Clearances	Authority	Responsibility
3.19	No Objection Certificate for storage of construction fuel oils and chemicals, etc.	Commissioner of Police	Contractor
3.20	No Objection Certificate for storage of Distillate Oil	Chief Controller of Explosives	Contractor
3.21	No Objection Certificate for road opening and asphaltting Work including traffic Work.	Municipal Corporation: Assistant Engineer, Roads or concerned authorities	Contractor
3.22	Local approval for operating the plant	Municipal Corporation: Ward Office or concerned authorities	Not applicable
3.23	Local approval of Architectural plans for township	Municipal Corporation or concerned authorities	Owner
3.24	Consent under the Factories Act, 1948 relating to fire fighting capacities	Directorate of Town and Planning of Government of Gujarat	Contractor
3.25	Clearance of Lifts	Inspector of Lifts, Govt. of Gujarat	Contractor
3.26	Approvals / clearances for labour / man power like License from labour commissioner for Construction labour, Registration of Workers or exemption to be claimed if group insurance taken for some, etc.	Concerned Authorities	Contractor
3.27	Any other clearances	Appropriate Authorities	Contractor
3.28	Export Authorisation (Export license)	Appropriate Authorities of exporting country	Contractor

ANNEXURE-III

CRITERIA FOR LAYOUT

PLOT PLAN LAYOUT REQUIREMENTS

ITEM	SPECIFICATION REQUIREMENT
A. Site conditions to be considered	
1. Prevalent wind direction	See wind-rose in plot plan. Also refer Metrological Data.
B. Layout Requirements	
1. Maximum permissible slope in	
a) Rail track	1 in 400
b) Road	1 in 30
c) Sides of unpaved embankment	1 in 2
2. Required road width	
a) Main roads Refer Vol. II-G.	
b) Auxiliary interconnections Refer Vol. II-G.	
c) Road to the power house unloading bay :	
• Only for entry to the unloading bay	Yes
• To pass through the unloading bay	No
3. Required minimum horizontal distance between the nearest points of	
a) Plant boundary and the boundary of residential area	(Local municipality/factory rule)
b) Electrical transformer and any other	As per the Tariff Advisory building/facility Committee Rules
c) Fire water supply installation and any building/facility subject to fire risk.	As per the Tariff Advisory Committee Rules
d) Inflammable liquid (fuel oil, etc.) storage & handling installation and their fencing and other buildings/facilities.	Rules of the Indian Explosive (Indian Explosives Act) and Indian Petroleum Code

ITEM	SPECIFICATION REQUIREMENT
4. Required minimum vertical clearance	
a) Under pipes/cable racks at road crossings	7.0 Metres
b) Soil coverage over underground pipes	1.0 Metre (minimum)
c) Pipe/Cable trench	Not Acceptable
5. Railway Wagon clearance	Rules of the Indian Railways
6. Minimum Clearance between any road edge and building/structure/ any fixed installation.	3 Metres
7. Required level, above the local developed grade level, of	
a) top of all roads	150 mm
b) all outdoor paved areas	150 mm
c) Temporary storage areas, workshops, offices, residence etc. required at the time of erection work.	Yes
d) Green belt around power plant area	As per environmental guidelines of MOEF, Govt. of India.

BUILDING/ EQUIPMENT LAYOUT REQUIREMENTS

A. Minimum clear space required at all working and walking areas for operating & maintenance personnel	
1. Horizontal, in all directions	
a) Adjacent to any electrical equipment, electrical cables, running (rotating/reciprocating) equipment, safety valve or vent/drain pipe outlet, pipe/ equipment of surface temperature exceeding 60°C.	1200 mm
b) Adjacent to any other plant facilities (including walls/structures)	1000 mm
2. Vertical (head-room clearance)	
a) Under any pipe/equipment surface of temperature exceeding 60°C and any electrical cables or other electrical items.	2.0 Metre
b) Under any other plant facilities (including structures, pipes etc.)	2.0 Metre

ITEM	SPECIFICATION REQUIREMENT
3. For all areas where any equipment (including trucks, trolleys and other material handling equipment) will move or maneuver.	Minimum 500 mm clear in all direction from the outer edges of the equipment
4. Minimum clear hand space required for	
a) The application of thermal insulation	100 mm
b) Welding work	150 mm
c) Bolt tightening	150 mm
B. Floors, platforms, staircase, ladders, walls, doors & windows	
1. Statutory Requirement	As per the regulations of Tariff Advisory Committee, Indian National Building Code, Indian Factories Act, Local Municipal Rules, etc.
2. Operation & Maintenance Requirement	
a) Adequate floor space shall be kept to permit dismantling, temporary storing and in-situ maintenance of plant & equipment parts, satisfying the clear space requirements stated above. A separate unloading bay for such purpose is required.	Yes
b) Floors or fixed/portable platforms with stairs/ ladders shall be provided for easy approach to any plant item, including valves, instruments, etc. to be operated, observed and/or to be frequently (more than once a month) maintained.	Yes
3. Plinth level of all buildings, above the local developed for power house building.	300 mm, however, 500 mm grade level
4. Minimum access opening required (with rolling shutter) transportation,	3.5M wide x 4M high or, wherever entry of truck, for material more depending upon the is envisaged equipment size to be handled.

ITEM	SPECIFICATION REQUIREMENT
C. Other Maintenance Requirement	
1. Generator stator handling In case the Generator stator cannot be handled by the turbine house crane, all provisions for its overhauling, including the arrangement to slide the stator on the turbine house floor, the foundation work for stator jacking /lowering assembly, dismantling of building end walls/structures etc. shall be kept.	Yes
2. Maintenance of the internals/impellers of all important equipment, like boiler feed pumps, feed water heaters, Surface Condenser, fans of the boiler draft plant, Intake and circulating water pumps, cooling water pumps, coal mills, compressors, blowers, heat exchangers, fuel air oil pumps, filters etc.	Shall be possible without disconnecting or dismantling any piping/ducting.
3. Overhauling and handling of the casings for the above items	Shall be possible without disturbing/dismantling any piping/ducting not directly connected to them.
4. Crane Approach Wherever required the unobstructed approach of the crane hook/other hoisting equipment hook to various plant & equipment shall be possible.	Yes
D. Central Control Room All electronic equipment other than those directly associated with control, operation or presentation of displays shall be mounted external to the control room in air conditioned control equipment room.	Yes
The bidder shall describe in his bid the proposed layout philosophy of the Central Control Room and Control Equipment Room and the arrangement of equipment best suited for the system offered by him and as per good ergonomically consideration.	
However, as a guide line, following features are given :	
a) False ceiling and false flooring shall be provided.	
b) Uniform height, colouring schemes for cabinets etc. shall be available.	

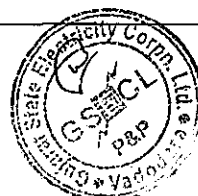
ITEM	SPECIFICATION REQUIREMENT
c) The total area of floor space covered by Control Consoles/Panels in the Control Room shall not exceed 15% of floor area.	
d) No opening shall be provided from Boiler side.	
e) Two double leaf doors, suitably located for entering the Control room shall be provided with opening towards the turbine floor.	
f) Cable entry for the panels/consoles shall be from bottom and suitable openings shall be provided.	
g) The Control Room lighting shall be designed to provide a glare free uniform illumination. The level of illumination shall be minimum 400 LUX.	
h) Necessary Air Conditioning shall be provided for Central Control room, Control Equipment Room and SWAS room etc.	
i) Basic amenities like toilet, Tiffin rooms, wash basins, rest rooms etc. shall be provided near the Control Room.	
E. Toilet and drinking water facility	Required in all buildings and on all floors wherever operating personnel are to be deployed.

SECTION-4

SPECIAL CONDITIONS FOR
ERECTION AND CONSTRUCTION

CONTENTS

SL.NO.	DESCRIPTION	PAGE NO.
1.0	GENERAL	1
2.0	SCOPE OF WORK.....	1
3.0	INSURANCE	2
4.0	WORK AT SITE.....	3
5.0	MANUFACTURER'S SUPERVISION.....	3
6.0	CONTRACTOR'S REPRESENTATIVE.....	4
7.0	FOREIGN PERSONNEL.....	4
8.0	PROGRAMME OF WORK AND PROGRESS REPORT.....	4
9.0	INDEMNITY.....	5
10.0	CLEAN UP WORK AT SITE.....	5
11.0	CO-ORDINATION WITH THE OWNER'S ENGINEERS	5
12.0	MATERIALS HANDLING AND STORAGE	5
13.0	LABOUR AND LABOUR LAWS	6
14.0	PROTECTION AND CARE OF WORKS.....	8
15.0	OWNERSHIP OF ARTICLES OF VALUE DISCOVERED AT SITE	8
16.0	CONVENIENCE OF PUBLIC	8
17.0	PREVENTION OF EXTRAORDINARY TRAFFIC AND PROTECTION OF HIGHWAY	9
18.0	WORK MATERIALS AND PLANT.....	9
19.0	ERECTION/CONSTRUCTION TOOLS, TACKLES AND MACHINERY	10
20.0	URGENT REPAIR WORK.....	10



SECTION-4

SPECIAL CONDITIONS FOR
ERECTION AND CONSTRUCTION

1.0 GENERAL

The following items shall supplement the conditions in the other Sections of this Volume.

2.0 SCOPE OF WORK

2.1 Erection Work

The Contractor shall prepare erection drawings and obtain approval of the same from the Owner as applicable.

The Contractor shall receive the imported Goods, if any, at the port of entry, clear them through Customs and make damage report through port broker. The Contractor shall arrange for payment at prescribed rate of Customs Duties, if required by the Owner, which will be reimbursed by the Owner against Contractor's valid documents upto the overall amount specified in the price bid and agreed.

The Contractor shall transport all imported Goods & indigenous goods from port of entry, from manufacturer's works to the Site and unload all Goods at the Site. Crane services shall be provided by the Contractor, if necessary. All storage at port of entry or at railway station shall be at Contractor's cost.

The Contractor shall be responsible for complete installation as per approved drawings, testing, commissioning, trial run of the Plant at the Site and putting the Plant into commercial operation including finish painting work.

All machinery and tools for transportation and erection shall be provided by the Contractor at his cost.

The Goods after receipt at the Site, shall be checked and verified against the shipping documents and all claims made and replacement or repair order against loss or damage in transit shall be intimated to the Owner. The Goods shall remain under the custody of the Contractor until the Plant is taken over by the Owner upon completion of the Work. The Contractor shall take adequate steps to ensure safety and protection of such Goods. Necessary stores receipt certificates shall be issued to the Owner after the Goods are checked and certified.

No Goods pertaining to the Contract shall be removed from the Site without the consent in writing by the Owner.

The Contractor shall be responsible for replacement, free of cost to the Owner, of any material damaged due to improper storage.

The Contractor shall be responsible for setting up correct reference lines for the purpose of fixing alignments of various equipment. The Contractor shall be responsible for replacement, free of cost to the Owner, of any goods damaged/lost/broken down in any point of operation due to any reason whatsoever while under the custody of the Contractor.

The Contractor shall arrange for, at his cost, all consumables, paints, lubricants, etc. as required.

The contractor shall arrange at his own cost for approvals, clearances, registration, inspections etc. from but not limited to Government authorities, statutory authorities, e.g. Factory Inspector, Boiler Inspector, Electrical Inspector, Explosive Inspector, Municipal corporation, ESI authorities, Labour authorities etc. for design, engineering, supply, erection and commissioning etc.

All surplus/unused materials/scrap materials left after completion of project shall become property of Contractor, provided the materials were brought by the Contractor and the payment was not made for the same by Owner.

2.2 Civil, Structural and Architectural Works

The Contractor shall be responsible for the preparation of the design and all drawings and obtain approval of the same from the Owner when required.

The Contractor shall be responsible for the survey and true and proper setting out of the Works and for the correctness of the positions, levels, dimensions and alignments of the all parts of the Works and shall provide all necessary survey grid-pillars, bench-marks, instruments, appliances and labour in connection therewith. If at any time during the progress of the Works any error shall appear or arise in the positions, levels, dimensions or alignments of any part of the Works, the Contractor, on being required to do so by the Owner/Engineer, shall at his own expense rectify such errors to the satisfaction of the Owner/Engineer. The checking of the setting out of any line or level by the Owner/Engineer or the Engineer's representative shall not in any way relieve the Contractor of his responsibility for the corrections thereof. The Contractor shall carefully protect and preserve all survey grid-pillars, bench marks, site rails, pegs and other things used in setting out the Works.

The Contractor shall be responsible for all civil, structural and architectural Works as required for the installation of the Plant and its sub-systems and other facilities.

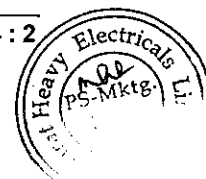
The Contractor shall arrange for supply of all Goods at his cost.

3.0 INSURANCE

In addition to the conditions stipulated in Section-3 of this Volume, the Contractor shall also arrange for insurance coverage as under :

a) Workmen's Compensation Insurance

This insurance shall protect the Contractor against all claims applicable



under the Workmen's Compensation Act (Government of India). This policy shall also cover the Contractor against claims for injury, disability, disease or death of his or his sub-contractor's employees, which for any reason are not covered under the Workmen's Compensation Act. The liabilities shall not be less than :

Workmen's Compensation : As per statutory provisions
Employee's liability : As per statutory provisions

b) Comprehensive General Liability Insurance

The insurance shall protect the Contractor against all claims arising from injuries, disabilities, disease or death of members of public or damage to property of others due to any act or omission on the part of the Contractor, his agents, his employees, his representatives and sub-contractors from riots, strikes civil commotion and terrorism.

The hazards to be covered will pertain to all the works and areas where the Contractor, his sub-contractor(s), his agents(s) and his employee(s) have to perform work pursuant to the Contract.

The above are only illustrative list of insurance covers normally required and it will be the responsibility of the Contractor to maintain all necessary insurance coverage to the extent both in time and amount to take care of all his liabilities either direct or indirect, in pursuance of the Contract.

4.0 WORK AT SITE

In the execution of the Work, no persons other than the Contractor, or his duly appointed representative, sub-contractor(s) and workmen employed by him and his sub-contractor(s) shall be allowed to do work at the Site, except by the special permission, in writing, of the Owner or his representative. Access to the Work at all times shall be accorded to the Engineer and representatives of the Owner.

The Contractor shall at all times and at his own cost take sufficient precautions to ensure the safety of public and guard the Site deemed necessary.

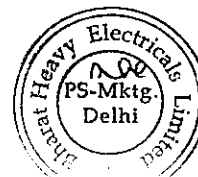
The Work at Site shall be carried out without interference with Owner's activities.

No female labour shall be allowed during dark hours.

The Contractor shall not employ for the purpose of executing the Works, any person who is below the age of eighteen (18) years. The Contractor shall pay to each labourer, for the work done by such labourer, wages, not less than the wages paid for similar work in the district.

5.0 MANUFACTURER'S SUPERVISION

If the Contractor is not the manufacturer, he may be required to work under the guidance of the manufacturer's technical personnel. However, this will not



relieve the Contractor of his responsibility for the correctness of work done or quality of workmanship.

6.0 CONTRACTOR'S REPRESENTATIVE

6.1 The Contractor shall employ the necessary competent representatives at the Site, whose name shall have previously been communicated in writing to the Owner/Engineer by the Contractor to supervise the erection of the Plant. The required representatives shall be present at the Site during working hours, and any written orders or instructions which the Owner/Engineer or his duly authorised representative may give to such representative of the Contractor, shall be deemed to have been given to the Contractor.

6.2 The Contractor's representative employed for the purpose of the work at the Site shall be stationed at the Site when the Owner informs the Contractor in writing to that effect.

7.0 FOREIGN PERSONNEL

The Contractor shall bear all expenses in connection of any foreign personnel he plans to bring into India for the performance of the Works.

If the Contractor requires the assistance of the Owner, to the extent possible, to obtain any necessary travel permits for the foreign personnel, the Contractor shall provide the Owner with all necessary data on such foreign personnel. The Contractor shall allow the Owner a reasonable time prior to the proposed date of departure of the foreign personnel, to enable the Owner to provide the assistance required.

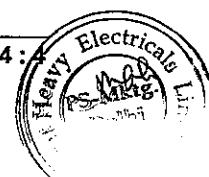
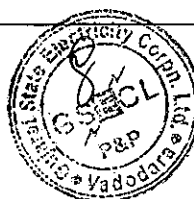
The Owner shall assist the Contractor to the extent possible in obtaining necessary permits to travel to India and back, by issue of necessary certificates and other information needed by the Competent Authorities.

The Contractor and the foreign personnel shall abide by statutory laws, rules & regulations in force in India at the time thereof & shall not in any way interfere with Indian political and/or religious affairs. The Contractor's foreign personnel shall work and live in close co-operation & co-ordination with their co-workers and the community and shall not engage themselves in any other employment either part time or full time nor shall they take part in any local politics.

The Contractor shall pay all taxes due in India for the foreign personnel employed by the Contractor for their work in connection with this Contract. The Contractor shall obtain at his own cost "work permits" required from competent authorities to enable the foreign personnel to work in India.

8.0 PROGRAMME OF WORK AND PROGRESS REPORT

The Contractor shall, as required from time to time, submit to the Owner erection and construction schedules in the form of PERT network or bar chart showing the time-table the Contractor proposes to follow to carry out the work with dates and estimated completion times for various parts (milestones) of the Work. Such schedules shall be approved by the Owner, prior to the



commencement of the Work at the Site.

During the progress of the work, the Contractor shall submit copies of monthly progress reports and photographs and such other reports on the erection and construction Works and his site organisation, as the Owner/Engineer may direct. The format of the progress report shall be decided upon by the Contractor with the approval of the Owner. However, if at any time the Owner desires to change the format or requires any additional information, the Contractor shall comply. The Contractor shall also submit an anticipated one (1) months programme at the beginning of each month describing in detail the anticipated programme for the following month. The Contractor shall also submit from time to time, a list of various categories of his employees. Monthly progress reports shall be submitted by the tenth (10th) day of the month following the reporting month.

9.0 **INDEMNITY**

The Contractor shall, except if and so far as the Contract provides otherwise, indemnify the Owner against all losses and claims in respect of injuries or damage to any person, material or plant, or damage to any property whatsoever but not limited to third party damages which may arise out of or in consequence of the execution of the Works, and against all claims, proceedings, damages, costs, charges and expenses whatsoever in relation thereto.

10.0 **CLEAN UP WORK AT SITE**

The Contractor shall without any additional payment at all times keep the working and storage areas used by him and/or his sub-contractor(s) free from accumulation of waste materials or rubbish. If these materials are not removed by the Contractor within forty-eight (48) hours, after being requested by the Owner, these will be removed by others and the cost of the same will be charged to the Contractor. Any inflammable materials shall be removed forthwith on request by the Owner.

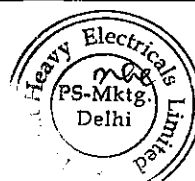
On completion of erection and construction work, the Contractor shall remove or dispose of in a satisfactory manner all temporary structures, packing cases, waste and debris and leave the premises in a condition satisfactory to the Owner. All surplus earth shall be removed beyond the Plant area and dumped in a place(s) as directed by the Owner/Engineer.

11.0 **CO-ORDINATION WITH THE OWNER'S ENGINEERS**

The Contractor shall at all times work in co-ordination with the Owner's Engineers and afford them every facility to become familiar with the erection and maintenance of the equipment and construction work.

12.0 **MATERIALS HANDLING AND STORAGE**

The Contractor shall be responsible for examining the shipment and shall notify the Owner immediately of any damage, shortage, discrepancy, etc. for the



purpose of Owner's information only.

The Contractor shall maintain an accurate and exhaustive record detailing of all Goods received by him for the purpose of erection and keep such record open for inspection by the Owner at any time.

All electrical panels, control gear motors and such other devices shall be properly dried by heating before they are installed and energised. Motor bearings, slip rings, commutators and other exposed parts shall be protected against moisture ingress and corrosion during storage and periodically inspected. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion due to prolonged storage.

All the electrical equipment such as motors, generators etc. shall be tested for insulation resistance at least once in three months from the date of receipt till the date of commissioning and a record of such measured insulation values shall be maintained by the Contractor. Such records shall be open for inspection by the Owner/Engineer.

The Contractor shall ensure that all the packing materials and protection devices used for the Goods during transit and storage are removed before the Goods are installed.

The consumables and other supplies which are likely to deteriorate due to storage must be thoroughly protected and stored in a suitable manner to prevent damage or deterioration in quality during the storage period.

All the materials stored in the open or dusty locations must be covered with suitable weatherproof and flameproof covering material wherever applicable.

If the materials belonging to the Contractor are stored in area other than those earmarked for him, the Owner will have the right to have them moved to the area earmarked for the Contractor at the Contractor's cost.

The Contractor shall be responsible for providing suitable covered storage facilities to store all Goods which require covered storage. Normally, all the electrical equipment such as motors, control gear, generators, exciter and consumables like electrodes, lubricants, etc. shall be stored in the covered storage space. In addition, the Owner, may direct the Contractor to move certain other materials which in his opinion will require covered storage and the Contractor shall strictly comply with his instruction.

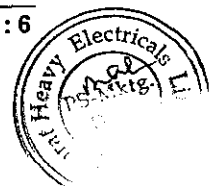
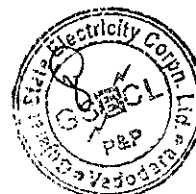
13.0 LABOUR AND LABOUR LAWS

13.1 Recruitment of Local Labour

Local labourers shall be engaged for unskilled work. Preference may also be given for appointment of local labourers in semi-skilled and skilled categories, if such suitable labourers are available.

13.2 Labour Laws and Local Regulations

The Contractor shall abide by the prevailing labour laws and shall have to



obtain a labour license from the appropriate authority as per the law at his cost and shall indemnify the Owner against any financial and other obligation in connection with labourers employed by him. On obtaining the labour license, the Contractor at the appropriate time, shall submit a certified photocopy of the same to the Owner.

13.3 Wages and Working Hours and Conditions

The Contractor shall pay wages and observe hours and conditions of labour not less favourable than those established for the trade or industry in the district where the work is carried out. In the absence of any wages, hours or conditions of labour so established, the Contractor shall pay wages and observe hours and conditions of labour which are not less favourable than the general level of wages and hours and conditions observed by other contractors whose general circumstances in the trade or industry in which he is engaged are similar.

13.4 Contractor to furnish return of labour employed

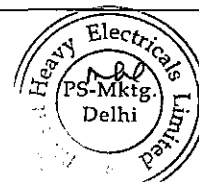
The Contractor shall, if required by the Owner/Engineer, deliver to the Owner/Engineer or to his office a return in such form and at such intervals as the Owner/Engineer may prescribe, showing in detail classes of labour employed and the number employed within each class by the Contractor from time to time on the Site and such information in respect of construction machinery as the Owner/Engineer may require.

13.5 The Contractor shall make his own arrangements for the engagement of all labour and provide on the Site in so far as the Contract otherwise provides, for the transport, housing, feeding and payment thereof.

The Contractor shall, so far as is reasonably practical, having regard to local conditions, provide on the Site, to the satisfaction of the Owner/Engineer an adequate supply of drinking and other water for the use of his staff and labour.

13.6 Other Requirements

- a) The Contractor shall not, other than in accordance with the Statutes, Ordinances and Government Regulation or Orders currently in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor, or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his sub-contractor(s), agents or employees.
- b) The Contractor shall not give, barter or otherwise dispose of to any person or persons any arms or ammunition of any kind or permit the same as aforesaid.
- c) The Contractor shall in all dealings with labour in his employment have a due regard for all recognised festivals, days of rest and religious or other customs.
- d) In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with any regulations, orders and requirements as may be made by the Government, or the local municipal or sanitary authorities for the purpose of dealing with and overcoming the same.



- e) The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his employees.
- f) The Contractor shall be responsible for observance by his sub-contractor(s) of the foregoing provisions.

14.0 PROTECTION AND CARE OF WORKS

14.1 The Contractor shall in connection with the Works provide and maintain at his own cost all temporary works, lights, guards, fencing and watching when and where necessary or required by the Owner/Engineer or by any competent statutory or other authority for the protection of the Works.

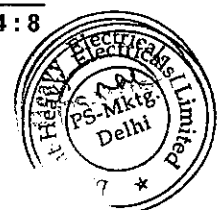
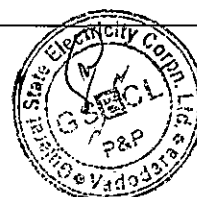
14.2 From the commencement to the completion of the Works, the Contractor shall take full responsibility for the care of the Works and of all temporary works. If any damage, loss or injury happens to the Works or to any part thereof or to any temporary work from any cause whatsoever (save and except the "Force Majeure" as defined earlier) the Contractor shall at his own cost repair and make good the same so that at completion the works shall be in good order and condition and in conformity in every respect with the requirements of the Contract Documents and the Owner/Engineer's written instructions. The Contractor shall also be liable for any damage to the Works caused by him in the course of any operations he carries out for the purpose of complying with his obligations under the Contract Documents.

15.0 OWNERSHIP OF ARTICLES OF VALUE DISCOVERED AT SITE

All fossils, contains, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the Site shall be deemed to be the absolute property of the Owner. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing or damaging the same, and shall immediately, upon discovery thereof and before removal, inform the Owner/Engineer of such discovery and carry out, at the expense of the Owner the Engineer's orders concerning the removal of the same.

16.0 CONVENIENCE OF PUBLIC

All operations necessary for the execution of the Works and for the Construction of any temporary work shall, so far as compliance with the requirements of the Contract permit, be carried on so as not to interfere unnecessarily or improperly with the public convenience of access to use public or private roads and foot paths or to use properties whether in the possession of the Owner or of any other person. The Contractor shall indemnify the Owner in respect of all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in relation to any violation by the Contractor of the above.



17.0 PREVENTION OF EXTRAORDINARY TRAFFIC AND PROTECTION OF HIGHWAY

The Contractor shall use reasonable means to prevent the highways or bridges communicating with or on the routes to the Site from being subjected to extraordinary traffic by traffic of the Contractor or any of his sub-contractors. In particular the Contractor shall select routes, choose and use vehicles and restrict and distribute loads, so that any such extraordinary traffic as will inevitably arise shall be limited as far as reasonably possible, and so that no unnecessary damage or injury may be caused to such highways and bridges. If it is found necessary for the Contractor to move over part of highway or bridge, one or more loads, where the moving of such load will in all probability damage the highway or bridge unless means of protection or strengthening are carried out, then the Contractor shall, before moving the load on to such highway or bridge, give notice to the Owner of the weight and other particulars of the load to be moved, and his proposals for protecting or strengthening the said highway or bridge. The Contractor shall also carry out the protection and strengthening of the highway or bridge as required.

18.0 WORK MATERIALS AND PLANT

18.1 Materials and Workmanship

All construction materials, structural steel and workmanship shall be of the respective types described in the Contract Documents, and shall be subjected from time to time to such tests as stipulated in the approved quality assurance plan. The Contractor shall establish on site testing facilities as required by him. Collection of samples and testing as specified in the Contract Documents including special tests, if any, shall be carried out by the Contractor at his cost.

18.2 Examination of the Works

No work shall be covered up or put out of view without the approval of the Owner/Engineer and the Contractor shall afford full opportunity for the Owner/Engineer to examine and assess any work which is about to be covered up or put out of view, and to examine foundations before permanent work is placed thereon. The Contractor shall give due notice to the Owner/Engineer whenever any such work or foundation is ready for examination. The Contractor shall uncover any part or parts of the Works, make openings in or through the same as the Owner/ Engineer may from time to time direct and shall reinstate and make good such part or parts to the satisfaction of the Owner/Engineer. If any such part or parts have been covered up or put out of view after compliance with the requirements of this item and are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating and making good the same, shall be borne by the Owner as mutually agreed upon but in any other cases all the such expenses shall be borne by the Contractor or may be deducted by the Owner from any money due or which may become due to the Contractor.

18.3 **Improper Work and Material**

The Owner/Engineer shall during the progress of the works have the right to order in writing from time to time:

- a) The removal from the Site within such time or times as may be specified in the Contract Documents of any materials which in the opinion of the Owner/Engineer are not in accordance with the Contract Documents.
- b) The substitution of proper and suitable materials, and
- c) The removal and proper re-execution (notwithstanding any previous test thereof or interim payment thereof) of any work which in respect of materials or workmanship is not, in the opinion of the Owner/Engineer, in accordance with the Contract Documents.

In case of default on the part of the Contractor in carrying out orders, the Owner shall be entitled to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be borne by the Contractor and shall be recoverable from him by the Owner or may be deducted by the Owner from any money due or which may become due to the Contractor.

18.4 **Temporary Arrangement**

The Contractor shall bear all expenses and charges for special or temporary way-leaves required by him in connection with access to the Site.

19.0 **ERECTION/CONSTRUCTION TOOLS, TACKLES AND MACHINERY**

19.1 **Tools, Tackles and Machinery**

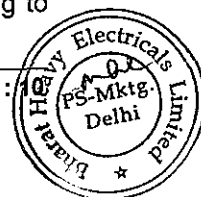
The Contractor shall provide all construction/erection machinery, tools, tackles and scaffolding required for the Works. A detailed list of the above, together with their capacities and present conditions, etc. shall be submitted to the Owner/Engineer at least three (3) months before the commencement of Site work.

19.2 **Exclusive use of Machinery**

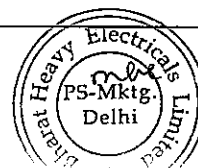
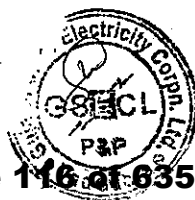
All erection and construction machinery, temporary works and materials provided by the Contractor shall, when brought on to the Site, be deemed to be exclusively intended for the execution of the Work, and the Contractor shall not remove the same or any part thereof for any other use.

20.0 **URGENT REPAIR WORK**

If, by reason of any accident or failure or other event occurring in connection with the Works, either during the execution of the Works or during the Warranty period, any remedial or repair work is necessary, then the Contractor shall take necessary remedial action. If however the Contractor is unable or unwilling to



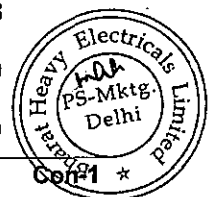
do such repairs, the Owner may use his own or other workmen to do the repairs. The cost of repairs so done shall be charged to the Contractor or may be deducted by the Owner from any money due or which may become due to the Contractor.



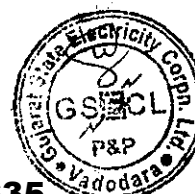
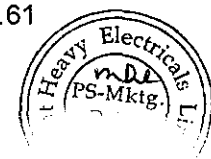
SECTION-3
GENERAL CONDITIONS
CONTENTS

SL.NO.	DESCRIPTION	PAGE NO.
1.0	APPLICATION.....	1
2.0	DEFINITION OF TERMS AND INTERPRETATION	1
3.0	SCOPE OF WORK.....	19
4.0	CONTRACT PRICE.....	20
5.0	TIME : THE ESSENCE OF CONTRACT.....	24
5.0A	TRANSFER OF TITLE AND RISK	24
6.0	PERFORMANCE BANK GUARANTEE FOR DUE PERFORMANCE OF THE WORK.....	25
7.0	SUPPLY, ERECTION CONTRACT/DIVISIBLE CONTRACT.....	26
8.0	TERMS OF PAYMENT.....	26
9.0	SHIPPING PARTICULARS	34
10.0	DELIVERY TERMS	35
11.0	LIQUIDATED DAMAGES	35
12.0	SHOP ASSEMBLY AND INSPECTION	36
13.0	CONTRACTOR'S DRAWINGS AND DATA	36
14.0	MISTAKES IN DRAWINGS.....	37
15.0	MATERIALS AND WORKMANSHIP FOR MANUFACTURER	37
16.0	COMPLETENESS OF EQUIPMENT.....	38
17.0	CERTIFICATE OF THE OWNER.....	38
18.0	OWNER'S DECISION	38
19.0	CERTIFICATE NOT TO AFFECT THE RIGHT OF THE OWNER OR THE CONTRACTOR.....	38
20.0	OWNER ACCEPTANCE AND TAKE OVER CERTIFICATE.....	39
21.0	WARRANTY.....	39

DEVELOPMENT CONSULTANTS
((K9213R_EPC-SPC-001_V1_S3.doc) July 09 2012)



22.0	DEFAULT OF CONTRACTOR.....	42
23.0	AMENDMENT TO THE WORKS.....	43
24.0	FORECLOSURE OF CONTRACT	43
25.0	DEDUCTION FROM CONTRACT PRICE.....	46
26.0	ASSIGNMENT OF CONTRACT.....	46
27.0	SUBCONTRACTING.....	46
28.0	FORCE MAJEURE.....	47
29.0	PROGRESS REPORTS AND PHOTOGRAPHS	48
30.0	CONFIDENTIALITY AND PATENT RIGHTS	48
31.0	BANKRUPTCY, ETC.....	49
32.0	INDEMNIFICATION OF THE OWNER.....	49
33.0	CORRESPONDENCE.....	50
34.0	CONTRACT AGREEMENT.....	50
35.0	NOTICE TO PROCEED AND EFFECTIVE DATE	50
36.0	USE OF THE PLANT PRIOR TO OWNER ACCEPTANCE.....	51
37.0	INSURANCE	51
38.0	CONTRACTOR'S CARE OF THE WORKS	53
39.0	ARBITRATION AND JURISDICTION.....	53
40.0	SUSPENSION OF WORK.....	55
41.0	TRAINING OF OWNER'S PERSONNEL	56
42.0	AS-BUILT DRAWINGS.....	57
43.0	REJECTION OF DEFECTIVE PLANT	57
44.0	MOST FAVOURED CUSTOMER.....	57
45.0	CONTRACTOR'S ACCEPTANCE OF THE WORK AND SITE.....	58
46.0	APPLICABLE PERMITS.....	60
47.0	LAW AND LANGUAGE.....	61
48.0	STAMP DUTY.....	61



SECTION-3 GENERAL CONDITIONS

1.0 APPLICATION

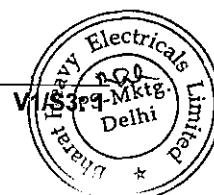
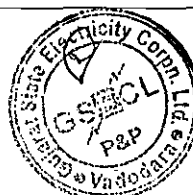
These General Conditions shall govern the Works.

2.0 DEFINITION OF TERMS AND INTERPRETATION

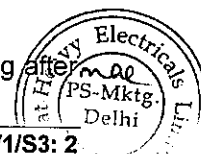
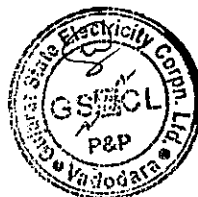
2.1 Definitions:

- In this Contract (as defined below), unless the context requires otherwise, the words and expressions defined below shall have the meaning hereinafter assigned to them.
- **"Advance Payment Bank Guarantee"** shall have the meaning assigned to the term under Clause 8.2 of this GCC.
- **"Annexure"** shall mean all appendices; annexure, tables and schedules annexed to this Contract or incorporated by reference herein and shall include all amendments and revisions thereto made by mutual agreement of the Owner and Contractor in accordance with the provisions contained in this Contract.
- **"Acceptance Test/Performance Guarantee Test"** for equipment /system shall mean such tests as are required to determine and demonstrate guaranteed capacity, efficiency and operating characteristics of the equipment /system Plant as stipulated in the Contract Document.
- **"Applicable Laws"** shall mean Constitution of India, all laws, treaties, ordinances, rules, directives, regulations and amendments thereto made from time to time and in force and effect in India, judgments, decrees, injunctions, writs and orders of any court, arbitrator or authority, rules, regulations, orders and interpretations of any Governmental Instrumentality, court or statutory or other body having jurisdiction over the subject matter of the Contract, as may be in effect at the time of performance of Work hereunder by the Contractor, provided, however, that if at any time the Applicable Laws are less stringent than the standards set forth in the Contract, Contractor shall not be excused from meeting the standards set forth herein.
- **"Approved"** and **"Approval"**, where used in the Contract shall mean respectively, approved by and the approval of the Owner or the Owner's Representative in writing.

When the words 'Approved', 'Approval', 'subject to Approval', 'Satisfactory', 'Equal to', 'Proper', 'Requested', 'As directed', 'Where directed', 'When directed', 'Determined by', 'Accepted', 'Permitted', or words and phrases of like import are used the approval, judgment, direction etc is understood to be a function of the Owner or the Owner's Representative.



- **"Auxiliary Power Consumption"** shall mean the electrical energy (in kW) consumed by all the equipments, systems etc. forming part of the Plant and provided by the Contractor in pursuance of the Contract over a period of one hour i.e. difference of Gross Power measured at Generator Terminals and Net Power measured at 400 KV side of Generator Transformers, when the Plant is operating at rated capacity (guaranteed) measured in accordance with the procedures detailed in the Technical Specifications.
 - **"Bidder"** shall mean duly established reputed organizations, manufacturers, etc. having requisite financial and technical capability and experience of participating in the Bid invited by the Owner for the Works. [
 - **"Bank Guarantee" or "Performance Bank Guarantee" or "Bonds"** shall mean the primary, irrevocable, and unconditional on demand bank guarantees from Indian nationalized bank, to be furnished by the Contractor as a security for his performance under the Contract and the Advance Payment payable to the Contractor in accordance with Clauses of the General Conditions of Contract.
 - **"Cause"** in relation to the revocation or amendment of any Permit shall mean any fact or circumstance, including without limitation any default, neglect or failure to abide by any of the terms and conditions of such Permit, which legally entitles the issuing authority to revoke the Permit or make the relevant amendment in its terms and conditions.
- "Ceiling"** shall mean an upper limit for payment inclusive of applicable taxes & duties, by the Owner to the Contractor for various services rendered in pursuant to Contract as well as deduction towards Liquidated Damages for delay in Commercial Operations or otherwise shortfall in Performance Guarantee
- **"Contractor"** shall have the meaning assigned to the term in the Contract Agreement and shall include its legal successors in title approved by the Owner, who satisfy the qualification criteria set forth in the Tender Document,
 - **"Contract" or "EPC Contract"** shall mean the Contract Agreement, Contract and such further documents as may be expressly incorporated in the Contract by reference and all amendments in writing made to any of them in accordance with the provisions contained in this behalf in the Contract and executed by duly authorized representatives of the Parties and shall include such other document that the Parties may have agreed in writing.
 - **"Consultant"** shall mean Development Consultants Pvt. Ltd., Consulting Engineers, whose office is situated at GR. HQ.: 24 Park Street, Kolkata – 700 016, or any other agency (engaged for specific purpose) appointed by the Owner for the Project implementation and shall include their duly authorized representatives.
 - **"Change in Law"** shall mean the occurrence of any of the following after

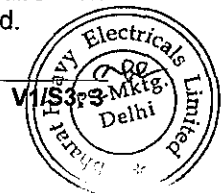
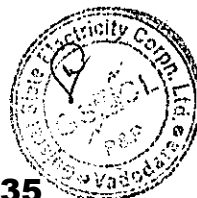


[please insert the date]:

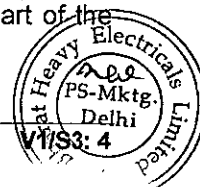
- (a) the enactment of any new Applicable Law.
- (b) any modification or repeal of any existing Applicable Law or any new or modified directive or order there under,
- (c) Any change in the interpretation or enforcement of any Applicable Laws by a competent legislature of Government Agency in India which is contrary to the existing accepted application or interpretation thereof, provision for which has not been made elsewhere in the Agreement.

provided that "Change in Law" shall not include

- (i) any change in the interpretation or application of any Applicable Law except as provided in (c) above; and
 - (ii) any enactment, modification, repeal, interpretation or application of any Applicable Law of India which increases market prices of goods, commodities, labour and services in general.
- **"Change Order"** shall mean a written order from the Owner to the Contractor after the Commencement Date of the Contract requiring a change in any part of the Work that may involve:
 - (a) a change in the scope of Work,
 - (b) additional work, or
 - (c) the omission of a portion of the Work, and
 - (d) if appropriate, an adjustment in one or more of the (i) Contract Price, (ii) Guaranteed Commercial Operation Date, (iii) Milestone Payment Schedule, (iv) any of the Performance Guarantees, or (v) any provision/scope of this Contract including any Appendices or Schedules hereto.
 - **"Codes" or "Indian Standards and Codes"** shall mean the latest applicable Indian and international technical codes and standards, whether required by statute or not.
 - **Commencement Date or Zero Date** shall mean the date on which the Contractor is to commence performance of Work or its obligations under the Contract as specified in the Notice to Proceed delivered by the Owner to the Contractor under and in accordance with the Contract.
 - **"Commissioning"** shall mean the first successful operation of each equipment / systems provided by the Contractor, and the Plant as a whole at full load (after the Mechanical Completion), without any problem/interruption, in accordance with the Contract, after all initial adjustments, cleaning, re-assembly, and Trial Run, as required on completion of installation of Plant at site, have been completed.



- **"Commercial Operation"** shall mean, operation of the Plant upon Commissioning and successful completion of all the Tests before Commercial Operation.
- **"Commercial Operation Date"** or **COD** shall mean the date mentioned in the Provisional Acceptance Certificate which will be issued by the Owner, upon the satisfactory completion of reliability run and Plant entering into Commercial Operation, and the Plant becoming available for continuous operation on 24X7 basis for commercial sale of power by Owner,.
- **"Company Contractor"** shall mean any Person other than the Contractor under contract with the Owner with respect to the Project.
- **"Completed Performance Test"** shall mean with respect to each equipment / systems / Plant, the Performance Test conducted in accordance with the contract during which the equipment / systems / Plant and the operation thereof comply with all Applicable Laws and the Performance Guarantees and which are established as completed Performance Test in accordance with the provisions of the contract in this behalf herein.
- **"Confidential Information"** shall mean information now or hereafter owned by or otherwise within the possession or control of a Party, including patented and unpatented inventions, business and trade secrets, know-how, techniques, data, specifications, as-built drawings, blue prints, flow sheets, designs, engineering information, Construction information, operation criteria, and other intangible information related to the Project.
- **"Consequential Damages"** shall mean indirect, punitive, special or incidental damages, the loss of profits or revenue, loss of use of the Equipment or any associated equipment, cost of capital and/or financing, down time costs, loss of opportunity, loss of goodwill, and claims of customers for such damages, except the damages provided under the Contract.
- **"Consignee"** shall mean the authorised representative or officer of the Owner to whom the Equipment is required to be delivered in the manner indicated in the Contract and whose identity shall have been notified by the Owner in good and sufficient time having regard to the Contractor's schedule for the delivery of the Equipment.
- **"Consumables"** shall mean all lubricants, lubrication and control oils, greases, filters, jointing & packing materials, hardware, demineralising resins and water treatment chemicals etc. required for operation of the Plant.
- **"Contract Agreement"** shall mean the agreement signed by the Parties to which these General Conditions of Contract, Schedule of Liquidated Damages and other documents and agreements forming part of the Contract are scheduled.



- " **Project Network/ Master Network**" shall mean the Network covering details like:

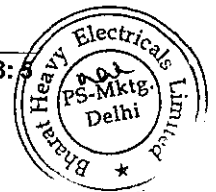
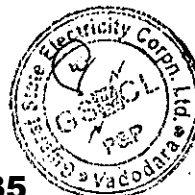
design, engineering & manufacturing and procurement schedule for the Equipment identifying all systems and Equipment and milestone dates for manufacture, assembly, inspection/ shop testing, shipment and delivery.

erection, Commissioning and testing schedule till Take-Over,

design, engineering, Construction, fabrication schedule for the Project identifying all buildings, structures and milestone dates for various Construction activities.

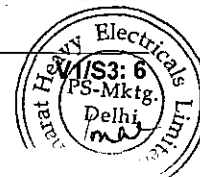
Bar chart covering critical and parallel activities indicating period

- **Contract Period** shall mean the period from the Commencement Date/ Zero Date till Take Over of the Plant. Provided that the expiry of the Contract Period shall not affect the obligations of the Contractor beyond the Contract Period, as specified under the Contract
- "**Contractor's Works**" or "**Manufacturer's Works**" shall mean the places which are used by the Contractor or any of its sub-vendor/sub-contractor for the manufacture of Equipment for the Plant or performance of Work, designated by Contractor and communicated to the Owner.
- "**Contractor's Equipment**" shall mean all machinery, apparatus, equipment, appliances, materials, items and other things of whatsoever nature required for the execution and completion of the Works, performance of the Contractor's obligations under the contract including Work, establishing of Performance Guarantees, and the remedying of any defects and deficiencies, but does not include Equipment and other things intended to form or forming part of the Plant.
- "**Contractor Permits**" shall mean all those Permits, required by the Contractor from any Government Instrumentality for the performance of any of the obligations of and Work by the Contractor under the Contract, including without limitation, all registrations and licenses required to permit the Contractor to do business in the jurisdiction where it has to perform any part of the work, inclusive of all the Permits, authorizations, consents and approvals required solely for Construction, Commissioning, testing operation of the Plant and transmission of electricity to GETCO.
- "**Contractor's Representative**" shall mean the person named as such in the Contract or other person appointed from time to time by the Contractor in his place in accordance with the Contract, , and such appointment communicated to the Owner,.
- "**Country**" shall mean India, where the works are to be executed and to which Equipment are to be delivered.
- "**CIF Price**" shall mean delivery free of expenses to the Owner on board the



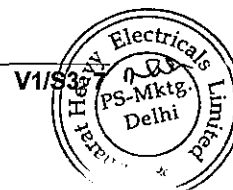
vessel at the port of entry including the insurance and freight charges.

- **"Contract Document"** shall mean and include the General Conditions of Contract, Special Conditions of Contract, Minutes Of Meeting dated [insert] between Owner and the Contractor, the Final Proposal of Contractor dated [insert] as accepted by the Owner, Specifications, Schedules, Annexures, Drawings, Schedule of Prices and Schedule of Quantities submitted by the Successful Bidder, Letter of Intent, Notice to Proceed issued by the Owner, subsequent amendments to the foregoing in accordance with the terms of the Contract.
- **"Contract Price"** shall mean the agreed sum of money stated in the Contract to be paid to the Contractor for the successful completion of the Works and obligations, in accordance with the terms of the Contract.
- **"Day"** or **"Days"** shall mean a Gregorian calendar day
- **"Defects Liability Certificate"** shall mean the certificate, which the Owner shall issue to the Contractor when the Warranty Period or Extended Defects Correction Period, whichever is later, for the Plant including Equipments has expired, and the Contractor has fulfilled all his obligations under the Contract for such defects.
- **"Directive or Owner's Instructions"** shall mean any requirement, instruction, clarification, direction, order, regulation, code, standard or rule of any Competent Authority, which is legally binding and any modification, extension or replacement issued by the Owner or the Consultant in writing to the Contractor from time to time during the subsistence of the contract.
- **"Documents"** shall mean all design documents, engineering documents, drawings, calculations, computer software (programs), computer diskettes and tapes, audio and video tapes, samples, patterns, models, Construction documents, erection documents, quality plans, inspection reports, field quality plans and test reports, operation and maintenance manuals, and other manuals, and all other data and information to be submitted by the Contractor and shall include without limitation engineering, design and Construction drawings, data sheets, specifications, plans, bills of materials and estimates etc.
- **"Drawings" shall mean**
 - a) Drawing furnished by the Consultant/Owner .
 - b) Supplementary drawings if any furnished by the Consultant/ Owner to clarify and to define in greater detail the intent of the Contract.
 - c) Drawing submitted by the Contractor with his Final Proposal provided such drawings are acceptable to the Consultant/ Owner.
 - d) Drawing furnished by the Consultant/Owner to the Contractor

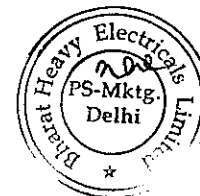


during the progress of Work.

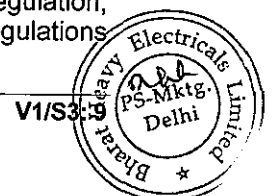
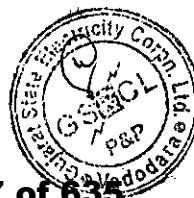
- e) Engineering data and drawings submitted by the Contractor during the progress of Work, provided such engineering data and drawings are acceptable to the Consultant/Owner.
- "Engineer" shall mean an officer of the Owner as may be duly appointed and authorised in writing by the Owner for the purpose of the Contract.
 - "Equipment" or "Equipments" or "Equipment(s)" shall mean all of plant, systems, equipments, and Materials specified in Schedule to be supplied under the Contract and such other equipment and materials as may be agreed between the Owner and the Contractor, necessary for incorporation in the Plant.
 - "Extended Defects Correction Period" shall mean, in relation to any individual item of Work or Equipment comprised in the Works, which has been rectified, repaired, or replaced, twelve (12) months from the date of such rectification, repair or replacement or twenty four (24) months from the date of COD of the Plant whichever is later.
 - "Ex-Works" shall have the meaning ascribed thereto under Incoterms.
 - "Facility" or "Plant" shall mean the **1x800 MW** supercritical thermal power plant including , all the Equipments, together with all auxiliaries, and related buildings and Civil works of the said power plant to be constructed at Wanakbori, Kheda District, Gujarat, India, as an integrated whole, including without limitation all systems and sub-systems thereof and related facilities, including without limitation any and all appliances, parts, instruments, appurtenances, accessories and other property that may be incorporated or installed in or attached to or otherwise become part of the Plant or as envisaged in the Contract or which otherwise constitutes a part of the Plant and located on Site.
 - "Facility Site" or "Site" shall mean land at Wanakbori, Kheda District, Gujarat, India, owned by Owner on which the Facility will be located, as more particularly identified on the site plan and as described in drawings attached to Contract hereto as Annexure [insert].
 - **TAKE OVER CERTIFICATE** shall mean, in relation to the Plant, the certificate issued by the Owner confirming the Owner's Take Over of the Plant as being complete in every respect in accordance with clause No. 20.0 of the General Conditions of Contract, after Provisional Plant Acceptance Certificate is issued and liquidation of the punch lists and pending issues, after completion, synchronization and placed in Commercial operation in accordance with the contract, except for the warranty in respect of Plant/Equipments under the Extended Defects Correction Period, Latent Defects and Warranty for Mandatory Spares.



- **"Final Proposal"** shall mean the document containing the final technical & commercial proposal of Contractor for the Plant as may be modified in accordance with the provisions of the Tender Document, and agreed to in writing by the Owner and shall include but not be limited to technical information, data, documents and drawings forming part thereof, annexed as Annexure [inesrt] to the Contract.
- **"Financial Closure"** shall mean the date on which the Financing Documents providing for funding by the Lenders have become effective.
- **"Financing Documents"** shall mean any and all agreement or agreements, notes, bonds, indentures, political risk insurance policies, credit agreements, debt repayment or refinancing instruments, reimbursement agreements, mortgages, security agreements, guarantees, registration statements, disclosure statements, subordination agreements, partnership agreements, lease agreements, participation agreements and other documents relating to the Construction, interim or long-term financing (and any refinancing of the same) of the Project, including any modifications, extensions, renewals or replacements of the same entered into by the Owner for the provision of finance in connection with the Project.
- **"First Synchronisation"** shall mean electrical connection of plant to the Grid by Interconnection of the Facility for the first time after matching of voltage, phase sequence and frequency after satisfactory Commissioning of TG and STG.
- **"Force Majeure"** shall have the meaning setforth in clause 28.0 of these General Conditions of the contract.
- **"Foreign Currency"** shall mean a freely convertible currency such as US \$, Japanese Yen, Pound Sterling, Swiss Francs & Euro specified in the Schedule of Prices and Schedule of Delivery in which the Contract Price is payable, but not Indian Rupees.
- **"F.O.B"** shall mean delivery free of cost to the Owner on board the vessel at the port of shipment.
- **"F.O.R. Destination"** shall mean delivery free of expenses to the Owner on board rail wagons at the railway siding at the Site or its nearest railway station including the insurance coverage.
- **"F.O.R. Works"** shall mean loaded and stowed or trimmed free of expenses to the Owner on board rail wagons at the Contractor's Works siding or it's nearest railway station for transportation.
- **"F.O.R. Site"** shall mean delivery free of expenses to the Owner at his Site.
- **"GUVNL"** shall mean Gujarat Urja Vikas Nigam Limited including its successors in title and assigns of its interest.
- **"General Conditions of Contract"** or **"GCC"** shall mean these Conditions of Contract' as amended in accordance with the provisions contained in this behalf herein.

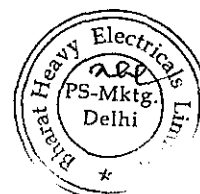


- **"Guaranteed Commercial Operation Date"** shall mean the date by which the Contractor has guaranteed to make the Plant ready for Commercial Operation after successful completion of Reliability Run.
- **"Guaranteed DM Water Consumption"** shall mean the guaranteed demineralised water consumption for the plant operation as stated at CL3.02.01 of VOL IIA/S-10
- **"Good Engineering Practices"** shall mean those practices, methods, acts, techniques and standards as may be followed or employed in the performance of the work and discharge of its obligations by the Contractor and which (i) are generally accepted internationally for use in the electric utility industry, taking into account conditions in India, in connection with power plants of the same or similar size and type as the Plant, (ii) are commonly used in prudent electric utility engineering, construction, project management and operations, and (iii) would be expected to result in performance of the services and completion of Works in a manner consistent with Applicable Laws, Applicable permits, reliability, safety, environmental protection, economy and expediency.
- **"Government Instrumentality" or "Competent Authority"** shall mean the Government of India, the Government of Gujarat, or any political subdivision, ministry, department, agency, corporation, commission or any regional, local or municipal authority or governmental body thereof or any other governmental or statutory body under the direct or indirect control of the Government of India or Government of Gujarat, or of any political subdivision, ministry, department, agency, corporation, commission, or any regional, local or municipal authority or governmental body thereof, and shall include without limitation any other governmental or statutory body in India having jurisdiction over the Plant or over the performance of any part of Work or the Works or any obligation of the Contractor or the Owner under the contract.
- **"Grid"** shall mean the system of electrical transmission and distribution of GETCO interconnecting different generating stations, transmission lines, sub-stations, circuits, transformers, switchgear and other equipment upto and on the GETCO side of the Interconnection Point.
- **"GETCO"** shall mean the Gujarat Energy Transmission Corporation Limited.
- **"Goods"** shall mean Equipment to be supplied under the Contract
- **"Reliability Run"** shall mean the first continuous operation of the Plant with sub-systems under varying loads to demonstrate satisfactory operation for a specified period (14 days) after completion of successful Initial Operations and conditions as specified elsewhere in the Contract.
- **"Hazardous Materials"** shall mean (i) hazardous materials, hazardous wastes, hazardous substances, toxic substances or contaminants as those terms are defined under any environmental law or regulation, including, but not limited to, Applicable Laws, and in the regulations



adopted or promulgated pursuant thereto; (ii) petroleum and petroleum products including crude oil and any fractions thereof; (iii) any other hazardous, radioactive, toxic or noxious substance, material, pollutant, or solid, liquid or gaseous waste; and (iv) any substance that, whether by its nature or its use, is subject to regulation under any environmental law or with respect to which any applicable environmental law or any Governmental Instrumentality requires environmental investigation, monitoring or remediation.

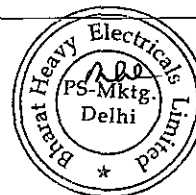
- **"Incoterms"** shall mean **"International Rules for the Interpretation of Trade Terms,"** as adopted by the International Chamber of Commerce (the "ICC") and as in force on the date of invitation of the bids. All matters relating to the Construction and interpretation of Incoterms shall be resolved by reference to the Guide to Incoterms.
- **"Taxes"** shall mean all taxes, duties, and cess imposed by the Government of India or any of its subdivisions (including value added tax), excise, storage and consumption taxes, service tax, import duties and customs duty and fees, license fees, sales and/or purchase taxes, octroi, entry tax, and labour cess applicable to any portion of the Works or Supplies, or any other tax, duty or fee of similar nature irrespective of the nomenclature used for the same
- **"Personal Taxes"** shall mean all taxes on income, profit, other real and personal property and franchise taxes, as well as personal income taxes of the Parties or any authorised persons acting on behalf of the Parties; and all applicable national, state and local payroll, social security, workers' compensation, employment taxes and contributions imposed by Applicable Law with respect to or measured by compensation (wage, salaries or other) paid to employees of the Parties, including taxes, health and welfare funds, pensions and annuities, disability insurance and all other similar social payments.
- **"Initial Operation"** with respect the Plant shall mean all operations undertaken as part of "Commissioning" after completion of "Preliminary Operation" first synchronization and upto commencement of "Trial Run". It shall be the first integral operation of the Plant including all Equipment / Systems, and shall include first light up / initial equipment rolling, equipment stretch-out, dry-out and operational chemical cleaning, no-load / partial load / full load runs for mechanical / electrical tryout and gathering of operational data; calibration, setting and Commissioning of control systems; and shutdown inspection and adjustment after running trials of the Plant including the Equipment.
- **"Inspector"** shall mean the authorized representatives appointed by the Owner or the Consultant for purpose of the inspection of Equipments for the purposes of the Contract.
- **"Interim Payment Certificate"** shall mean any payment certificate other



than Final Payment Certificate, issued by the Owner or Owner's Representative pursuant to clause 8.12.1 other than the final payment certificate.

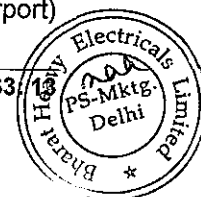
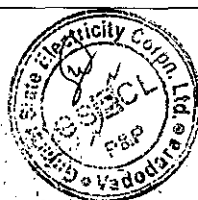
- **"Interconnection Facility"** shall mean all the facilities to be provided by the GETCO on the Site on GETCO's side of the Interconnection Point the location of which is specified in the Technical Specifications.
- **"Interconnection Point"** shall mean the 400kV Switchyard outgoing gantry from where the power is evacuated to the Grid by GETCO.
- **"Intellectual Property Rights"** or **"IP Rights"** shall mean copyright, all rights conferred under statute or common law in relation to inventions (including patents), registered trademarks, registered designs, circuit layouts, confidential information and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields
- **"Latent Defect"** shall mean the defects in design, materials and could not have been found prior to expiry of the Warranty Period mean a defect, which was in existence during the applicable Warranty period but was not reasonably discoverable during such Warranty period.
- **"Lenders"** shall mean those banks, firms or institutions who make available, from time to time, financing for the Project and whose identities have been notified to the Contractor.
- **"Letter of Intent"** or **"Lol"** shall mean the formal communication in writing by the Owner to the Contractor of the acceptance of the Contractor's Bid.
- **"Lien(s)"** shall mean any lien, claim, charge, encumbrance, cause of action, security interest, mortgage or other possessory or non-possessory interest in, on or against real, tangible or intangible property as administered under Applicable Law arising out of, due to, or otherwise as a result of the Contractor's acts or omissions, including any lien recorded or held by any Sub-Contractor or any other person entitled to a lien under Applicable Law.
- **"Limits of Rejection"** shall mean the limits prescribed to each of the Performance Guarantees, which if not adhered to, the Project shall be liable for rejection
- **"Liquidated Damages"** shall have the meaning as specified in 11.0 of the GCC.
- **"Local Currency"** shall mean the Indian Rupees.
- **"Manufacturer"** shall mean any entity or firm who is the producer and furnisher to the Contractor of any material or designer and fabricator of any equipment I systems which is to be incorporated in or forms part of the plant / works.
- **"Mandatory Spares"** shall mean the mandatory spares, and maintenance tools and tackles for the Plant, as specified in the Specifications, to be supplied by the Contractor under the Contract.

- **"Materials"** shall mean things of all kinds to be provided and incorporated in the Plant by the Contractor, including the items which are to be supplied by the Contractor under the Contract.
- **"Mechanical Completion"** shall mean with respect to the Plant, the completion of all works by the Contractor including completion of Construction, erection, installation, calibration and construction; testing services with respect to all mechanical, electrical, civil & structural, instrumentation and control systems (including Equipment) of the Plant, and the Plant has achieved a state of readiness for "Preliminary Operation". The existence of Punch List and pending issues items which do not prevent or adversely affect the Plant performance and safety, from being in a state of readiness for "Preliminary Operation" shall not be construed as preventing the Plant, from achieving Mechanical Completion.
- **"Milestone Payment Schedule"** shall mean the document, provided in Annexure [insert] hereof which sets forth (i) payments to be made by the Owner to the Contractor on schedule specified therein, and (ii) links each such payment with Project Milestones commencing on the Commencement Date. The Milestone Payment Schedule divides the contract price payment among certain progress milestones and may otherwise be adjusted from time to time in accordance with the contract.
- **"Month"** shall mean a month according to Gregorian calendar.
- **"Monthly Progress Report"** or **"Progress Report"** shall mean a progress report meeting the requirements set forth in clause 29 of the specification hereto.
- **"Notice to proceed"** or **"NTP"** shall mean the Owner's letter or notification intimating the Contractor to commence the Works.
- **"Notice in Writing"** or **"Written Notice"** shall mean a notice in writing, typed or printed or hand written characters, sent (unless delivered personally or otherwise proved to have been received) by registered post or by any agreed system of electronic transmission to the last known private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post it would have been delivered.
- **"Operation Manual"** shall have the meaning set forth in Specification hereof.
- **"Owner"** or **"Purchaser"** shall mean Gujarat State Electricity Corporation Limited (GSECL) and shall, unless repugnant to the context thereof, include its successors, assigns as well as authorized officers & representatives.
- **"Owner's Representative"** shall mean the person appointed by the Owner from time to time and notified as such to the Contractor to act as Owner's Representative for the purposes of the Contract.
- **"Owner's Instructions"** or **"Owner's Representative's Instructions"**



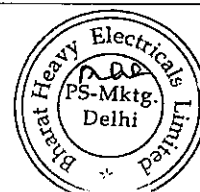
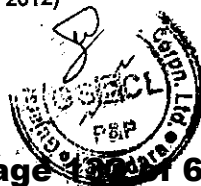
shall mean any drawings, specifications, instructions, details, directions and explanations, in writing issued by the Owner or by the Owner's Representative /Consultant from time to time during the subsistence of the Contract

- **"Owner or Purchaser"** shall mean Gujarat State Electricity Corporation Limited and shall include its successor(s) and assigns.
- **"Prime Bidder"** shall mean a reputed organization who submits a Bid and assumes single point responsibility acting by himself or on behalf of his associates. The Prime Bidder will be the party who will be contractually bound to the Owner.
- **"Owner Permits"** shall mean those Permits, No Objection Certificate (NOC), authorizations, consents and approvals required by the Owner to own, possess, operate and maintain the Plant and to generate electrical energy there from,
- **"Party"** shall mean either of the Owner or Contractor individually and **"Parties"** shall mean Owner and Contractor collectively.
- **"Permanent Works"** shall mean the permanent works, equipment and materials including all civil, electrical, control & instrumentation and mechanical works to be designed, engineered, manufactured, supplied, installed, erected, executed, Commissioned in accordance with the Contract and which form part of the Plant.
- **"Performance Guarantees"** shall mean the guaranteed capacity, efficiency and operating characteristics of the Plant as stipulated in Schedule of the Contract and Specifications.
- **"Performance Guarantee Tests"** shall mean, the tests specified in the Specifications and Schedule of the Contract to be conducted by the Contractor after entry into Commercial Operation of the Plant at the Site by the Contractor, other than the Tests before Commercial Operation, which shall be performed to demonstrate the achievement of Performance Guarantees, and shall be successfully conducted within three (3) Months of entry into Commercial Operation of the Plant.
- **"Performance Test"** with respect to the equipment/systems of the Plant shall mean the test to establish their design / rated performance conducted at site by the Contractor in accordance with the provisions of the contract.
- **"Permit"** shall mean any valid permit, authorization, license, registration, approval, consent, waiver, exemption, variance, franchise or any similar order of or from of any Government Instrumentality, court or other body having jurisdiction over the matter in question.
- **"Person"** shall mean any individual, corporation, partnership, association, joint stock company, trust, unincorporated organisation, joint venture, government or political subdivision or agency thereof.
- **"Port of Entry"** shall mean the final destination in India (sea or airport)



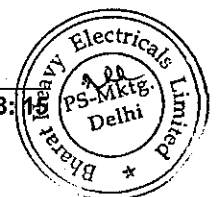
where customs duty, port and other handling charges are paid on imported materials.

- **"Power Purchase Agreement"** shall mean the Agreement between the Owner and the GUVNL for sale of electrical energy generated by the Facility to GUVNL.
- **"Preliminary Operation"** shall include all activities undertaken as part of Commissioning after Mechanical Completion up to commencement of Initial Operation and shall include mechanical and electrical checkouts, adjustments, calibration of instruments and protection devices, Commissioning of sub / supporting systems and static chemical cleaning of the Plant.
- **"Project"** or **"Plant"** shall mean the Facility and the work as an integrated whole, all as described in greater detail in the specification hereto.
- **"Project Documents"** shall mean the Power Purchase Agreement, the Financing Documents, the Contract, any Operation and Maintenance agreement in respect of the Plant, all fuel purchase agreements, all fuel transportation agreements and all other contracts relating to the Plant entered into by the Owner and shall include all Drawings and documents
- **"Protocol"** shall mean the statement of readings of any or all of Tests Before Commercial Operation and/or Performance Guarantee Test or any other tests performed by the Contractor under the Contract (which test has been witnessed by the Owner) and jointly signed by Owner and/or his representative or Inspector and Contractor and/or his representative.
- **"Provisional Acceptance Certificate"** shall mean the certificate issued by the Owner to the Contractor evidencing achievement of the COD by the Contractor.
- **"Prudent Utility Practices"** shall mean those practices, methods, equipment specifications and standards of safety and performance, as the same may change from time to time, as are generally accepted for use in electricity generating utilities taking into account conditions in India and commonly used in prudent electricity generation utility engineering and operations including design, engineering Construction, erection, Commissioning, operation and maintenance of power generating stations and equipment comprised therein lawfully, safely, efficiently and economically for facilities of the type and size similar to the Plant and that generally conforms to the Equipment manufacturer's operation and maintenance guidelines.
- **"Punch List"** shall mean the list in respect of the equipment / systems supplied / erected / commissioned, first prepared by Owner at the time of issuance of Provisional Acceptance Certificate of the equipment / systems, and thereafter periodically revised by Owner as necessary, which list shall set forth certain items of Work which remain to be performed by the Contractor in order to ensure that the Plant fully complies with all of the standards and requirements set forth in the Contract.

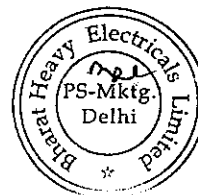


Provided, the Punch List and pending issues shall not include any items of work, alone or in the aggregate, the non-completion of which prevents the Plant as a whole from (a) being used for its intended purposes as described in the Contract in accordance with Applicable Laws and Applicable Permits or (b) being legally, safely and reliably placed in commercial operation

- **"QA Programme"** shall mean the comprehensive quality control and quality assurance programme to be followed by the Contractor in executing the Supplies, Construction/ Erection of the Works.
- **"Risk Transfer Date"** shall, subject to the obligation of the Contractor including, without limitation, in relation to the Performance Guarantee Test (and consequences of failure thereof including rejection) and Warranty, mean the date on which the Owner assumes the care and custody of the Equipment/Plant or the Plant enters in to Commercial Operation whichever is earlier.
- **"Schedule"** shall mean collectively all the schedules including Project Schedule, Milestone Schedule and other schedules pertaining to the work and the Plant as detailed in the Contract.
- **"Specifications"** or **"EPC Specification"** or **"Technical Specification"** shall mean collectively, the description of the scope, the Owner's requirements, design criteria, technical requirements, Final Proposal, drawings, programme of work Project Schedule, all Appendices to the contract, Appendices to these General Conditions of contract, Performance Guarantees, all terms and stipulations of the contract, and such amendments and revisions, as may be made in the Tender Documents or to the contract and all written agreements made after the execution of the contract by the Parties, or which may pertain to the method and manner of performing the work under the contract as agreed.
- **"Sub-contractor"** shall mean any Person (other than the Contractor or the Owner) to whom any part of the Works has been sub-contracted by the Contractor in accordance with the Contract and with prior approval of the Owner, or with whom the Contractor has entered into any contract for the supply of any Equipment in connection with the Works and with prior approval of the Owner, and shall include its legal successors in title or permitted assigns, and unless otherwise stated, all the Sub-contractors and suppliers to such Person and the term Sub-Contract shall be construed accordingly.
- **"Supplies"** shall mean the supply of the Equipment and the Mandatory Spares by the Contractor in connection with the performance of its obligations under the Contract, including all incidental activities thereto,
- **"Site"** shall mean the land and other places including existing roads and paths put at the disposal of the Contractor by the Owner in connection with the execution of the Contract.



- **"Synchronisation"** shall mean electrical connection of the Plant to the Grid by means of the Interconnection Facility for the first time where the Plant and the Grid are matched in voltage, phase and frequency, after satisfactory Commissioning.
- **"Take Over" or "Taking Over"** shall mean taking-over of the whole Plant by the Owner for the purpose envisaged under the Contract after Commercial Operation Date and after successful completion of Performance Guarantee Tests complete within three months from the Commercial Operation of the Plant and successful completion of Tests Before Take Over, as well as liquidation and completion of pending items specified in Punch List in pursuant of the Contract.
- **"Temporary Works"** shall mean all temporary works of every kind (other than Contractor's Equipment) required for the execution and completion of the Works and the remedying of any defects.
- **"Tender Documents"** shall mean the documents for Invitation to Bid together with all amendments thereto and clarifications, if any, issued by the Owner or the Consultant from time to time in respect thereof.
- **"Tests before Commercial Operation"** shall mean in relation to the Plant, all tests prescribed in the Specification and any other tests agreed between the Owner and Contractor to be undertaken by the Contractor.
- **"Tests before Take Over"** shall mean the tests prescribed in the 'Specification', and any other such tests as may be agreed between the Owner and Contractor or instructed as a Change Order, which has to be carried out by the Contractor before the Plant is Taken Over.
- **"Tonne"** shall mean 1,000 Kilogram weight.
- **"Transmission Facilities"** shall mean all of the facilities to be located off the Site and to be constructed by or for the GETCO to connect the Interconnection Facilities to the Grid.
- **"Reliability Run Test" or "Trial Run"** of the Plant shall mean the -Period of 14 days of continuous operation after Synchronization, or extended period thereof if any as more particularly defined at Vol-II A/S-10/CL2.02.02 .
- **"Tests on Completion"** shall mean such tests as are prescribed in the Specifications and/or other tests as mutually agreed upon by the Owner and the Contractor to be carried out by the Contractor to prove satisfactory performance of the Works.
- **"Ton"**, shall mean 1,000 Kilogram weight, "Gallon" shall mean Imperial gallon, unless otherwise mentioned specifically.
- **"Unexpected Archaeological Condition"** shall mean uncovering or revealing of an unknown historical or archaeological site at or contiguous to the Site during performance of the Contract that was not

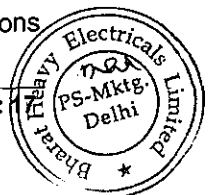
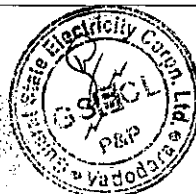


shown or indicated in the Subsurface Investigation and which Contractor could not have reasonably been expected to be aware of.

- **"Unpriced Technical Bid"** shall mean the unpriced technical bid submitted by the Successful Bidder as part of its Final Proposal
- **"Variation"** shall mean alterations, amendments, omissions, additions, or variations of the Equipment or the Supplies as agreed.
- **"Warranty"** shall mean all guarantees and warranties provided or agreed to be provided under the Contract for and in respect of the equipment, work, components, materials, Supplies and parts and works forming part of or incorporated in the Plant or relating thereto supplied or provided by the Contractor and shall include any guarantee or warranty provided or furnished by a sub-Contractor under a sub-contract.
- **Warranty Engineer** shall mean, the engineer deputed by the Contractor and staying at site, to be responsible for looking after / supervising Operation and Maintenance practices during warranty period.
- **"Week"** shall mean a continuous period of seven (7) Days.
- **"Wilful Misconduct"** shall mean that the Contractor has intentionally concealed the defect in full knowledge of the serious consequences that may flow from its existence and the defect is one, which the Owner could not have discovered on careful examination of the Plant at the time of commencement of Commercial Operation or during the Warranty Period.
- **"Work"** or **"Works"** shall mean the works and services involving engineering, procurement, Supplies, construction, installation, erection, Commissioning of the Plant and shall include all Permanent Works comprised in or forming part of the Plant and the temporary works or either of them as appropriate, and any other works required to be performed by the Contractor under the Contract.
- **"Warranty Period"** shall have the meaning assigned to the term under Clause 21.2 of the GCC, during which the Contractor shall bear all cost covering repair and/or replacement of any defective part of the Plant/ Equipment supplied, works done and services rendered under the Contract.

2.2 Interpretation of Bid Document

- 1) General Conditions shall be read in conjunction with Instructions to Bidders, special Conditions, Technical Specifications, Drawings and other documents forming part of the Bid Document wherever permissible or the context so requires.
- 2) Notwithstanding the sub-division of the Bid Document into sections and volumes, every part of each shall be deemed to be supplementary to and complementary of each other.
- 3) All headings and marginal notes to the items of the General Conditions



or to the Specifications or to any other document forming part of the Bid Document are solely for the purpose of giving a concise indication of the general subject matter thereof and not a summary of the contents thereof and they shall never be deemed to be part thereof or be used in the interpretation or construction thereof.

- 4) Wherever it is mentioned in the Bid that the Contractor shall perform certain work or provide certain facilities it is understood that the Contractor shall do so at his cost and the price shall be deemed to have included the cost of such performances and provisions so mentioned.
- 5) The materials, designs and workmanship shall satisfy the applicable standards, specifications contained herein and codes referred to. Where the Bid Document stipulates requirements in addition to those contained in the standards and codes, those additional requirements shall also be satisfied.
- 6) For the purposes of the Contract including General Conditions of Contract, the expression "legally, safely and reliably placed in commercial operation" shall mean that the Facility, will operate in the manner intended as described in the contract, in accordance with all Applicable Laws and Applicable Permits, and without undue risk of damage or injury to the Plant or Persons.
- 7) Words incorporating the singular only shall also include the plural and vice -versa where the context requires.
- 8) "Writing" shall include any manuscript typed or hand-written or printed statement, including E- Mail and facsimile transmission under or over signature or seal as the case may be.

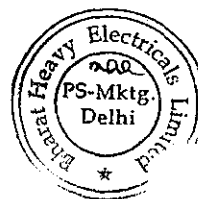
2.3 Priority of documents

For the purpose of interpretation of the Contract, especially in the event of any inconsistency, the following order of precedence shall apply:

Order of Precedence:

The order of precedence shall be the order in which the documents are listed below:

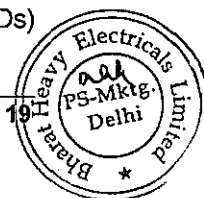
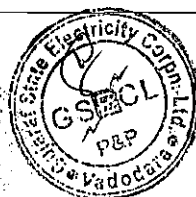
- i) The Contract Agreement
- ii) Letter of Award duly accepted by the Contractor together with its amendments, if any.
- iii) Pre Award Minutes of Meeting, Resolutions to Deviations / Clarifications
- iv) Pre-bid clarifications issued by the Owner and Amendments to Tender specifications
- v) General Conditions, ITB, Special conditions for erection and Construction
- vi) Technical Specifications
- vii) Contractor's Bid Proposal



3.0 SCOPE OF WORK

3.1 The scope of work, if not otherwise mentioned in the Contract, shall be on the basis of a single Contractor's responsibility, completely covering all the equipment specified under the accompanying Technical Specifications. The Works include the following: -

- a) Detailed design of all the equipment and sub-systems as per Specifications;
- b) Complete manufacture of all the Equipment including shop assembly and testing as per Specifications, supply of special tools and tackles and services necessary for satisfactory execution of the Contract;
- c) Providing Engineering Drawings, Data and operation manual, etc. for Owner's/Consultant's approval.
- d) Packing and transportation of the Goods from the Manufacturer's Works to the Site including freight charges, insurance coverage;
- e) Supply of Mandatory Spares;
- f) Receipt, unloading, storage, preservation and conservation of the Goods at the Site;
- g) Erection, Testing and Commissioning, trial run of all the equipment at the Site, Tests on Completion, putting into Commercial Operation;
- h)
 - i) Performance Guarantee Tests on successful completion of Reliability Run
 - ii) Reliability Test shall commence after completion of Commissioning of the Plant. Length of such operation shall be as specified in [VOL-IIA/S-10/CI 2.02.02 PAGE 3] of the Contract.
- i) Providing construction, erection, testing and commissioning supervision personnel to supervise the work, erection, testing and Commissioning of the Plant;
- j) All civil works including supply of all materials and temporary works etc. as needed;
- k) Structural work including supply of all materials, Consumables and temporary works etc. as needed;
- l) Architectural works as approved by the Owner;
- m) Providing three sets of as commissioned Drawings, three sets of as commissioned data/specification/parameter sheets duly signed by the relevant competent authority, and five sets of Compact disks (CDs) should be submitted prior to Take Over.



Provided that all Works shall be done as per the requirements of the Contract including, without limitation, the Drawings and Documents approved by the Owner and the Specifications.

Provided further that the Contractor shall, unless specifically excluded in the Contract, perform all such Work and/or supply all such items and materials not specifically mentioned in the Contract but are required for attaining Commercial Operation of the Plant as if such work and/or items and materials were expressly mentioned in the Contract and in a manner that ensures that the Plant is fit for the purpose intended.

3.2 STANDARD OF CARE

The Contractor shall execute and complete the Works in a safe, prudent and reliable manner in strict accordance with the Contract and with Good Engineering Practices.

4.0 CONTRACT PRICE

4.1 The Contract Price shall be for the entire scope of the Work with the breakdowns as specified in Schedule of Prices.

The Contract Price shall be lump-sum and firm, and valid for the entire period of the Contract.

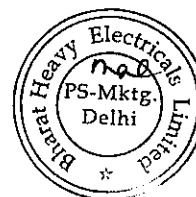
4.2 The price for the Goods of origin outside India shall be the CIF Price.

4.3 Taxes and Duties

4.3.1 For the Goods of Indian origin, all Taxes shall be deemed to be included in the Contract Price. However excise duty, sales tax, works contract tax, octroi, and similar taxes as payable on finished goods and included in the Contract Price shall be indicated separately considering exemptions which may ordinarily be available/applicable at the prevailing structured rate. Further, Service Tax on Service portion of the Contract will be indicated separately. The normal prevailing rates of aforesaid taxes and duties and exemptions/concessions to the same with concessional rates shall be indicated. In case of delay in delivery not attributable to the Owner, any increase in the rates of aforesaid taxes beyond the scheduled date of delivery shall be to the Contractor's account. The amount of aforesaid taxes paid shall be reimbursed to the Contractor by the Owner upon presentation of documentary evidence upto the limit indicated in the bid offer.

4.3.2 The Taxes and Duties mentioned in Clause 4.3.1 for direct dispatch able items to Site from bidder's Sub Contractors, Sub Vendors, JV Companies whose works are located within India shall be reimbursed by the Owner upon presentation of documentary evidence upto the limit indicated in the bid offer.

4.3.3 In the case where Equipment have been listed under the schedule of items of foreign origin (to be imported) and such list have been accepted by the Owner, the responsibility of obtaining an import license, taking procedures thereon and payment of Taxes will rest with the Contractor though technically Owner will remain as an Importer. The Contractor shall prepare all required documents for



the Owner to make application for such import license and extend all possible assistance to the Owner for expeditious clearance of the license as and when requested by the Owner. The Contractor shall also arrange for payment of Taxes against any consignment on behalf of the Owner and the amount paid towards Taxes will be reimbursed by the Owner to the Contractor in Indian Rupee on presentation of documentary evidence as per Contract. In the case of delay in delivery not attributable to the Owner, any increase in the Taxes, port handling and port clearing charges as well burden due to rise in foreign exchange rate shall be to the Contractor's account.

The Bidder is to furnish a detailed list of imported equipment and materials and quantities against each item along with his Bid.

- 4.3.4 In the case of raw materials, components, sub-assemblies and other equipment and materials imported by the Indian Contractor for value addition, construction materials and Consumables, if any, all such import duties and levies payable shall be deemed to have been included in the Contract Price and no separate claim on this behalf will be entertained by the Owner.
- 4.3.5 Additionally, the Contractor shall bear and shall be liable for the payment of its Personal Taxes.
- 4.3.6 The Contractor and all its expatriate personnel shall be responsible for the timely and prompt filing of all returns, documents, estimates, accounts, information and details complete and accurate in all respects as may be required under the applicable laws/regulations of India by the appropriate authorities in India. In case the Contractor or any of its expatriate personnel do not comply with the above requirements, which results in any penalty, interest or other liability, the same shall be borne by the Contractor.
- 4.3.7 GSECL will arrange C Forms as applicable on quarterly basis. Also TDS certificate will be issued on quarterly basis.
- 4.3.8 Taxes and duties in the proposal shall be the rates prevailing fifteen (15) days prior to the date of opening of Techno Commercial Bid.

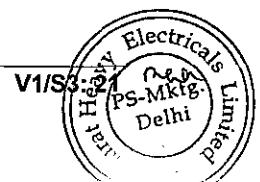
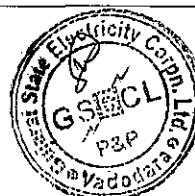
4.4 Price Adjustment for Quantity Variation in the Works and Change Order

- 4.4.1 Quantities of Equipment required by the Specification may be in certain cases, subject to variation pursuant to the Change Order in accordance with the procedure set out in this Clause 4.4.

4.4.2 Changes

(i) Owner shall have the right at any time by written notice to Contractor to make changes to the Work, whether such changes are modifications, alterations, deletions or additions. Contractor agrees to effect such changes in the Work as Owner may from time to time request subject to mutual agreement. The Change Order shall be limited within +/- 15% of Total Contract Price.

(ii) Any request by Owner for a change shall be delivered to Contractor in writing and shall be sufficiently definite and detailed to give Contractor an adequate basis on which to prepare a preliminary change order pursuant to Clause 4.4.3.



(iii) Upon receipt of Owner's request for a change, Contractor shall prepare a preliminary change order and deliver the same to Owner within ten (10) days time or any reasonable time mutually agreed following Contractor's receipt of such request.

(iv) Throughout the performance of the Works Contractor shall have a continuing obligation to suggest to Owner for Owner's consideration:

(a) All such changes as Contractor considers desirable; and

(b) Such other changes known to Contractor as may be necessary to incorporate significant new developments in technology which are applicable or appropriate to the Plant.

(c) Contractor shall submit any such suggestion in the form of a preliminary change order pursuant to Article 4.4.3.

4.4.3 Preliminary Change Orders

(i) Each preliminary change order submitted by Contractor to Owner pursuant to Clause 4.4.2 or any other express provision of the Contract shall be in writing and be accompanied by such information and data as will be reasonably required by Owner to evaluate properly the proposed execution of the work in question, the effect, if any, on the Work, scope of Work, an adjustment in one or more of the (i) Contract Price, (ii) Guaranteed Commercial Operation Date, (iii) Milestone Payment Schedule, (iv) any of the Performance Guarantees, or (v) any provision/scope of the Contract.

(ii) Owner shall reject or approve at its sole discretion each preliminary change order as expeditiously as proper consideration of the nature of the change may reasonably permit.

(iii) The cost of all work involved in preparing the information and data required to accompany the preliminary change order involved and for any additional analytical or investigative work requested by Owner in connection therewith is included in the Contract Price.

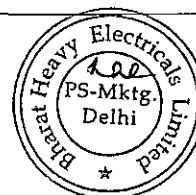
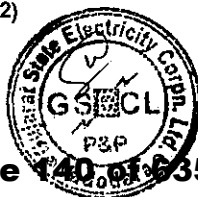
4.4.4 Change Orders

(i) Except as provided in Clause 4.4.5, Contractor shall not act upon any preliminary change order unless the Owner has executed a written Change Order.

(ii) Any adjustment of the Contract Price pursuant to the Change Order shall take into account, among other things, the elimination or avoidance of Work to be performed resulting from the changes in the Work and from assistance given by Owner.

4.4.5 Performance of Change Order pending agreement

If Owner and Contractor fail to agree on the effect of a Change Order and as a result a Change Order is not executed, Owner may nevertheless require Contractor to perform the Work as changed by delivering to Contractor a Change Order signed by Owner and Contractor shall complete all work specified in such Change Order and the dispute shall be resolved as provided in Clause 39:



The Owner shall pay to the Contractor in accordance with the Contract, such amount as has been ascertained by Owner as payable for such Change Order pending the resolution of the dispute. Contractor's performance of the Work as changed shall not prejudice either party's position regarding the effects of such change.

4.4.6 Variations in Contract Price

Except as otherwise provided in the Contract any increase or reduction of the Contract Price resulting from any Change Order shall be for the account of Owner, provided that no increase in the Contract Price shall be granted with respect to a change if:

- (1) The providing of the additional services is necessary in order for Contractor to satisfy its responsibility to make the Plant operable and capable of performing as contemplated under the Contract and to ensure that the Plant when completed and the Work is performed in accordance with the Contract;
- (2) The additional services are required because of delays attributable to Contractor, to late deliveries of Equipment or Contractor's Equipment or to labour shortages or relate to any rectification or remedy of defects or deficiencies required under the Contract;
- (3) The additional services are required because of a breach of any of the Guaranteed Commercial Operation Date and Performance Guarantees or Warranties under the Contract; or
- (4) The change relates to re-performance of any of the Work because of Contractor's failure to follow Owner's Specifications.

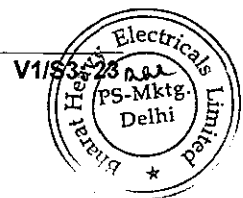
It is clarified that any adjustments in the Contract Price shall be made only in accordance with this Clause 4.4.

4.4.7 Not Considered Changes

Without prejudice to any other provision of the Contract, the following shall not be considered under any circumstances as changes in or within the Work, nor shall any of the following be taken into account when calculating the effect upon the Contract Price of changes in or within the Work nor shall any of the following of themselves be considered the basis for any adjustment of the Contract Price:

- (1) Any escalation in the cost of Equipment or labour;
- (2) Any increase in manpower hourly rates;
- (3) Currency fluctuations in respect of costs included within the Contract Price; and
- (4) Any change in the sourcing of Equipment.

4.4.8 The Work shall be subject to further detailing by the Parties from time to time and that, such detailing shall not be considered as a change in Work. In addition, a request by Owner that Contractor perform services or provide Equipment or Contractor's Equipment not specifically included within the Scope of Work shall not be considered a request for a change in the Work if it is required to make the Plant operable and capable of performing as specified in the Contract.



5.0 **TIME : THE ESSENCE OF CONTRACT**

The time and date of completion of the Work as stipulated in the Contract Document and the Guaranteed Commercial Operation Date shall be deemed to be the essence of the Contract. The Contractor shall so organize his resources and perform so as to complete the Work not later than the aforesaid date.

The Contractor shall submit a PERT network showing various key phases of the Work such as design, procurement, manufacturing, shipment, and field erection and construction activities within thirty (30) days after the date of receipt of Notice to Proceed. This network where applicable shall indicate the interface facilities to be provided by the Owner and the dates by which such facilities are needed by the Contractor and also the programme for phase wise release of Work Site for erection work as may be needed by Contractor.

The Contractor shall discuss the network so submitted with the Owner and the same shall be finalized pursuant to such discussions. The agreed network may be in the form as submitted or in revised form in line with the outcome of discussions and shall form part of the Contract Document.

The above PERT network shall be reviewed and periodic review reports shall be submitted by the Contractor to the Owner as directed by him.

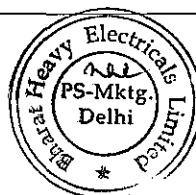
The Contractor shall make available to the Owner detailed manufacturing, delivery, erection, testing and commissioning programmes in line with the agreed PERT network in the form of PERT or Bar Chart as desired by the Owner within ninety (90) days from the date of receipt of Notice to Proceed. During performance of the Contract, such programmes shall be renewed, updated and submitted to the Owner as and when needed by him or periodically as specified by him. If in the opinion of the Owner/Engineer proper progress is not maintained, suitable changes shall be made in the Contractor's operation to ensure proper progress.

5.0A **TRANSFER OF TITLE AND RISK**

5.0A1 The legal title (but not risk which shall be transferred on the Risk Transfer Date) of the Equipment dispatched from any country outside India, shall be passed on to the Owner on the point of embarkation. However, the physical possession of such goods will remain in the hands of the Contractor for performance of the balance Scope of Work. The Contractor shall submit, in such form and within such time as required by the Owner, an indemnity bond indemnifying the Owner from any loss or damage to the equipment/material for the period between point and embarkation and the Taking Over the Plant by the Owner.

The transfer of title of goods shall take place when the goods in deliverable country/state are placed on board vessel for onward transmission to the Owner. The clean Bill of Lading issued by the Master of the Vessel shall be indicative of such deliverable country/state. Risk shall however continue to be that of the Consignor/Contractor upto the Taking Over of the Plant.

5.0A2 The Contractor shall remain responsible for, and shall bear the risk of loss or damage to, the Equipment in its possession and the Plant from the Commencement Date until the Risk Transfer Date. Provided that the transfer of risk shall be without prejudice to the obligation of the Contractor under the Contract.



6.0 **PERFORMANCE BANK GUARANTEE FOR DUE PERFORMANCE OF THE WORK**

6.1 The Contractor, upon receipt of Notice to Proceed from Owner shall furnish a Performance Bank Guarantee in the form specified as per Annexure-D as the performance security, for an amount equal to 17.5% of the total Contract Price under the Contract for diligent and due fulfillment by the Contractor of all obligations under the terms and conditions of the Contract. The initial Performance Bank Guarantee of 17.5% will be permitted to be reduced to 10% on completion of Reliability Run, completion of Performance Guarantee Test, and /payment of liquidated damages,(if applicable) whichever is later.

6.2 The Performance Bank Guarantee shall be liable to be invoked towards and claims and/or damages due to the Owner for failure of the Contractor to meet his obligations under the Contract. The Bank Guarantee shall be valid until it is released at the end of Warranty Period as stipulated in Clause 21 of this Section.

6.3 However, the amount of the Performance Bank Guarantee, after expiry of the Warranty Period, may be reduced in proportion to the Work released from Warranty obligations at the discretion of the Owner.

The Performance Bank Guarantee amount in case of divisible Contract shall be 17.5% of the total value of the Contract for the faithful performance of the Contract in accordance with the Contract Document. The guarantee amount shall be payable to the Owner in the currency of the consideration of the Contract without any condition whatsoever and their Guarantee shall be irrevocable.

6.4 In addition to the grounds specified above, The Performance Bank Guarantee is shall be liable to be invoked in the event:

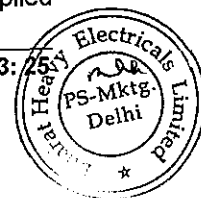
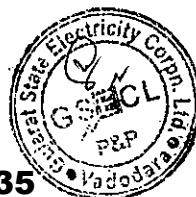
- a) The Owner has obtained an award in arbitration and the amount awarded has not been paid within thirty (30) days after the award, or
- b) The Contractor has gone into liquidation or has been declared bankrupt, or
- c) Any other reason which may adversely affect the contractual obligations of the Contractor.

Performance Guarantee is intended to secure the satisfactory performance by the Contractor of the entire Contract.

7.0 **SUPPLY, ERECTION CONTRACT/DIVISIBLE CONTRACT**

Notwithstanding anything stated elsewhere in the Bid Document, the Contract to be awarded is on the basis of Supply- Erection Contract (Divisible Contract) with single point responsibility. In the mode of contracting on the basis of Supply-Erection, the supply portion of the Contract will relate to the supply of the Plant and the erection portion will relate to port clearance, port handling, inland transportation, insurance, storage, unloading, erection, construction, testing, commissioning, Engineering, Project Management etc. as will be defined in the Contract Document.

In the case of a divisible contract, the title of ownership of Goods to be supplied



shall pass on to the Owner on dispatch Ex-works/F.O.B. However, until the Work is completed in all respects and the Plant is taken over by the Owner, the Goods shall remain within the custody of the Contractor. The above arrangement shall not in any way dilute the responsibility of the Contractor for the successful commissioning of the Plant and completion of other works as per Bid Specifications and both the contracts shall contain a cross default clause, namely, that a breach of one contract shall automatically be classified as a breach of the other contract, which will confer a right on the Owner to levy LD from other contractor and to terminate also the other contract as well at the risk and cost of the Contractor.

8.0 TERMS OF PAYMENT

8.1 The terms of payment for the price components of the Supplies of Equipment and Mandatory Spares, civil and architectural works, and erection are detailed in the Contract Agreement.

8.1.1 Initial Advance

The advance in accordance with the provisions of Clause 8.4, 8.5, 8.6, 8.7, and 8.8 of these GCC (each of such advance being referred to as "Advance Payment") will be paid on fulfillment of all of the following conditions by the Contractor:

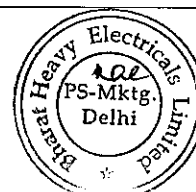
- i) Signing of Contract Agreement;(Agreement shall be signed within 45 days from the date of acceptance of LOA)
- ii) Submission of an unconditional Performance Security (Performance Bank Guarantee) as per clause -6.0 of the General Conditions;
- iii) Submission of an unconditional additional Performance Guarantee /by concerned entity, as prescribed by the Owner;
- iv) Submission of a preliminary Project network schedule indicating major milestones based on the Work schedule.
- v) Submission of Advance Payment Bank Guarantee as per clause-8.2 below.

Submission of detailed Project Network Schedule shall be made within 45 days from the date of signing of Contract.

8.2 Documentation and Bank Guarantee for Advance Payment

The Contractor shall furnish the following documentation as a condition for making request for Advance Payment.

- i) Invoice for amount of Advance Payment in original and five (5) copies.
- ii) Bank guarantee in the proforma attached with Volume-1, Section-2, Annexure-I-I for an amount equivalent to the aggregate amount of Advance Payment ("**Advance Payment Bank Guarantee**") with one (1) copy of original bank guarantee valid upto Take Over of Plant issued or counter guaranteed/confirmed by any Indian Nationalized Bank or its foreign branch. The charges for counter guarantee/confirmation, if any, shall be to Contractor's account.



- iii) Advance Payment Bank Guarantee for Advance Payment shall be denominated proportionately in currencies of contract or US Dollars.

8.3 Adjustment of Advance Payment

The Advance Payment made shall be adjusted against the progress payments, progressively at the same rate of advance i.e., if 10% advance paid, 10% of the invoice value of the progress payment will be adjusted against making progress payment. Upon each such recovery, the value of the Advance Payment Bank Guarantee shall be reduced progressively by the amount of advance so recovered by Owner from Contractor's progress payments. Apportioning the break-up of other payments shall be as further detailed below. All further payments under the Contract shall be made as stipulated in the Contract Agreement. Reduction of Advance Payment Bank Guarantee shall be permitted every six months i.e. January and July of each year based on records available with GSECL.

8.4 Design Engineering Charges

Design engineering charges component will be paid as per detailed break-up as set forth in the contract after issue of certification of completion of same by Contractor to Owner and acceptance thereof by Owner/Owner's representative in following installments:

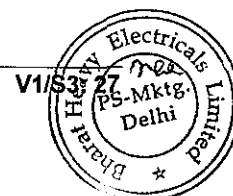
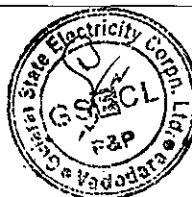
- i) 0 to 5% (max 5%) of Design Engineering Charges as Advance Payment on fulfillment of conditions in sub-clauses-8.1 and 8.2
- ii) 75% (cumulative not exceeding 80%) of Design Engineering Charges as progress payment on approval of drawings and document – payable in 36 monthly equated installments.
- iii) 7% (cumulative not exceeding 87%) of Design Engineering Charges on certification of successful completion of Reliability Run of Plant as per specification by Owner.
- iv) 6% (cumulative not exceeding 93%) of Design Engineering Charges on Final Plant Acceptance/Take- Over of Plant and also submission of as built drawings.
- v) 7% (cumulative not exceeding 100%) of Design Engineering Charges on Satisfactory completion of warranty period.

Contractor acknowledges that certification or its acceptance by the Owner's representative shall not, however, relieve or absolve in way or manner the Contractor from the performance of work and other obligations under the Contract including Performance Guarantee and Warranty obligations under the Contract.

8.5 Project Management Charges

Project Management charges component will be paid as per detailed break-up in following installments:

- i) 0-5% (max 5%) of Project Management charges as Advance Payment on fulfillment of conditions in sub-clauses-8.1 and 8.2



- ii) 75% (cumulative not exceeding 80%) of Project Management charges on equal monthly installments for the Contract Period.
- iii) 7% (cumulative not exceeding 87%) of Project Management Charges on certification of successful completion of Reliability Run of plant as per specification by Owner;
- iv) 6% (cumulative not exceeding 93%) of Project Management charges on Take Over of plant.
- v) 7% (cumulative not exceeding 100%) of Project Management Charges on Satisfactory completion of warranty period and also submission of as built drawings, O & M manuals etc.

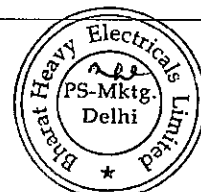
8.6

Supply Price

For Supplies of Equipments, the payments shall be linked with the despatch of materials and shall only be made after production of all despatch documents as specified in Letter of credit (L/C) conditions in case of supplies of non Indian origin and / or in the relevant contract conditions which will, inter-alia, include 3 original Bills of Lading in case of CIF supplies and the equipment Material Despatch Clearance Certificate issued by the Owner/Owner's representative after inspection if applicable.

- i) Supply price component will be paid as per break-up below:

Item No.	Time of Payment	% Component FOB/Ex-Works Price	Condition to be fulfilled
1.0	Advance Payment	0-5% (max 5%)	As per clauses-8.1 and 8.2 of this General Condition.
2.0	Advance Payment against placement of orders for major equipments.		
a)	Evidence of order placement of all major equipment/system	0-5% (cumulative not exceed 10%)	Evidence of order placement for all major Items to be ordered within first 6 months from zero date as per L1 schedule shall be considered-
b)	Despatch of Equipment/system from Manufacturer's Works	55% (cumulative not exceeding 65%)	Production of invoices and satisfactory evidence of shipment for major orders and submission of Material Despatch Clearance Certificate and Inspection Certificate as per quality assurance program.



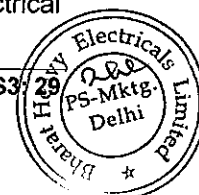
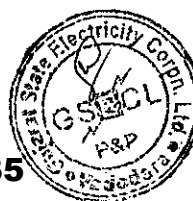
Item No.	Time of Payment	% Component FOB/Ex-Works Price	Condition to be fulfilled
3.0	Receipt of equipment /system	15% (cumulative not exceeding 80%)	Verification and certification by the Owner / Owner's representative of the equipment / system received and stored at 'Site'
4.0	Successful Completion of Reliability Run	7% (cumulative not exceeding 87%)	Certification of successful completion of Reliability Run of plant as per contract by Owner.
5.0	Successful completion of Performance tests	6% (cumulative not exceeding 93%)	Take Over of Plant
6.0	Warranty Charges	2% 7% (cumulative not exceeding 100%)	Satisfactory completion of Warranty Period and Extended Defects Correction Period, as evidenced by issuance of Defects Liability Certificate, and also submission of O & M manuals, As built drawings etc.

- ii) The Ocean Freight and Marine Insurance Charges and the in-land transportation and Marine insurance charges shall be paid to Contractor on pro-rata basis to the FOB price of component shipped on evidence of activities having been carried out. The aggregate of all such pro-rata payment shall not exceed the total amount identified in contract price provided, however, wherever equipment wise above mentioned charges have been identified in contract the payment of such charges shall be based on such charges identified in contract against evidence of activity having been carried out.

8.7 Erection, testing and Commissioning Price
(Excluding civil & architectural works)

In case of erection, progress payments shall only be made after the issue of Certificates by the Owner / Owner's representative, as detailed under:

- i) 0-5% (max 5%) of total erection, testing and commissioning price as Advance Payment and fulfillment of conditions in sub-clauses -8.1 and 8.2 above and on establishment of site office by the Contractor at site.
- ii) 75%(cumulative not exceeding 80%) of the erection, testing and commissioning price will be made as progressive payments against progressive erection on tonnage basis for mechanical and electrical



items and successful completion of quality check points. Separate basis for cabling and instrumentation, which will be finalized between Owner and Contractor prior to contract award. Progress payments shall only be made after the issue of Certificates by the Owner/Owner's representative, one for the quantum of work completed and the other by the Field Quality Surveillance representative for the successful completion of quality check points involved in the quantum of work billed.

- iii) 7% (cumulative not exceeding 87%) of the erection, testing and commissioning price on successful completion of Reliability Run of Plant as per contract.
- iv) 6% (cumulative not exceeding 93%) of the erection, testing and commissioning price on Take Over of plant.
- v) 7% (cumulative not exceeding 100%) of the erection, testing and commissioning price on satisfactory completion of warranty period.

Further break-up of erection activities of the above identified equipment for progressive payments shall be as setforth in Milestone payment schedule.

8.8 Civil, Structural and Architectural Price

- i) 0-5% (max 5%) of total civil, structural & architectural price as Advance Payment and fulfilment of conditions in sub-clauses 8.1 and 8.2 above and on establishment of site office by the Contractor at site.
- ii) 75% (cumulative not exceeding 80%) progressive payment on certification by the Owner/Owner's representative on the basis of the work performed of total civil, structural and architectural price of the package as per the payment stages as setforth in Milestone Payment Schedule.
- iii) 7% (cumulative not exceeding 87%) of total civil, structural and architectural price component on successful completion of Reliability Run as per contract.
- iv) 6% (cumulative not exceeding 93%) of total civil, structural and architectural price component on Taking Over.
- v) 7% (cumulative not exceeding 100%) of the total civil, structural and architectural price component on satisfactory completion of warranty period.

8.9 Mandatory Spare Price

- i) The FOB Ex-works including packing and forwarding charges price component of Mandatory Spares shall be paid as indicated below:
 - a) 75% of price component for Mandatory Spares after submission of material despatch clearance and inspection certificate, despatch to Site and submission of requisite shipping documents. An indicative list of the shipping documents is given under Clause 9.3 of these GCC.

- b) 25% of price component for Mandatory Spares on receipt and storage at Site and physical verification by the Owner/Owner's Representative.
- ii) The ocean freight and marine insurance charges and the inland transportation and insurance charges shall be paid to the Contractor pro-rata to the value of Mandatory Spares received at Site on production of invoices by the Contractor.
- iii) Tools and tackles Prices: This shall form part of Supply Price and shall be claimed under supply payment.

Quantity variation in spares: The Purchaser may vary the quantity of mandatory spares to be ordered provided the ordered quantity results in a "whole number" or a "complete set". Order for spares with quantity expressed as a fraction will not be made. Variation in quantities, indicated in percentage or LOT will not be made. However, complete deletion of any item can be made.

8.10 **Not Used**

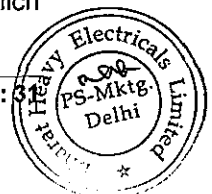
8.11 **Schedule of Payments**

Based on the terms of payment in clauses mentioned above and work schedule payment of Contract Price component linked with achievement of Milestones shall be paid in accordance with Milestone Payment Schedule. The Milestone payment schedule specifies the installments of Contract Price, and the Milestones to be achieved and the payment thereunder shall be subject to the following:

- i) The installments quoted in the Milestone payment Schedule may be modified by Owner / Owner's representative if progress is not as scheduled.
- ii) Payment shall be made on the date which is the later of (i) accomplishment of a milestone and (ii) the date fixed for accomplishment of such a milestone as set out in the Milestone Payment Schedule.
- iii) Submission of documentation/data to Owner/Owner's representative for approval.
- iv) Submission of monthly progress reports and updated Network Schedule

8.12 **Application for Interim Payment Certificates and Claim for Payments**

8.12.1 The Contractor shall submit a statement (the **Interim Payment Certificate**"), in six copies to the Owner/Owner's representative after the end of each month before the tenth day of the next month, in a form approved by the Owner/ Owner's representative, showing the amounts to which the Contractor considers himself to be entitled, together with supporting documents which



shall include the detailed report on the progress during the month. In order to be eligible for payment, the Interim Payment Certificate shall include the following items, as applicable, which shall be expressed in the currencies in which the contract price is payable, in the sequence listed:

- i) The estimated contract value of the Design and construction documents produced and the Works executed up to the end of the month (including variations but excluding items described in subparagraphs (iv) to (vii) below);
- ii) Certification from Owner/Owner's representative that the applicable Work has been performed and that the quality of Work described in the Interim Payment Certificate is in line with contract;
- iii) If there is any pending or threatened dispute, regarding Work covered by such request or payment as a result of which Contractor intends to withhold payment from such sub-Contractor, a report detailing such dispute and circumstances thereof;
- iv) Any amounts to be added and deducted for which Change Order has been issued;
- v) Any amounts to be added and deducted for the Advance Payments and repayments in accordance with clause 8.3 above;
- vi) Any other additions or deductions which may have become due in accordance with the Contract including, without limitation, deduction on account of liquidated damages.
- vii) The deduction of the amounts certified in all previous Interim Payment Certificates.
- viii) Any other information that the Owner/Owner's representative may reasonable request.

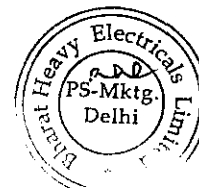
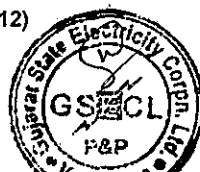
8.12.2 Contractor shall raise its consolidated invoices/bills only once a month.

8.13 Mode of Payment

8.13.1 For supply of Equipment and Mandatory Spares:

The mode of payment by Owner to the Contractor shall be mutually agreed before finalization of Contract. The same may be by way of establishing an irrevocable Letter of Credit (L/C) in favour of the Contractor through a bank in case of supplies of Non-Indian origin directly to Owner and through a nationalized bank to be nominated by the Contractor in case of Indian Supplies only for payments due on despatch of equipment or by way of direct disbursement of loans. The payment will be made through usance L/C as per credit period of payment specified in the specification. The L/C format will be mutually decided during finalization of Contract.

The value of L/C will be as per payment schedule for each quarter and valid for a quarter. It will be the responsibility of the Contractor to utilize the L/C to the fullest extent. In case L/C has been established by the Owner and not utilized by the Contractor, all reinstatement charges for the L/C for further period necessitated due to non-utilization of L/C will be to the account of the



Contractor.

All L/C charges shall be to Owner's account except L/C charges for confirmation by Contractor's bank which will be borne by the Contractor. For non-Indian supplies, Contractor shall be responsible for all permits, licenses and the like from respective authorities necessary for export of equipment from the respective countries to the Owner.

8.13.2 For Other Payments

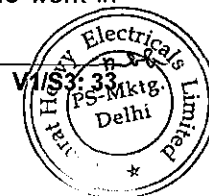
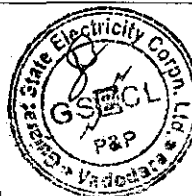
The payment of advance(s), price adjustment, any other supply payment, ocean freight, marine insurance, Taxes (wherever admissible), inland transportation (including port handling), insurance, civil and architectural works and for the erection portion of the Works shall be made direct to the Contractor by the Owner.

8.13.3 Unless otherwise agreed by the parties, payments by Owner to Contractor, shall be made in currencies as per Schedule of Prices by cheque to an account or accounts designated by Contractor and maintained by Contractor or by such other person or entity at a bank or banker in Vadodara, Gujarat, India in writing. Extra Work shall be paid in accordance with the applicable Change Order as part of the work under the Contract. Once all acts necessary to initiate the relevant wire transfer have been completed within the time specified for such payments, any delays within the international or domestic banking system in the transfer of such payments to Contractor's account or accounts as aforesaid shall not give rise to a claim that Owner has breached its payment obligations hereunder.

Payment will be made in the respective currencies quoted by the bidder for onshore supply for import content of raw material of onshore supply. Bidder shall have to provide the drawdown schedule in respective currencies & to include in price bid accordingly.

8.13.4 The Owner shall pay the amount certified in each Interim Payment Certificate within 30 days from the date on which the Owner/Owner's representative received the Contractor's statement and supporting documents and the Owner shall pay the amount certified in the Final Payment certificate within 120 days from the date of issue of the Take Over certificate.

8.13.5 Pursuant to this clause-8.0, if the commercial banks are closed due to a public holiday, period as above shall be extended to the first business day after the end of the period concerned. In addition, unless the parties otherwise agree, Owner shall not be obligated to pay, in respect of any request for payment, any amount in excess of 100% of the cumulative amount anticipated to be paid for work completed to such date, as set forth in the projected payment schedule as per Schedule of Prices. If any request for payment does not comply in all material respects with the Contract, Owner shall inform Contractor about the same within 15 days following the receipt of such request for payment, and Contractor shall re-submit such request for payment. If less than the full amount is paid, Owner shall state in writing the reasons for paying such lesser sum. Any dispute regarding Owner's payment of a lesser sum than that set forth in a request for payment must be raised by Contractor within 30 days of receipt of such payment, or Contractor's right to dispute such payment is waived. During the pendency of any such Dispute and the resolution thereof, Contractor shall continue to perform the work in



accordance with the provisions set forth herein.

8.14 **Payments Withheld**

8.14.1 Owner shall have the right to withhold from any payment due to Contractor, including the final payment, such amounts as Owner reasonably deems necessary or appropriate to protect it because of any one or more of the following reasons:

- i) Defects in any work, which might affect Owner's ability to operate Unit or Plant as contemplated herein, whether or not payment has been made therefor;
- ii) The filing of a any vendor/tradesman's lien or similar encumbrance in respect of the work or the plant (or any portion thereof);
- iii) A dispute as to the accuracy or completeness of any request for payment received by Owner pursuant to this clause-8.0 within 90 days of receipt thereof or payment made thereunder;
- iv) Contractor's failure to deliver any Performance Securities and additional performance to Owner as in the Contract;
- v) Any requirement in accordance with Applicable Laws to withhold any Taxes payable by Contractor in respect of the work or any part thereof; and
- vi) Contractor's failure to make payments to sub-Contractors or workers for work, including amounts withheld by Contractor because of disputes between Contractor and such Persons.

8.14.2 In addition to the provisions of this clause-8.0 which relates to the recovery by the Owner of any amounts that the Owner may have paid, for which the Contractor is liable under the contract, the Owner shall also be entitled to recover all the dues in terms of the contract including liquidated damages for delay, liquidated damages for the shortfall in the guaranteed performance parameters, etc by way of deductions from the payments due to the Contractor or that may become due to the Contractor in future or from any securities/guarantees under the contract and/or otherwise.

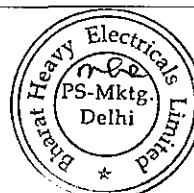
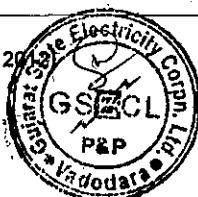
8.14.3 Notwithstanding any dispute that Contractor may have, and regardless of the basis thereof or grounds there for, Contractor agrees that it will, for so long as the Contract has not been terminated diligently prosecute the Work up to Take over of Plant, all in accordance with the terms of the Contract.

9.0 **SHIPPING PARTICULARS**

9.1 The Contractor shall be responsible for the correct appraisal of freight rates, weights and volumes of structural's or machinery as the case may be. The Owner shall not be liable to pay any warehouse or wharf age charges due to the necessity of storing Goods awaiting shipment.

9.2 All consignments shall be addressed to and the bill of lading and other shipping documents shall be made in the name of the Consignee.

9.3 After shipment is effected, the following documents shall be forwarded to the



Consignee by registered air mail/courier services.

- | | | |
|------|--|---|
| i) | The original bill of lading in duplicate and four (4) non-negotiable copies of the same. | |
| ii) | F.O.B. invoices | Six (6) copies including one (1) original |
| iii) | Freight invoice & freight details | Six (6) copies including one (1) original |
| iv) | Insurance premium receipts or certificates | - Ditto - |
| v) | Packing list | - Ditto - |
| vi) | Certificate of origin | Six (6) copies including one (1) original |

10.0 **DELIVERY TERMS**

10.1 When the Goods are ready for shipment, the Owner should be notified by the Contractor through fax or email. Notification of dispatch and delivery in regard to each and every consignment shall be made to the Owner immediately after dispatch and delivery in case of delivery at either the Site or at the port of entry as applicable at least forty-eight (48) hours ahead of actual delivery. The Contractor shall further supply to the Consignee an invoice and packing list of all Goods dispatched or delivered by him and other shipping particulars. All packages, containers, bundles and loose materials forming part of each and every consignment shall be described fully in the packing list, and full details of the contents of packages and quantity of goods shall be submitted to the Owner.

10.2 For the Goods imported by the Contractor, the Contractor shall deliver the Goods at CIF price. The Contractor shall also make all arrangements to deliver the Goods to the location specified in Technical Specifications.

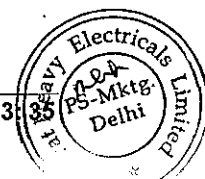
11.0 **LIQUIDATED DAMAGES**

11.1 **Delay**

Scheduled dates for Commissioning will be as specified in Schedule [insert] of the Contract. If the Contractor fails to achieve Commissioning within the time fixed thereof, he shall be liable to pay liquidated damages for the delay at the rate of half percent (½%) of the total Contract Price per week of delay. The total amount of liquidated damage on account of delay shall not exceed 10% of the Total Contract Price considering all types of Contracts including supply and erection.

11.2 **Failure to meet Performance Guarantees**

The liquidated damage for non fulfillment of Performance Guarantees will be as indicated below.



Sl. No.	Item	Value
1.	For increase in each Kcal/KWh of weighted average plant overall heat rate.	Rs. 7.5 Crores
2.	For every KW shortfall in gross power output at generator terminal	Rs. 100,000
3.	For increase in Auxiliary Power Consumption per KW	Rs. 200,000
4.	For every m³/hr increase in DM water consumption	Rs. 1 Crore

The total amount of liquidated damage for non fulfillment of Performance Guarantee shall be maximum 10% of the Contract Price considering all types of Contracts including supply and erection.

- 11.3 The total amount of liquidated damages on account of delay in Commissioning and non-fulfillment of Performance Guarantees shall not in any case exceed fifteen percent (15%) of the total Contract Price. The Owner shall deduct the amount of such liquidated damage from any money due or which may become due to the Contractor under the Contract, and/or recover such liquidated damage from the Performance Guarantee of the Contractor. To be entitled to impose the liquidated damage, the Owner will not be required to prove that he has incurred such amount as actual damages.

Liquidated damages to be paid in currency of the Contract Price on Pro-rata basis.

- 11.4 Rejection

If the total aggregate liquidated damages for short fall in Performance Guarantees of all parameters (shortfall in HR, power output, DM water consumption, Auxiliary Power Consumption) will be higher than 10% of the Contract Price then the Owner may at its option, either,

(a) Reject the Equipment/plant and recover the payments already made

Or

(b) Terminate the Contract pursuant to GCC 24.0 and recover the payments already made;

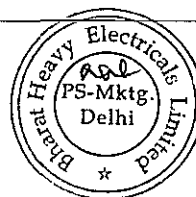
Or

© Accept the equipment after levy of liquidated damages in accordance with the provisions specified in GCC 11.0 of Contract Agreement.

- 12.0 **SHOP ASSEMBLY AND INSPECTION**

- 12.1 Shop Assembly

Shop Assembly to the largest extent feasible shall be performed by the Contractor to assure proper fitting of the various parts, and for checking the correctness of clearances and dimensions. Parts thus assembled shall be match-marked for reassembly at the Site, prior to dismantling for shipment. A detailed description of the intended shop assemblies shall be submitted along with a quality assurance plan.



12.2 Inspection before Shipment

No Goods shall be shipped before all tests and inspections have been carried out according to the Approved quality assurance plan unless otherwise instructed by the Owner.

The acceptance of any Goods prior to shipment shall in no way relieve the Contractor of any of his responsibilities for meeting all the requirements of the Specification and shall not prevent subsequent rejection if such Goods are found to be defective.

Incase inspection of Equipment/Goods needs visiting foreign countries, cost of 10 man visits shall be considered in the contract..All expenditure including that for travel shall be borne by bidder.

13.0 **CONTRACTOR'S DRAWINGS AND DATA**

13.1 a) The Contractor shall be responsible for developing detailed Drawings to adopt equipment and materials to be supplied to the requirements indicated in the Specification and shall submit a list of such Drawings and a programme for submission of these Drawings and documents within ninety (90) days from the date of receipt of the Notice to Proceed.

b) The Contractor shall also provide the Owner with the following Drawings and documents in the number of copies mentioned in Technical Specifications as per agreed schedule.

i) Technical particulars conforming to the Specifications.

ii) Outline drawings of major equipment together with weights and sufficient overall dimensions.

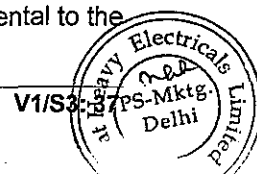
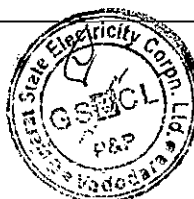
iii) Other drawings and documents as indicated in the Technical Specifications.

c) The Contractor shall, prior to submitting the Drawings and documents, submit to the Owner two copies of the Codes and Standards other than Indian Standards and Codes which shall govern the Works.

13.2 Copyright in the Owner's requirements and other documents issued by the Owner or the Owner's Representative to the Contractor shall (as between the parties) remain the property of the Owner.

The copyright in all drawings, documents and other materials containing data and information furnished to the Owner by the Contractor herein shall remain vested in the Contractor or, if they are furnished to the Owner directly or through the Contractor by any third party, including suppliers of materials, the copyright in such materials shall remain vested in such third party. The Owner shall however be free to reproduce all drawings, documents and other material furnished to the Owner for the purpose of the Contract including, if required, for operation and maintenance of the Facility

13.3 The Contractor shall indemnify the Owner in case of breach of this clause by the Contractor. If these documents are received by a third party from the Contractor and the third party makes use of these documents detrimental to the



Owner or use these documents for their personal gain, the Contractor shall compensate the Owner for the loss suffered as well as for the value of gain derived by third party.

14.0 **MISTAKES IN DRAWINGS**

The Contractor shall be responsible for and shall pay for any alterations of the Work due to any discrepancies, errors or omissions in the Drawings or other particulars supplied by him whether such Drawings or particulars have been Approved by the Engineer or not.

15.0 **MATERIALS AND WORKMANSHIP FOR MANUFACTURER**

All Goods to be supplied and all Works to be done by the Contractor under the Contract shall be manufactured and executed in the manner stipulated in the Specifications.

The Contractor shall use the best available materials for the Works. These materials shall be of recent manufacture, free from defects and imperfections and unused.

The highest standards of safety shall be adhered to during execution of the Works.

16.0 **COMPLETENESS OF EQUIPMENT**

The equipment supplied shall be complete in all respects. The Contractor shall not be eligible for any extra payment in respect of such mountings, fittings, fixtures and accessories if required for the safe and reliable operation of the equipment.

Parts of all similar equipment supplied shall be interchangeable with one another.

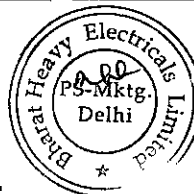
17.0 **CERTIFICATE OF THE OWNER**

Every application to the Owner for a certificate must be accompanied by a detailed invoice (in quadruplicate) setting forth in order of the schedule of quantities and prices as per Approved billing breakdowns of the Works executed and/or Goods ready for dispatch up to the date of claim. The certificate relating to such Goods and Work as in the reasonable opinion of the Engineer in accordance with the Specifications shall be issued within thirty (30) days of receipt of the application.

The Owner may, with any certificate, make any corrections or modifications to any previous certificates issued by him. The payments to be made against invoices under certification will be regulated and adjusted accordingly.

18.0 **OWNER'S DECISION**

In respect of all matters which are left to the decision of the Owner, including the granting or withholding of certificates; the Owner shall, if required to do so by the Contractor, give in writing a decision thereon and his reasons for taking such decision. If in the opinion of the Contractor, a decision made by the Owner



is not in acceptance with the meaning and intent of the Contract, the Contractor may file with the Owner within fifteen (15) days after receipt of the decision, a written objection to the decision. Failure to file such an objection within the allotted time will be considered to be acceptance of the Owner's decision and the decision shall become final and binding.

The Owner's decision and the filing of the written objection of the Contractor thereto shall be a condition precedent to the right to request for arbitration. It is the intent of the Contract Agreement that there shall be no delay in the execution of the Work in such cases and the decision of the Owner as given shall be promptly observed.

19.0 **CERTIFICATE NOT TO AFFECT THE RIGHT OF THE OWNER OR THE CONTRACTOR**

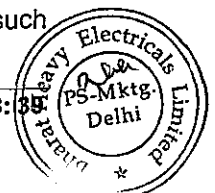
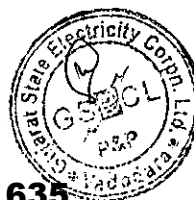
No certificate of the Engineer on account, nor any sum paid on account by the Owner, nor any extension of time for the execution of the Work by the Contractor under the powers granted by item "Certificate of the Owner" shall affect or prejudice the rights of the Owner against the Contractor, or relieve the Contractor of his obligations for the due performance of the Contract or be interpreted as Approval of the Work done or of the Goods supplied. No certificate shall create the liability for the Owner to pay for alterations, amendments, variations or additional work not ordered in writing by the Owner, or discharge the liability of the Contractor for payment of damages, whether due, ascertained or certified or not or of any sum against the payment of which he is bound to indemnify the Owner, nor shall any such certificate nor the acceptance by him or any sum paid on account or otherwise, affect or prejudice the rights of the Owner against the Contractor.

20.0 **OWNER ACCEPTANCE AND TAKE OVER CERTIFICATE**

In order to achieve Owner acceptance, Contractor must certify to the satisfaction of Owner/Owner's representative that:

- i) Reliability Run Test and Performance Guarantee Test have been completed to the satisfaction of Owner.
- ii) All punch list and pending issues have been completed in accordance with the contract;
- iii) All the Contractor's and sub-Contractor's personnel, supplies, unused materials, waste, rubbish and temporary facilities located at or near such plant have been removed from such location,
- iv) All other provisions of and all items required by the Contract have been performed or delivered, as the case may be, in accordance with the Contract and in a manner satisfactory to Owner.
- v) Contractor has delivered to Owner a Project Completion certificate certifying satisfactorily completion of each of the conditions set forth in sub-clauses -20(i) to 20(iv) above.

Upon certification by Contractor of satisfactory completion of sub-clauses -20 (i) through 20(iv), Owner shall issue a Take over Certificate certifying such



matters within 60 (Sixty) days

21.0 **WARRANTY**

21.1 The Contractor hereby provides following Warranty in respect of the Equipment to be furnished by the Contractor:

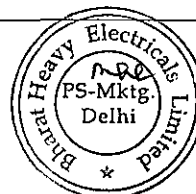
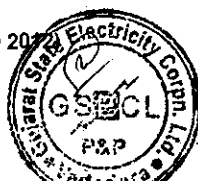
- a) All Equipment shall be new and in accordance with the Contract and shall be fit for the intended purposes,
- b) All Equipment shall be free from any defect due to faulty design, materials and/or workmanship.
- c) The Equipment shall perform satisfactorily and the performance and efficiencies of the specified Equipment shall not be less than the respective guaranteed values.
- d) The efficiencies, temperature rise and other performance data of all other Equipment shall be as per the Contract.
- e) All other Works including civil, structural and architectural works shall be in accordance with the Contract and free from any defect and omission.
- f) The Work will be designed so that the Plant is capable of being operated in a safe, reliable, economic and efficient manner, in accordance with the requirements of the Contract.

The Contractor undertakes to reaffirm the above Warranty, if so required by the Owner, in such forms as prescribed by the Owner and shall be signed by the Contractor and, if so required by the Owner, by Sub-contractor(s) of the Contractor.

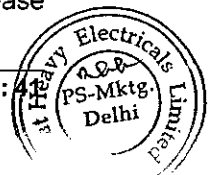
If the Contractor finds, after his Tender is accepted, that a variation in work, construction technique or the quality of materials is necessary to fulfill the Warranty called for, such variations may be made with the approval of the Owner, provided the request for changes is made during execution of the contract Agreement and the changes are to be made without any increase in the price.

21.2 The Warranty shall be valid for a period of twelve (12) calendar months commencing from the date of Taking Over of the fully completed Plant at the discretion of the Owner. This period of the Warranty shall be referred to as the "**Warranty Period**".

21.3 During the Warranty Period, the Contractor's liability shall be limited to the replacement of any defective parts that may develop in Plant, of his own manufacture or those of his associate(s) and Sub-contractor(s) under the conditions provided for by the Contract under proper use and arising from faulty design, materials or workmanship. All such replacements of defective parts mentioned above shall be made free of cost at Site by the Contractor and the return of the defective parts to the Contractor's works shall be the Contractor's responsibility and shall be made at his expense. In the case of these defective parts which are not repairable at Site but are essential, in the Owner's opinion, for the commercial operation of the Plant or the Equipment, the Contractor shall replace at the Site, free of cost of the Owner the said defective parts before the



- defective parts are removed to his Works in such a manner which will minimize interruption in the operation of the Plant and/or the Equipment. Provided always that such defective parts as are not repairable at Site, and are not essential in the meantime in the commercial use of the Plant, may be taken by the Contractor to the Contractor's works for repairs unless otherwise arranged. The decision to replace/repair the defective items shall be discussed and mutually agreed at appropriate stage.
- 21.4 The cost of any special or, general overhaul rendered necessary during Warranty Period due to defects in the Plant or defective Work shall be borne by the Contractor. The Owner will, however, render such assistance in this matter as will expedite the same.
- 21.5 If for rectification or replacement of any part of equipment or work due to defective materials, manufacture or design or workmanship, the services of the Contractor's personnel are requisitioned within the Warranty Period, these services shall be made available free of any cost to the Owner.
- 21.6 If it becomes necessary for the Contractor to replace or renew any defective portions of the Plant under this Clause, the provisions of this Clause will apply to the portions of the Plant so replaced or renewed until the expiration of **Extended Defects Correction Period**. Further, the Contractor shall ensure that the Performance Bank Guarantee shall remain outstanding or a replacement on-demand bank guarantee is delivered to the Owner in an amount equal to one hundred percent (100%) of the estimated value of each such item until the Extended Defects Correction Period applicable thereto has expired.
- 21.7 If any defect be not remedied within a reasonable time, the Owner may proceed to do the work at the Contractor's risk and expenses but without prejudice to any other rights which the Owner may have against the Contractor in respect of such defects.
- 21.8 If the replacements or renewals are of such character as may affect the efficiency of the Plant, the Owner shall have the right to give to the Contractor within one (1) month of such replacement or renewal, notice in writing that "tests on completion" be made, in which case such tests shall be carried out as provided in Clause on Tests on completion and Trial Run at the Site" in the Technical Specifications. Should such tests show that the Plant sustains the guarantee given in the Contract; the cost of the test shall be borne by the Owner. Should the guarantee be not sustained, the cost of the test shall be borne by the Contractor. Further, all necessary works will be carried out by the Contractor to achieve guarantee given in the contracts and perform tests to prove the same at his own cost.
- 21.9 Until the final certificate has been issued, the Contractor shall have the right of entry at his own risk and expenses by himself or his duly authorised representatives whose names shall previously have been communicated in writing to the Owner at all reasonable working hours of the Plant and taking notes there from and, if he desires, at his own expenses making any tests, subject to the approval of the Owner that will not be unreasonably withheld.
- 21.10 The issue of the Taking over Certificate shall in no way exempt the Contractor from the provisions of this Clause 21.
- 21.11 At the end of the Warranty Period, the liability of the Contractor shall cease



other than in respect of items which are subject to an Extended Defects Correction Period.

21.12 The Contractor shall provide, at the Site, at least one (1) control and instrumentation engineer, one (1) electrical engineer, one (1) mechanical engineer and one (1) operation expert during the Warranty Period without additional cost to the Owner.

21.13 The Contractor agrees that any item of Equipment replaced or rectified during the Warranty Period shall conform to the Technical Specifications of the corresponding original Equipment and if required by the Owner, the Contractor shall demonstrate such conformance through suitable means (to be decided by the Contractor at its sole discretion) including inspection by the Owner, shop testing or operation of the Equipment of which the replaced equipment/material constitutes a part.

21.14 **WARRANTY FOR SPARES**

In addition to the foregoing, the Contractor warrants that all spares supplied will be new and in accordance with the Contract and will be free from defects in design, material and workmanship and further guarantee as under:

For mandatory spares and two (2) years recommended spares:

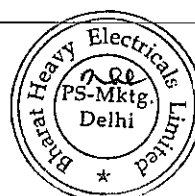
For item of spares ordered or to be ordered by the Owner for two (2) years operational requirement of the Plant which are manufactured as a continuous operation together with the corresponding main equipment/ component, the Warranty will be twelve (12) months from the Taking Over of the Plant under the Contract. In case of any failure in the original Equipment due to faulty designs, materials and workmanship, the corresponding spare parts if any, supplied shall be replaced without any extra cost to the Owner unless a joint examination and analysis by the Owner and the Contractor of such spare parts prove that the defect found in the original part that failed can safely be assured not to be present in spare parts. Such replaced spare parts will have the same Warranty as applicable to the replacement made for the defective original part/component.

21.15 **Latent Defects:**

Notwithstanding the issue of the Take Over Certificate, the Contractor shall be responsible for making good with all possible speed any Latent Defect in any Works /equipment of the plant which appears at any time before the expiry of defect liability period. And shall remedy such defect at its own cost and expense. The latent defect liability period shall be a minimum of 5 years from the end of defect liability period. The defects to which this applies are defects in design, materials or workmanship or defects arising from any act or omission of the Contractor done or omitted prior to Take-over of the portion of the Plant affected by the defects or during the Warranty Period which a reasonable examination at the end of the Warranty Period would not have disclosed.

22.0 **DEFAULT OF CONTRACTOR**

Termination upon Contractor's bankruptcy or default:



22.1 In the event the Contractor:

- (i) Contractor is adjudged a bankrupt or insolvent, or
- (ii) Contractor makes a general assignment for the benefit of its creditors, or
- (iii) A trustee or receiver is appointed for Contractor or for any of its property, or
- (iv) Contractor files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or similar laws, or
- (v) Contractor fails to supply sufficient skilled workers or suitable materials or Equipment, or fails to commence the Work or abandons the Work or part thereof or fails to rectify any Work done that has been objected or rejected to by the Owner or if it fails to make prompt payments when due to Subcontractors or for labour, materials or equipment, or
- (vi) Contractor otherwise commits a material breach of any of the terms of the Contract,

Then Owner may, without prejudice to any other right or remedy Owner may have hereunder or at law or in equity, at any time terminate the Contract upon 30 days' notice to Contractor, provided such event or breach is not remedied within such 30 days period or, if the breach or default cannot reasonably be cured within 30 days, such longer period (not to exceed 90 days) as may be reasonably necessary to cure such breach or default. Owner may terminate the Contract immediately upon notice to Contractor if Contractor disregards a material provision of any Applicable Law. Owner may terminate the Contract, upon 30 days' notice, if Contractor disregards any other provision of Applicable Law, provided any such failure is not remedied within such 30 days period. Contractor shall receive no Termination Payment or other cancellation payments in the event of a termination under this clause, but Contractor shall be entitled to any part of the Contract Price then due and payable for the Works already performed.

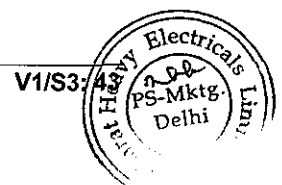
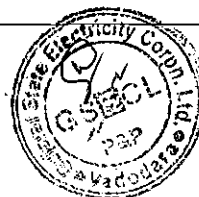
23. Not used

24. FORECLOSURE OF CONTRACT

Termination for Owner's Convenience:

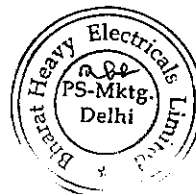
Owner may at will for its convenience at any time and without cause, terminate the Contract upon 30 days prior written notice to the Contractor.

Immediately upon receipt of such notice, Contractor shall stop performance of the Works, stop all further sub-contracting or purchasing activity, and terminate Sub-contracts; handover all Documents, equipment, materials and spares relating to the Works prepared by the Contractor or procured from other sources up to the date of termination for which the Contractor has received payment equivalent to the value thereof and shall immediately order & commence demobilization and remove all Contractor's Equipment, which is on Site and repatriate all his staff and labour from the Site.



Consequences of Termination.

- 24.1 Termination for Contractor's bankruptcy or default under Clause 22
- 24.1.1 In the case of termination by Owner for default or bankruptcy under the circumstances contemplated by Clause 22, Contractor shall not, pending settlement of Owner's claims by reason of such termination, be entitled to receive any further payment and shall protect, defend, indemnify and hold Owner harmless from and against all Losses arising directly or indirectly from or incurred by reason of such termination and, in any event, Owner shall not be liable to Contractor for any amount of the Contract Price in excess of the percentage of Work actually completed by the termination date multiplied by the Contract Price ("**Work Value**").
- 24.1.2 In addition, should the aggregate amount of the Contract Price actually paid prior to termination exceed the Work Value, Contractor shall pay to Owner an amount equal to such excess within thirty (30) days after receipt of an invoice from Owner therefor.
- 24.1.3 Accrued or actual or potential liabilities of Contractor under the Contract, for acts and omissions with respect to Work partially or fully completed at the time of termination shall not be affected by any such termination.
- 24.1.4 In furtherance of the foregoing, Owner shall have the right (either with or without the use of Contractor's Equipment) to finish the Work itself or with the assistance of third parties and Contractor shall be liable for the excess of the total cost of the Work actually incurred by Owner to all parties, persons or entities over the price for the Work originally contracted for hereunder.
- 24.1.5 In particular, to complete the Work, Owner shall have the right to take possession of and use, or to permit any third party to use, all Contractor's Equipment on or about the Site which are the property of Contractor. Rent for use of equipment by Owner and indemnification thereof shall be provided by GSECL.
- 24.1.6 Upon completion of the Work, all such Contractor's Equipment shall be returned to Contractor, subject to the right of Owner (which shall constitute a lien on such Contractor's Equipment) to sell the same and apply the proceeds to any claim which Owner may then have against Contractor.
- 24.1.7 Owner shall have the right at its sole discretion to select third parties to assist in or undertake such completion of the Work, such selection to be based upon such criteria as Owner shall determine.
- 24.2 Termination for Owner's Convenience under Clause 24
- Upon termination of the Agreement under Clause 24 (for Owner's Convenience), Contractor shall be entitled to be paid:
- (a) all actual documented costs incurred by Contractor, as audited and accepted by an independent certified public accounting firm of national reputation selected by Owner and acceptable to Contractor, incurred or that could not be avoided in connection with performance by Contractor



of Works as of the date of the Termination which were not previously paid for by Owner, and

- (b) all actual documented costs incurred by Contractor, if such cost is part of the Contract Price, in connection with the items procured/facilities executed by Contractor in connection with the services for which Contractor has not been paid, provided that such items are delivered to Owner at the Project Site together with all documents necessary to transfer title thereto to Owner (the 'Termination Payment').

As a condition precedent to receiving the Termination Payment, Contractor shall execute and deliver all such papers and take all such steps, including the legal assignment of Contractor's contractual rights, as Owner may require for the purpose of fully vesting in Owner all rights, title and interests of Contractor in and to all subcontracts, purchase orders, warranties, guarantees and other agreements.

All claims by such contractors and Subcontractors to be due and owing for Services and other work performed prior to such date shall constitute debts between Contractor and Subcontractors, and Owner shall in no way be liable for such sums. Contractor shall include in all agreements and contracts entered into with contractors and Subcontractors a provision providing for the foregoing.

- 24.3 Upon any termination aforesaid, Owner may at its option elect to (a) assume responsibility for and take title (to the extent title has not previously passed to Owner) to and possession of the Plant and any or all work, materials or equipment remaining at the Facility Site, and (b) succeed automatically, without the necessity of any further action by Contractor, to the interests of Contractor in any or all contracts and Subcontracts entered into by Contractor with respect to the Plant

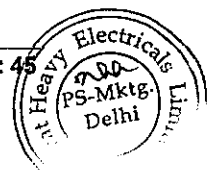
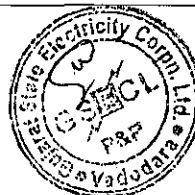
- 24.4 Surviving Obligations:

Termination of the Contract (a) shall not relieve either Party of its obligations with respect to the confidentiality of Proprietary Information as set forth elsewhere (b) shall not relieve either Party of any obligation hereunder which expressly or by implication survives termination and (c) except as otherwise provided in any provision of the Contract expressly limiting the liability of either Party, shall not relieve either Party of any obligations or liabilities for loss or damage to the other Party arising out of or caused by acts or omissions of such Party prior to the effectiveness of such termination or arising out of such termination and shall not relieve Contractor of its obligations as to portions of the Works already performed or of obligations assumed by Contractor prior to the date of termination.

- 24.5 Verification of the Termination:

Contractor shall, within 90 days of any such termination of the Agreement submit to Owner all invoices and other documentation as is sufficient to enable Owner to verify the performance of the Works and Contractor's costs associated therewith and to determine the amount of the Termination Payment. Termination Payment shall not include the costs of future anticipated profit or restocking charges.

Payment and Limitation of the Termination Payment. Owner shall pay the



Termination Payment to Contractor within 90 days of Owner's receipt of the documentation required under the clause: Verification of the Termination.

24.6 Limitation of Liability:

24.6.1 Payment of the Termination Payment shall be sole and exclusive liability of Owner, and the sole and exclusive remedy of Contractor, with respect to termination of the Contract pursuant to above clauses. In no event shall Owner have any further liability to Contractor in any such event for Consequential Damages.

24.6.2 (a) It is clarified here that except in cases of criminal negligence or wilful misconduct, the Contractor shall not be liable to the Owner, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the Contractor to pay liquidated damages to the Owner; and

(b) the aggregate liability of the Contractor to the Owner, whether under the Contract, in tort or otherwise, shall not exceed the total Contract Price, provided that this limitation shall not apply to any obligation of the Contractor to indemnify the Owner with respect to patent infringement.

For the avoidance of doubt it is hereby clarified that the Contractor's liability to pay the amounts pursuant to Clause 24.1.2 and/or Clause 24.1.4 shall not be excluded, or interpreted in any manner to be excluded under Clause 24.6.2(a) above, however such sums shall be considered towards the threshold for limitation of liability under Clause 24.6.2(b)

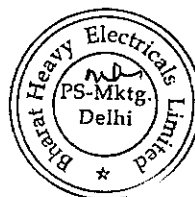
24.7 The Contract shall not be liable to be terminated except in accordance with the express provisions of the Contract.

25.0 **DEDUCTION FROM CONTRACT PRICE**

All costs, damages or expenses which the Owner may have paid, for which under the Contract, the Contractor is liable, will be claimed by the Owner. All such claims shall be billed by the Owner to the Contractor regularly as and when they fall due. Such bills shall be supported by appropriate and certified vouchers or explanations, to enable the Contractor to properly identify such claims. Such claims shall be paid by the Contractor within fifteen (15) days of the receipt of the corresponding bills and if not paid by the Contractor within the said period, the Owner may then deduct the amount, from any money due or becoming due by him to the Contractor under the Contract or may be recovered by actions of Law or otherwise, if the Contractor fails to satisfy the Owner of such claims.

26.0 **ASSIGNMENT OF CONTRACT**

The Contractor shall not assign its rights or obligations under the Contract without prior approval of the Owner. Any assignment in violation of this Clause shall be null and void. Further, such assignment, if approved by Owner, shall not relieve the Contractor from any obligations, duty, or responsibility under the Contract.



27.0 **SUBCONTRACTING**

27.1 Equipment

The Contractor may, after informing the Owner and getting his Approval, assign or subcontract any part of the Contract other than for raw materials, to manufacturers which are identified in Schedule [insert] of the Contract. Sub-contractor(s) not identified in Schedule [insert] of the Contract or any change in the identified sub-contractor(s) shall be subject to approval by the Owner. Provided that subcontracting shall not relieve the Contractor from any obligation, duty or responsibility under the Contract. Provided further that subcontracting to any subcontractor other than those identified in Schedule [insert] without prior approval of the Owner shall be null and void.

27.2 Erection Work

When the job of erection/construction is entrusted with the sub-contractor(s) the name/names of such sub-contractor(s) shall be approved by the Owner as elaborated above. Such subcontracting shall not relieve the Contractor from any obligation, duty or responsibility under the Contract.

27.3 Notwithstanding anything to the contrary contained herein, the Contractor shall remain solely responsible for and shall obtain all permits, licenses, approvals and authorisation as may be required under all applicable laws and regulations in India in respect of any award or performance of any transfer, sub-contract, sub-letting or assignment pursuant hereto.

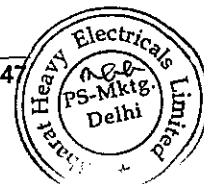
27.4 Notwithstanding any transfer, assignment or sub-letting with the approval of the Owner as aforesaid, the Contractor shall be and shall remain solely responsible and liable to the Owner for the quality, proper and expeditious execution and performance of the Works and for due performance and observance of all the conditions of the Contract in all respects, as if such transfer, assignment or sub-letting has not taken place and as if the Work so transferred, assigned or sub-let has been done directly by the Contractor.

28.0 **FORCE MAJEURE**

"Force Majeure Event" shall mean any event or circumstance or combination of events or circumstances referred to below that wholly or substantially prevents or unavoidably delays any Party in the performance of its obligations under the Contract, but only if and to the extent that such events and circumstances are not within the reasonable control, directly or indirectly, of the affected Party and could not have been avoided if the affected Party had taken reasonable care.

(a) Any cause which is beyond the control of Contractor or Owner, as the case may be (b) natural phenomenon including but not limited to weather conditions, floods, drought, earthquakes and epidemic (c) acts of any Governmental authority (domestic), including but not limited to war (declared or undeclared), revolution, quarantine, embargoes, licensing control or production or distribution restrictions (d) sabotage, riots and civil commotion (e) Nation wide or wide spread strikes or labour disputes extending beyond the Project site. (f) failure or delay in Contractor's source of supply due to force majeure causes enumerated at (a) to (e), provided that the Contractor proves to the satisfaction of the Owner that the supply from the alternate sources were not possible.

Any force majeure event which affects the Contractor's joint venture



partners/collaborators/joint venture company, who have executed the JDU, and which event satisfies the requirements of Clause 28 shall be treated as a "Force Majeure Event"

The following events are explicitly excluded from Force Majeure Events and are solely the responsibility of the affected party:

- i) any strike, work-to-rule action, go-slow, or similar labour difficulty which is not specifically, enumerated in the above clauses (a) to (f);
- ii) late delivery, of plant, machinery, equipment, materials, spare parts or Consumables for the Plant;
- iii) a delay in the performance of any contractor;
- iv) economic hardship;
- v) changes in Applicable Laws;
- vi) Force Majeure events which occur outside India and do not directly involve India comprising: (x) act of war (whether declared or undeclared), invasion armed conflict or act of foreign enemy blockade, embargo, resolution, riot, insurrection, civil commotion, act of terrorism, or politically motivated sabotage or kidnapping or (y) any event or circumstance of a nature analogous to any of the foregoing.

If the Contract is delayed or impeded in the execution of the work by circumstances of Force Majeure as herein defined, then the Contractor/Owner as the case may be, shall, within one week, give notice in writing to the Owner/ Contractor, of the existence of circumstances of Force Majeure, together with the evidence relied upon.

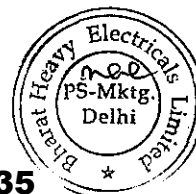
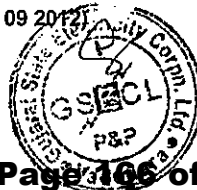
Burden of Proof: In the event that the Parties are unable in good faith to agree that a Force Majeure Event has occurred, the Parties shall submit the dispute to arbitration, provided that the burden of proof as to whether a force Majeure event has occurred shall be upon the Party claiming a Force Majeure Event.

Effect of Force Majeure : Neither party shall be considered to be in default or in breach of his obligations under the Contract to the extent that performance of such obligations is prevented by any circumstances of Force Majeure which arise after the Commencement Date.

In the event that Force Majeure circumstances continue for a period of more than one month, both the parties may discuss and mutually agree upon the future course of action which may include termination of Contract.

The Contractor shall request for extension of Time for Completion due to delay caused by Force Majeure. The Owner may agree to give extension in time as may be justified. However the Owner will not bear any additional cost whatsoever in connection with Force Majeure.

Performance to Continue : Upon the occurrence of any circumstances of any Force Majeure the Contractor shall endeavor to continue to perform his obligations under the Contract so far as reasonably practicable. The Contractor shall notify the Engineer of the steps he proposes to take including any reasonable alternative means for performance which is not prevented by Force Majeure. The Contractor shall not take any such steps unless directed so to do by the Engineer.



29.0 **PROGRESS REPORTS AND PHOTOGRAPHS**

The Contractor shall furnish three (3) prints each of monthly Progress Reports with photographs of the Works done in his shop . Photographs shall be taken when and where requested by the Owner. Adequate number of photographs shall be submitted indicating various stages of manufacture. Each photograph shall contain the date, the name of the Contractor and the title of the view taken.

Monthly Progress Report shall be submitted by the Contractor. These shall detail the status of design, drawings, procurement of raw materials and manufacture of the equipment and delivery of the equipment. The Owner shall advise the Contractor about the number of copies of progress schedule and photographs he has to submit each month together with the names and addresses of persons to whom they are to be sent. The Contractor shall also furnish actual progress against Works schedule and such other information as the Owner may require to satisfy himself about the timely manufacture and delivery of equipment and timely construction and erection works to suit the commissioning date.

30.0 **CONFIDENTIALITY AND PATENT RIGHTS**

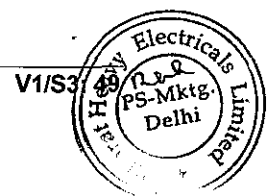
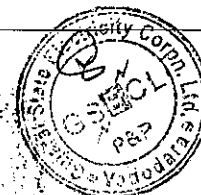
30.1 The Owner and the Contractor shall not, without the written consent of the other Party hereto, divulge to any third party any Confidential Information furnished directly or indirectly by the other Party hereto in connection with the Contract, whether such Confidential Information has been furnished prior to, during or following termination of the Contract. Notwithstanding the above, the Contractor may furnish to its Sub-contractor(s) such Confidential Information that it receives from the Owner to the extent required for the Sub-contractor(s) to perform its work under the Contract, in which event the Contractor shall obtain from such Sub-contractor(s) an undertaking of confidentiality similar to that imposed on the Contractor under this Clause 30.1.

Notwithstanding the above, the Owner may furnish any Confidential Information and other information it receives from the Contractor, to its lenders, other financing parties and to its professional advisors to the extent the same is required directly in relation to the Project or financing of the Project, in which event the Owner shall obtain from such lenders, other financing parties and professional advisors, an undertaking of confidentiality similar to that imposed on the Owner under this Clause 30.1

30.2 Save as provided above, the Owner shall not use the Confidential Information received from the Contractor for any purpose other than the operation and maintenance of the Plant. Similarly, the Contractor shall not use the Confidential Information received from the Owner for any purpose other than the design and procurement of the Plant and Equipment, construction and commissioning of the Facility and provision of other services required for the performance of the Contract

30.3 The obligation of a Party under sub-Clauses 30.1 and 30.2 above, however, shall not apply to the Confidential Information which:

(a) now or hereafter enters the public domain through no fault of that Party



(b) can be proven to have been possessed by that Party at the time of disclosure and which was not previously obtained, directly or indirectly, from the other Party hereto

(c) otherwise lawfully becomes available to that Party from a third party that has no obligation of confidentiality

30.4 The provisions of this Clause 30 shall not in any way modify any undertaking of confidentiality given by either Party prior to the date of the Contract in respect of the Facility or any part thereof

30.5 The Contractor shall indemnify and hold harmless the Owner and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Owner may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract by reason of: (a) the installation of the Facility by the Contractor or the use of the Facility in India; and (b) the sale of the power produced by the Facility in India.

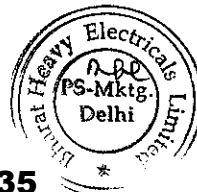
Such indemnity shall not cover: (i) any use of the Facility or any part thereof other than for the purpose indicated by or to be reasonably inferred from the Contract; and (ii) any infringement resulting from the use of the Facility or any part thereof, or the power produced thereby in association or combination with any other equipment, plant or materials not supplied by the Contractor, pursuant to the Contract

30.6 If any proceedings are brought or any claim is made against the Owner arising out of the matters referred to in sub-Clause 30.5, the Owner shall promptly give the Contractor a notice thereof, and the Contractor may at its own expense and in the Owner's name conduct such proceedings or claim and enter into any negotiations for the settlement of any such proceedings or claim.

If the Contractor fails to notify the Owner within twenty-eight (28) days after receipt of such notice from the Owner that it intends to conduct any such proceedings or claim, then the Owner shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Owner within the twenty-eight (28) day period, the Owner shall make no admission that may be prejudicial to the defense of any such proceedings or claim.

The Owner shall, at the Contractor's request, afford all available assistance to the Contractor in conducting such proceedings or claim, and shall be reimbursed by the Contractor for all reasonable expenses incurred in so doing.

30.7 The Owner shall indemnify and hold harmless the Contractor and its employees, officers and Sub-contractors from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Contractor may suffer as a result of any infringement or



alleged infringement of any patent (excluding any infringement or alleged infringement of any patent under Clause 30.5), utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract arising out of or in connection with any design, data, drawing, specification, or other documents or materials provided or designed by or on behalf of the Owner (other than by the Contractor).

Such indemnity shall not cover: (i) any use of the design, data, drawing, specification, or other documents or materials or any part thereof other than for the purpose indicated by or to be reasonably inferred from the Contract; and (ii) any infringement resulting from the use of the design, data, drawing, specification, or other documents or materials or any part thereof in association or combination with any other design, data, drawing, specification, or other documents or materials not supplied by the Owner, pursuant to the Contract.

30.8 The provisions of this Clause 30 shall survive termination, for whatever reason, of the Contract

31.0 **BANKRUPTCY, ETC.**

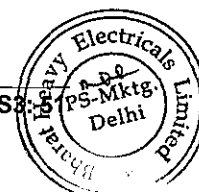
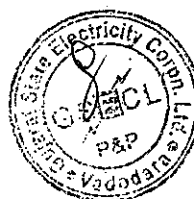
If the Contractor commits any act of bankruptcy or goes into liquidation (except for reconstruction purposes) or carries on its business under a receiver, the executors, successors, or other representatives in law of the estate of the Contractor or any such receiver, liquidator, or any person in whom the Contract may become vested, shall forthwith give notice thereof in writing to the Owner and shall for one month, during which he shall take all reasonable steps to prevent a stoppage of the work, have the option of carrying out the Contract subject to his or their providing such guarantee as may be required by the Owner but not exceeding the value of Works for the time being remaining unexecuted, provided however that nothing above said shall be deemed to relieve the Contractor or its successor of its obligation under the Contract under any circumstance. In the event of stoppage of the Works the Period of the option under this clause shall be fourteen (14) days only, provided that, should the above option be not exercised, the Contract may be terminated by the Owner by notice in writing to the Contractor, and the same power and provision reserved to the Owner by the item Default of Contractor shall apply.

32.0 **INDEMNIFICATION OF THE OWNER**

32.1. The Contractor shall indemnify the Owner of all liabilities incurred by the Owner due to any act or omission on the part of Contractor, his agent, representative, or sub-contractor(s) and causes harm/damage to other Contractor/representatives of the Owner or all or anybody rendering service to the Owner or is connected with the Owner's work in any manner whatsoever. The Contractor shall necessarily indemnify the Owner in all these respects.

The indemnity under this clause shall include all costs, charges, expenses on account of any claims, demands, actions and proceedings against the Owner in respect of such injuries, loss or damage.

32.2 Indemnification of the Contractor



The Owner shall fully indemnify, save harmless and defend the Contractor from and against any and all costs, charges, expenses on account of any claims, demands, actions and proceedings arising out of or resulting from claims by any third parties arising out of or related to the performance of Owner's obligations pursuant to this Contract to the extent caused by any act or omission on the part of the Owner, his agent, representative, or sub-contractor(s), provided that the foregoing obligation shall not apply to the extent such liabilities are caused by the acts or omissions of the Contractor, its agent, representative, or sub-contractor(s)

33.0 **CORRESPONDENCE**

The correspondence procedure will be developed mutually by the Owner and Contractor after award of Contract.

34.0 **CONTRACT AGREEMENT**

- a) The Successful Bidder will be called for Contract negotiations. A signed provisional Contract Agreement will be forwarded by the Bidder which shall be mutually discussed. The acceptable provisional agreement will be concluded within thirty (30) days. On receipt of this, the Owner will issue Notice to Proceed to Bidder. The final Agreement in six (6) originals shall be produced by the Contractor at his cost for signing within sixty (60) days.

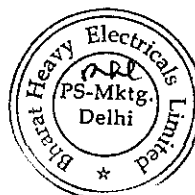
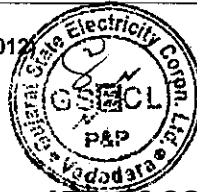
The Agreement will be signed in six (6) originals and the Contractor shall be provided with one (1) signed original and the rest will be retained by the Owner. The Contractor shall provide free of cost to the Owner all the engineering data, drawings and descriptive materials submitted with the Tender, complete set of his Tender and Tender Documents, copies of all the correspondences with the Owner, etc. in six (6) copies to form a part of the Contract Documents.

b) **Contract Documents**

These Contract Conditions together with the Specification, Tender drawings and guaranteed technical particulars, Tender data with subsequent agreed modification thereof, Tender, all correspondences with the Owner and Signed Agreement and other supporting documents shall constitute the Contract Document(s). No variation or modification or terms and conditions of the Contract Documents or waiver of any of these terms and conditions shall be deemed valid unless agreed in writing and signed by the Owner and the Contractor.

c) **Endorsement of Terms**

The failure of either party to endorse at any time any of the provisions of the Contract or any rights in respect thereto or to an option herein provided shall in no way be construed to be a waiver of such provisions, rights or option or in any way to affect the validity of the Contract. The exercise by either party of any of his rights herein shall not preclude or prejudice either party from exercising the same or any other right it may have hereunder.



35.0 **NOTICE TO PROCEED AND EFFECTIVE DATE**

35.1 Contractor shall commence Performance of Work on the date which the Owner specifies in Notice to Proceed (NTP) delivered for Commencement of the work (the "Commencement Date") which shall not be earlier than the date of issue of the Notice to Proceed. The Contractor shall perform its obligation in a manner that would ensure that the Commercial Operation of the Plant occurs within the Guaranteed Commercial Operation Date.

Before issue of NTP following conditions are to be complied with.

- (i) Signing of the Contract.
- (ii) Release of Advance payment.
- (iii) Unhindered & unencumbered access to the site as is where is basis

GSECL will issue LOA after ensuring issuance of NTP within 60 (sixty) days

35.2 The Contract shall come into force on the date of Notice to Proceed.

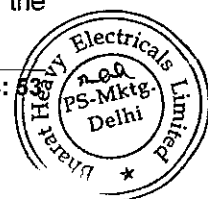
36.0 **USE OF THE PLANT PRIOR TO OWNER ACCEPTANCE**

Owner reserves the right to take possession of and use for any intended purpose, any portion or all of any delivered but as yet unaccepted Plant. The taking of possession at any time or use of any of such portion of Plant shall not be deemed to be an acknowledgement of Owner acceptance of Unit or the Plant, and shall not be exclusive with respect to Contractor until Owner acceptance of the Plant, has occurred. Owner shall provide Contractor with reasonable and timely access to complete its obligations hereunder. It is the expectation of the parties that any such modifications or repairs will be accomplished by Contractor with minimal interference with operation of the Plant.

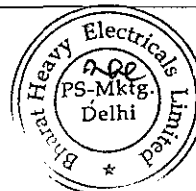
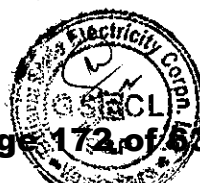
37.0 **INSURANCE**

37.1 The Contractor at his cost shall arrange, secure and maintain all insurance as may be pertinent to the Works and obligatory in terms of law to protect his interest and interests of the Owner against all perils detailed herein. MCE (Marine cum Erection comprehensive) insurance for the plant and equipment under contractor's scope shall be effective from the date of mobilization of site by the contractor. The form and the limit of such insurance as defined herein together with the underwriter in each case shall be as acceptable to the Owner. However, irrespective of such acceptance the responsibility to maintain adequate insurance coverage up to commercial Operation date shall be the Contractor's full responsibility. The Contractor's failure in this regard shall not relieve him of any of his contractual responsibilities and obligations. The insurance policies to be taken by the Contractor shall be in a joint name of the Owner and the Contractor. The Contractor shall, however, be authorised to deal directly with Insurance Company or Companies and shall be responsible in regard to maintenance of all insurance covers.

37.2 Any loss or damage to the equipment during handling, transportation, storage, erection, putting into satisfactory operation and all activities to be performed till such time the Plant is finally accepted by the Owner shall be to the account of the Contractor. The Contractor shall be responsible for raising of all claims and make good for the damage or loss by way of repairs and/or replacement of the Works, damaged or lost. The transfer of title shall not in any way relieve the



- Contractor of the above responsibilities during the period of the Contract. The Contractor shall provide the Owner with copy of all insurance policies and documents taken out by him in pursuance of the Contract. Such copies of documents shall be submitted to the Owner immediately after such insurance coverage. The Contractor shall also inform the Owner in writing at expiry/cancellation and/or change in any of such documents and ensure revalidation, renewal, etc. as may be necessary well in time.
- 37.3 Licenses/port clearances in respect of supplies to be made by the international Contractor from outside India required for purpose of replacement of equipment lost in transit and/or during storage shall be obtained by the Contractor on behalf of the Owner. The Contractor shall, however, be required to follow the procedure as may be laid down to facilitate arranging such licenses/clearances.
- 37.4 The perils required to be covered under the insurance shall include, but not limited to fire and allied risks, miscellaneous accidents (erection risks), workmen compensation risks, loss or damage in transit, theft, pilferage, riot and strike and malicious damages, civil commotion, weather conditions, accidents of all kinds, war risks (during ocean transportation only), Terrorism etc. Further insurance cover towards contamination from nuclear fuel/waste and ionizing radiations/radioactive is not envisaged. The scope of insurance shall be equivalent to the CIF value of equipment plus ten percent (10%) for all risks up to and including delivery of the equipment on CIF basis and for CIF value plus custom duty (as applicable on the cost of replacement) and additional ten percent (10%) of CIF value for all risks subsequent to delivery of goods on CIF Indian port basis. In case of indigenous supply, the scope of insurance shall be equivalent to FOR Site price inclusive of all Taxes plus ten percent (10%) for all risks. For the risks during the erection, the insurance cover to be taken shall be of appropriate value adequate to take care of all costs incurred till the erection. The insurance policies to be taken should be on replacement value basis including the Taxes (as applicable) on the replacement value. Notwithstanding the extent of insurance cover and the amount of claim available from the underwriters, the Contractor shall be liable to make good the full replacement/rectification value of all equipment and materials and to ensure their availability as per project requirements.
- 37.5 All costs on account of insurance liabilities covered under the contract will be included in Contract Price. However, the Owner may from time to time, during the pendency of the Contract, ask the Contractor in writing to limit the insurance coverage, risks and in such a case, the parties to the Contract will agree for a mutual settlement, for reduction in Contract Price to the extent of reduced premium amount. The Contractor, while arranging the insurance, shall ensure to obtain all discounts on premium which may be available for higher volume or for reason of financing arrangement of the Plant.
- 37.6 The Contractors shall ensure that for all activities to be performed in India viz. inland transportation, storage, erection, testing, commissioning, theft, pilferage, etc. till the equipment/plant is taken over by the Owner, the insurance cover shall only be taken from Indian Insurance Companies.
- 37.7 The clause entitled "Insurance" under the Section 4 of this Volume, covers the Additional insurance requirements for the portion of the Works to be performed at the Site.
- 37.8 In respect of insurance proceeds/claim settlements relating to claims raised/referred by the Contractor, the Owner shall give, from time to time, written



authorisation to the underwriter(s) to directly pay such proceeds/settlements to the Contractor as are in accordance with the provisions hereunder:

- i) Wherever total damage/loss of equipment/materials would occur, the Contractor will be entitled to payments received from the underwriters except the following amounts :
 - a) The amount paid to the Contractor under the Contract in respect of equipment/material damaged/lost (excluding the prorata Advance Payment).
 - b) Taxes which have already been paid by the Owner.

Subsequent payments, if any, due under the Contract shall be regulated by the relevant terms of payment, provided the claim money settled by the underwriter is more than the total of the amount as per (a) and (b) above. In the event of the claim money settled is less than the total of the amount in (a) and (b) above, the entire claim money settled will be retained by the Owner and the Contractor will forthwith pay the Owner the shortfall amount between the claim money and the total amounts as per (a) and (b) mentioned above.

- ii) In case of damage to any equipment/material during any stage, the Contractor upon rectification of the damaged equipment to the satisfaction of the Owner shall be paid to the extent of full claims settled by the underwriters. Subsequent payments, if any, due under the Contract shall be regulated by the relevant terms of payment.

37.9 The Contractor shall be responsible for making good any loss or damage at his own cost in a prompt manner, irrespective of the extent of settlement of claims by the insurers/underwriters or the time taken in settlement of such claims.

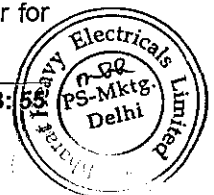
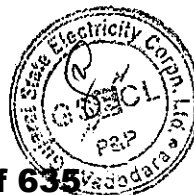
37.10 The Contractor shall ensure adequacy of the value of insurance covers irrespective of the coverage indicated under this clause.

38.0 CONTRACTOR'S CARE OF THE WORKS

38.1 The Contractor shall take full responsibility for the care of the Works from the Notice to Proceed until the date of issue of the Take Over Certificate when responsibility shall pass to the Owner. If the Owner's representative issues a Take Over Certificate for part of the Works, the Contractor shall cease to be responsible for the care of that part from the date of issue of such certificate of Take Over when responsibility shall pass to the Owner.

38.2 The Contractor shall take responsibility for the care of any outstanding Work which is required to be completed prior to the expiry of the Contract Period, until the Owner's representative confirms in writing that such outstanding work has been completed.

38.3 If any loss or damage happens to the Plant, during the period for which the Contractor is responsible, the Contractor shall rectify such loss or damage, at his cost, so that the Works conform with the Contract. Without prejudice to any other obligation of the Contractor under the Contract, the Contractor shall also be liable for any loss or damage to the Works caused by operations carried out by the Contractor prior to the expiry of the Contract Period in so far as such loss or damage is not covered under Insurance to be taken by the Owner for

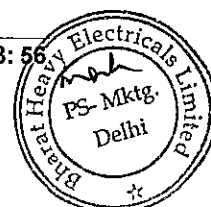


operation of Plant.

39.0 **ARBITRATION AND JURISDICTION**

39.1 **Arbitration**

- a) The Parties shall negotiate in good faith and attempt to resolve any dispute, controversy or claim arising out of or relating to the Contract or the breach, interpretation, termination or validity thereof (a "Dispute"); provided, however, that if the Parties are unable to resolve a Dispute within a period of [30] days from the date of first occurrence of the Dispute, such Dispute shall be settled by valid and binding arbitration conducted by three arbitrators in accordance with the UNCITRAL (United Nations Commission on International Trade Law) rules.
- b) If a Dispute is not resolved by the good faith negotiation of the Parties, either Party may serve upon the other a written demand that such matter be resolved through arbitration, which written demand shall include a brief description of the Dispute and shall specify the name and address of an arbitrator selected by it. The other Party shall within 20 days of receipt of the arbitration demand select its arbitrator and provide the name and address of such arbitrator to the demanding Party and its arbitrator. The two selected arbitrators shall within 15 days of the selection of the second arbitrator select the third arbitrator, failing to do so, the arbitrators shall request the President of International Chamber of Commerce (ICC), promptly to appoint the third arbitrator in good standing of its association as the third arbitrator in accordance with ICC Appointing Authority Rules, 2003. Related costs of such appointment shall be borne by the defaulting party for the appointment of its arbitrator.
- c) The place of arbitration shall be Vadodara, Gujarat , India and the law applicable to the arbitration procedure shall be UNCITRAL. The English language shall be used throughout the arbitrage proceedings. Each Party shall bear its own arbitration proceeding expenses, including but not limited to counsel fees, except common expenses of arbitration which shall be shared equally. The Parties and the arbitrators shall proceed with the arbitration expeditiously and shall to the best of their ability conclude all proceedings there under, including any hearings, in order that a decision may be rendered by the arbitrators within 120 days from the filing of the demand for arbitration by the demanding Party.
- d) The decision of any two of the three arbitrators shall be final and binding. The parties agree that the decision and any award rendered by the arbitrators in connection with a Dispute :
- i) Shall be final and binding on the Parties and may be enforced in any court having jurisdiction over the Party against which enforcement is sought;
- ii) Shall be the sole and exclusive remedy between the Parties regarding the Dispute and any claims, counterclaim issues or accountings presented or pled to the arbitrators in connection with the arbitration of the Dispute; and
- iii) In the case of an award, shall be made and promptly paid in



Rupees free of any tax, deduction or offset.

Any costs, fees or taxes incident to enforcing the decision or award shall be charged against the party resisting such enforcement. Any award shall include interest from the date of any damages incurred for breach or other violation of the Agreement, and from the date of the award until paid in full, at a rate to be fixed by the arbitrators.

- e) The provisions of this Clause shall survive the termination or expiration of the Contract. All notices by one Party in connection with an arbitration shall be delivered in accordance with instructions.
- f) The arbitrator shall have full powers to review and/or revise any decision, opinion, directions, certification or valuation of the Owner in consonance with the Contract, and neither party shall be limited in the proceedings before such arbitrators to the evidence or arguments put before the Owner for the purpose of obtaining the said decision.
- g) No decision given by the Owner in accordance with the foregoing provisions shall disqualify him as being called as a witness or giving evidence before the arbitrators on any matter whatsoever relevant to the dispute of difference referred to the arbitrators as aforesaid.
- h) Performance of the Contract shall continue during arbitration proceeding unless the Owner shall order the suspension thereof or any part thereof and if any such suspension shall be added to the Contract Price. No payments due or payable by the Owner shall be withheld on account or a pending reference to arbitration.

39.2 Subject to Clause 39.1 above, the Courts at [Gujarat] shall have the exclusive jurisdiction on any matter arising out of, under or in relation to the Contract.

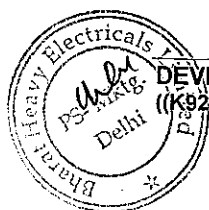
40.0 SUSPENSION OF WORK

40.1 Owner's Right to Suspend:

40.1.1 Owner may at any time and from time to time and for any reason, by written notice to the Contractor, suspend furtherance performance of all or any part of the Works hereunder upon 10 days' prior written notice to Contractor (or, in emergency situations, upon such prior notice as circumstances permit) indicating (a) the portion of the Works the completion of which Owner has elected to defer, (b) Owner's estimate of the duration of such suspension, and (c) the effective date of such suspension of the Works.

Upon receipt of and consistent with the effective date of such notice, Contractor shall:

- (a) stop performance of further Works which Owner has elected to defer and shall continue to complete performance of the balance of the Works. During the period of such suspension Contractor shall properly care for and protect all Work in progress and all property of Owner which pursuant to the terms of the Contract is subject to the supervision of Contractor in whatever state of completion;
- (b) place no further subcontracts or purchase orders for materials, services, work or facilities in respect of the Work except to the extent expressly



requested by Owner; and

- (c) unless otherwise directed by Owner, use all reasonable endeavours to suspend on the most favourable terms available to Contractor all purchase orders, subcontracts and rental and lease agreements to the extent affected by such suspension and otherwise minimise any additional costs associated with such suspension.

40.1.2 Contractor shall promptly deliver to Owner copies of all such Work in progress and all such property as may be requested by Owner & mutually agreed. Owner may at any time terminate the suspension by written notice to Contractor specifying the effective date of termination and Contractor shall use its best efforts to resume performance of its obligations pursuant to the Contract immediately upon receipt of such notice. During the suspension period, the Contractor shall not be allowed to take all such properties outside the plant premises without Owner's permission.

40.1.3 During a suspension, Contractor shall not be entitled to payment of the Contract Price which would have otherwise been ordinarily payable during the relevant period of such suspension, except for such part of the Work which has been completed prior to the date of suspension specified in the notice of suspension.

40.1.4 Upon resumption by Contractor of all activities affected by a suspension, Owner shall resume payments of the Contract Price (it being understood that no interest shall be payable in respect of such resumed payments) with the payment dates therein adjusted to reflect the period during which scheduled payments were not made.

40.2 Consequences of Suspension

40.2.1 Owner's instructions under Clause 40.1 shall be treated as instructions to carry out a change under Clause 4.4, except to the extent that the suspension instructed by Owner is necessary by reason of default, breach, failure or non-performance on the part of Contractor.

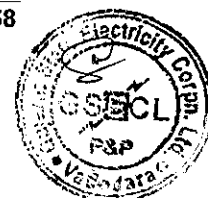
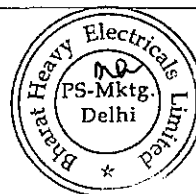
40.2.2 To the extent such instructions are treated as a request for a change under Clause 4.4 in accordance with the immediately preceding Clause 40.2.1, Contractor shall be entitled to submit to Owner a preliminary change order for a determination of an adjustment Guaranteed Commercial Operation Date, the Contract Price, the payment and milestone Schedule, the Project Schedule and the Performance Guarantees, as appropriate. Contractor shall mitigate to the fullest extent reasonably possible any additional expenses to be borne by Owner as a result of suspension of the Works pursuant to this clause.

40.2.3 Except as provided in this Clause 40.2.2 Contractor shall have no claim against Owner.

40.3 Contractor's Right to Suspend.

The Contractor shall have the right to suspend the relevant Works, for the reasons mentioned below, by giving twenty one (21) days' notice to the Owner upon occurrence of the following reasons:

- (a) If the Owner has failed to pay the Contractor, without reasonable cause, any



sum due to the Contractor under the Contract within thirty (30) days after the expiry of time within which payment of such amount was required to be made under the Contract;

- (b) If the Contractor is unable to carry out any of its obligations under the Contract for reasons solely attributable to the Owner, including but not limited to the Owner's failure to provide access to Site or failure to obtain any Applicable Permit necessary for the execution and/or completion of the Facility which the Owner is required to obtain as per the provisions of the Contract or as per Applicable Laws,

If the Contractor's suspends performance of the Works or the rate of progress is reduced pursuant to this Clause 40.3, then the Time for Completion shall be extended, and any and all additional costs or expenses incurred by the Contractor as a result of such suspension or reduction in the rate of progress shall be paid by the Owner to the Contractor in addition to the Contract upon resumption of Works, except where the suspension of the Works or reduction in the rate of progress is attributable to the Contractor's default or breach of Contract.

41.0 TRAINING OF OWNER'S PERSONNEL

The Contractor shall furnish all manuals, documentation and train Owner's Engineers/Personnel free of cost for safe, successful and reliable operation of the plant (for minimum 60 people).

The Contractor shall undertake to train free of charge, Engineering personnel selected and sent by the Owner at the works of the Contractor (not less than 60 man month duration). The period and the nature of training for the individual personnel shall be agreed upon mutually between the Contractor and the Owner. These engineering personnel shall be given special training in the shops, where the equipment will be manufactured and/or in their Collaborator's works and in any other plants where equipment manufactured by the Contractor or his Collaborator is under installation/operation or testing to enable those personnel to become familiar with the equipment being furnished by the Contractor.

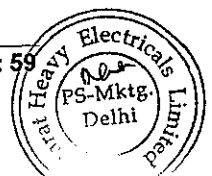
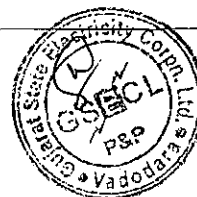
All traveling expenses for the engineering personnel to be trained during the total period of training will be borne by the Owner. However, the Contractor shall provide necessary accommodation and local transport for such personnel.

The Contractor shall also train Owner's Operation & Maintenance personnel to become proficient in operating the equipments and for routine maintenance/repair/replacement, lubrication, overhauling, adjustments, testing etc. of the plant and equipments.

42.0 AS-BUILT DRAWINGS

The Contractor shall furnish drawings and document in as-built condition as stipulated in the Specification.

On completion of the project, contractor should submit Three Sets of As commissioned drawings, Three Sets of as Installed Bill of Materials and Three Sets of As Commissioned Data/ Specification /Parameter Sheets Duly Signed



by the Competent Authority. (Note: This was earlier at definition of drg sr no (f) CI 2.1)

43.0 **REJECTION OF DEFECTIVE PLANT**

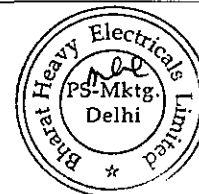
43.1 Without prejudice to the rights of the Owner elsewhere in the Contract, if the completed Plant or any portion thereof, before it is Taken Over under Clause "Taking Over" or during the Warranty Period, is found defective or fails to fulfill the requirements of the Contract, the Engineer shall give the Contractor notice setting forth particulars of such defects or failure, and the Contractor shall forthwith make the defective Plant good or alter the same to make it comply with the requirements of the Contract. Should he fail to do so within seven (7) days, the Owner after giving seven (7) days written notice may reject and replace at the cost of the Contractor the whole or any portion of the Plant, as the case may be, which is defective or fails to fulfill the requirements of the Contract.

43.2 In the event of such rejection, the Owner shall have the right to operate any and all Equipment and/or Plant as long as it is in operating conditions, whether or not, such Equipment has been accepted as complete and satisfactory, to enable him to obtain necessary replacement except that this shall not be construed to permit operation of any equipment which may become damaged by such operation before any required alterations or repairs and/or replacements have been made. All repairs or alterations or replacement required of the Contractor shall be made by the Contractor at such times as directed and in such a manner as will cause the minimum interruption in the use of the equipment by the Owner. Should the Contractor not so replace the rejected plant within the time frame as directed by the Engineer, up to the requirements of the Specification, the Contractor's full and extreme liability under this Clause will be satisfied by the repayment of all money paid by the Owner to him in respect of such plant plus dismantling, site clearance and disposal costs or should be replacement cost whichever is higher.

43.3 Nothing in this Clause shall be deemed to deprive the Owner or, effect any right under the Contract which he may otherwise have in respect of such defects or deficiencies or in any way relieve the Contractor of his obligation under the Contractor. Further, this Clause shall be in addition to and not in derogation of any other right of the Owner under the Contract.

44.0 **MOST FAVOURED CUSTOMER**

The Contractor agrees that Owner is and throughout the implementation of the Works will be "the most favoured customer" of the Contractor and all it's Associates. As such, Contractor confirms and agrees that no other customer of the Contractor or it's Associates will receive greater priority including provision of project personnel, resources and systems than Owner and Contractor hereby assures Owner that the successful, efficient and effective implementation of the Works is and will be the most important customer activity of Contractor and all its affiliates and associates. Contractor and all its affiliates shall not undertake any other project anywhere in the world if to do so, reasonably could be expected to have an adverse effect on the implementation of the Works.



45.0 **CONTRACTOR'S ACCEPTANCE OF THE WORK AND SITE**

45.1 **Acceptance of the Work Generally**

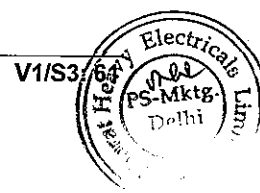
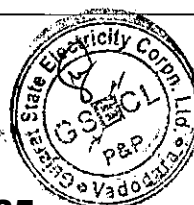
Contractor acknowledges that it has:

- (1) Entered into the Contract for the consideration set forth in the Contract and after due and careful inquiry.
- (2) Satisfied itself in respect of all pertinent matters which may bear upon the performance of the Contract and the Work, including:
 - (a) The nature and magnitude of the Work;
 - (b) The Applicable Laws and all environmental risks, conditions and applicable restrictions;
 - (c) The calculation and sufficiency of the Contract Price;
 - (d) Achievement of the Commercial Operation and Performance Guarantees;
 - (e) Quality and quantity of the Equipment and Contractor's Equipment required for the performance of the Work;
 - (f) Access to the Site;
 - (g) Availability of all labour and personnel;
 - (h) The character and quality of the Work to be performed;
 - (i) General and local conditions;
 - (j) Disposal, handling and storage of materials;
 - (k) All other pertinent, relevant or related matters and conditions.

45.2 **Acceptance of the Site:**

Bidder acknowledges that:

- (1) The Plant shall be designed and engineered for erection and installation and performance in accordance with the Contract at the Site; and
- (2) Bidder has satisfied itself as to all general, local and groundwater conditions at the Site and the areas adjacent thereto, including but not limited to:
 - (a) Sea, river and land transportation and access and right of way to the Site, including the availability and condition of roads and ports and rights-of-way, conditions affecting transportation, access and egress;
 - (b) Handling and storage of materials;
 - (c) Availability and quality of labour, sand, and rock;



- (d) Rainfall and other climatic conditions, tides, currents, soundings and ground water and other hydrological conditions (including the monsoons);
- (e) Topography, ground surface, subsurface
- (f) Equipment required by Bidder prior to and during performance of its obligations hereunder;
- (g) Availability of housing and other relevant social and urban infrastructure;
- (h) Any and all other pertinent, relevant or related matters and conditions.

45.3 No Claim for Actual Conditions

Contractor acknowledges that all appropriate allowances for the matters and conditions referred to in Articles 45.1 and 45.2 and those pertaining to the Work or to the Contract generally have been taken into account in calculating the Contract Price, and the other terms and conditions of the Contract.

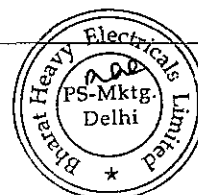
Contractor's failure to acquaint itself and consider any applicable condition, situation, requirement or other matter referred to in Articles 45.1 and 45.2 and those pertaining to the Work or to the Contract generally, will neither relieve it from the responsibility for successfully performing the Contract, nor entitle the Contractor to a Change Order, adjustment of Contract Price or Guaranteed Commercial Operation Date for reasons relatable to such failure.

45.4 Except as otherwise expressly stated in the Contract:

- (1) Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Work;
- (2) Contractor accepts total responsibility for having foreseen all difficulties and costs and expenses of successfully completing the Work; and
- (3) No increase in the Contract Price, or extension of the schedule based in whole or in part upon any discrepancy between the actual conditions encountered by Contractor and those which Contractor anticipated, or any unforeseen difficulties or costs generally, shall be considered by the Owner or effected.

45.5 The Contractor acknowledges that all engineering data and information and data and information relating to hydrological, geo-technical and sub-surface at the Site made available to the Contractor by the Owner in the Specifications, information made available to bidders during the bid process, generally or otherwise, directly and indirectly, are all solely for the convenience of the Contractor. The verification and interpretation of the same shall be at the sole risk and responsibility of Contractor.

Contractor agrees that the Owner shall have no liability for the adequacy, correctness, accuracy or completeness of such data and information. The Owner makes no representation or warranty, express or implied, as to the adequacy, accuracy, correctness or completeness of any such data or information.



Contractor further agrees that it shall protect, indemnify and hold Owner harmless from and against any and all Losses arising directly or indirectly from or incurred by reason of the use of any such data and information by any Person to whom Contractor has supplied such data and information or any portion thereof including the Contractor himself, his Subcontractors, and their respective employees, agents, personnel and consultants.

Furthermore, Contractor hereby waives any claims it may otherwise have against any Person that has prepared, compiled, provided or prepared any such data and information arising due to any reason whatsoever, including without limitation, from the use thereof by Contractor or by other Persons to whom Contractor has supplied such data and information.

Specifically and without limitation, Contractor agrees and warrants that it shall independently and fully verify, check and establish the adequacy, correctness, accuracy and completeness of all data and information which it may require for any purposes related directly or indirectly to the Contract, its obligations hereunder or for any other reasons, at its sole risk and cost.

46.0 **Applicable Permits**

The Owner and the Contractor shall each be responsible for obtaining the Owner Permits and the Contractor Permits respectively. If the Contractor at any time becomes aware, whether as a result of notice from Owner or otherwise, of any Applicable Permit not obtained by the Contractor, the Contractor shall promptly give notice thereof to Owner and the Contractor shall be responsible for obtaining such Applicable Permit.

The Contractor shall be responsible for ensuring compliance with the terms and conditions of all Applicable Permits, whether obtained by the Owner or the Contractor.

The Contractor shall indemnify and hold harmless to the Owner and all Owner indemnified parties from and against any damages arising from and out of the securing of, or failure to secure, the Contractor Permits or failure to maintain the Owner Permits.

With respect to the Owner Permits, the Contractor shall provide support to Owner in obtaining all Owner Permits. Such Contractor support shall include:

- i. Attendance at meetings with Owner and third parties designated by Owner;
- ii. Preparation of permit applications or, as applicable, application to transfer permits to the Owner;
- iii. Assistance in preparation of responses to inquiries by governmental instrumentalities / agencies;
- iv. Assistance in presentations at hearing of governmental instrumentalities / agencies;
- v. Provision of all available information and documents required by Owner in connection with obtaining any Owner Permits; and

- vi. Such other services as Owner may request from time to time required for Owner permits.

47.0 **Law and Language**

The Contract and the respective rights, privileges, duties and obligations of the Owner and the Contractor hereunder shall be governed by the laws of the Republic of India.

48.0 **Stamp Duty**

Costs of stamp duty and other similar charges imposed by law on the Contract or any part thereof shall be borne by the Contractor.

49.0 **TERMINATION BY THE CONTRACTOR.**

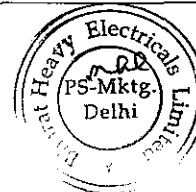
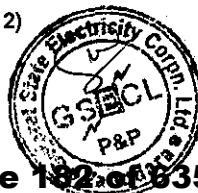
49.1 Upon the occurrence of any one or more of the following events, the Contractor may issue a notice of default to the Owner (the "Contractor's Preliminary Notice"):

- (a) If the Owner has failed to pay the Contractor any sum due to the Contractor under the Contract within sixty (60) days after the expiry of time agreed for payment of the said sum.
- (b) In case of prolonged suspension imposed by the Owner for a continuous period of 120 days that affects the whole of Works.
- (c) In case of prolonged suspension imposed by the Contractor under Clause 40.3 for a continuous period of 90 days that affects the whole of Works.
- (d) If the Owner is adjudged bankrupt or insolvent; or if the Owner makes a general assignment for the benefit of its creditors, or a trustee or a receiver is appointed for all or a substantial part of the Owner's assets, or if the Owner files a petition for reorganization under bankruptcy or other Applicable Laws.

if the Owner has not remedied or cured the default specified in the notice within 30 days of receipt of notice, then the Contractor shall have the right to terminate the Contract forthwith by issue of a notice of termination to the Owner.

Upon such termination the contractor shall be paid as per Clause no.24.2(a) & (b) i.e. Upon termination of the Agreement pursuant to Contractor's right to terminate, the Contractor shall be entitled to be paid :

- (a) all actual documented costs incurred by Contractor, as audited and accepted by an independent certified public accounting firm of national reputation selected by Owner and acceptable to Contractor, incurred or that could not be avoided in connection with performance by Contractor of Works as of the date of the Termination which were not previously paid for by



Owner, and

(b) all actual documented costs incurred by Contractor, if such cost is part of the Contract Price, in connection with the item procured / facilities executed procured by Contractor in connection with the services for which Contractor has not been paid, provided that such items are delivered to Owner at the Project Site together with all documents necessary to transfer title thereto to Owner (the 'Termination Payment'). As a condition precedent to receiving the Termination Payment, Contractor shall execute and deliver all such papers and take all such steps, including the legal assignment of Contractor's contractual rights, as Owner may require for the purpose of fully vesting in Owner all rights, title and interests of Contractor in and to all subcontracts, purchase orders, warranties, guarantees and other agreements.

(c) All claims by such contractors and Subcontractors to be due and owing for Services and other work performed prior to such date shall constitute debts between Contractor and Subcontractors, and Owner shall in no way be liable for such sums. Contractor shall include in all agreements and contracts entered into with contractors and Subcontractors a provision providing for the foregoing.

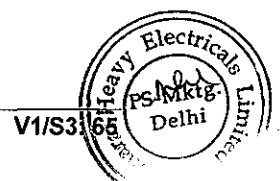
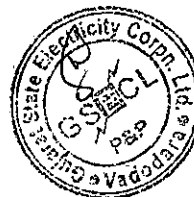
The Contractor shall send a copy of the Contractor's Preliminary Notice to the Lenders and notwithstanding anything contained in this Clause or in any other Clause of the General Conditions of Contract or elsewhere, the Contractor's right to terminate the Contract shall be subject to the right of the Lenders to step-in and remedy the default or substitute the Owner; provided that the Lenders must exercise their right to remedy the default and/or substitute the Owner within a period of thirty (30) days from the date of receipt of the Contractor's Preliminary Notice, failing which the Contractor shall have the right to terminate the Contract upon the expiry of the said 30 days' period."

50.0 DEEMED COMPLETION

In case the Performance Guarantee Tests cannot be completed within 90 days of Trial Operation for reasons not attributable to Contractor, the Performance Guarantee Tests shall be deemed to be completed successfully and the unit shall be deemed to be Taken Over and payment linked to this activity shall be released to Contractor by Owner. Contractor shall conduct the Performance Guarantee Tests to establish that performance guarantees are met for the unit, using applicable correction curves. Contractor shall be allowed to demobilize its resources on deemed completion of Performance Guarantee Tests and remobilize at the expense of the Owner for carrying out the Performance Guarantee Tests at a later date. In any case, the Performance Guarantee Tests for the unit shall be conducted within 6 months of the Trial Operation of the unit

51.0 DEEMED COMMISSIONING

In case the Initial Operation cannot be completed within 30 days from Scheduled date for reasons not attributable to the Contractor, the Initial Operation shall deemed to be completed and payment linked to successful completion of Reliability Run shall be released to the Contractor by Owner



CONTENT

CLAUSE NO.	DESCRIPTION
1.00.00	GENERAL
2.00.00	DESIGN COORDINATION MEETING
3.00.00	CO-OPERATION WITH OTHER CONTRACTORS AND CONSULTING ENGINEERS
4.00.00	GUIDELINES FOR ENGINEERING SERVICES
5.00.00	OPERATING MANUALS AND MAINTENANCE INSTRUCTIONS
6.00.00	PLANT HANDBOOK
7.00.00	CONTRACT STAGE DOCUMENT SUBMISSION AND APPROVAL PROCEDURE
8.00.00	TENDER STAGE DOCUMENT SUBMISSION

VOLUME : IIA

SECTION-VI

ENGINEERING SERVICES

1.00.00 **GENERAL**

1.01.00 As part of the overall project management activity, the Contractor shall be responsible for proper engineering and co-ordination of activities during various phases of execution of the contract. The Contractor shall identify a person, designated as Project Manager, with whom the Owner, the Consulting Engineer or the Review Consultant shall interact on matters related to engineering as well as execution of the contract. The Project Manager shall be the single-point contact person on behalf of the Contractor and shall be responsible for all engineering co-ordination. The Owner/Consultant/Review Consultant shall interact with the Project Manager only on all matters of co-ordination between the Owner and the Contractor or on matters involving the Contractor, his manufacturing units and sub-vendors. For the purpose of expediting the Owner or his representative may sometimes interact with the manufacturing units or sub-vendors of the contractors. However such interaction will not, under any circumstance, dilute the responsibility of the Contractor to provide a fully engineered and co-ordinated package under this contract.

1.02.00 On finalization of the contract, a procedure for exchange of engineering information will be mutually agreed and finalized between the Owner and the Contractor.

2.00.00 **DESIGN COORDINATION MEETING**

The Contractor and his sub-vendors will be called upon to attend design co-ordination meetings with the Engineer, other Contractors and the Consultants of the Owner during the period of execution of contract. The Contractor including his sub-vendors shall attend such meetings at their own cost at Owner's or Consultant's office in Kolkata or at mutually agreed venue as and when required and fully cooperate with such persons and agencies involved during those discussions.

3.00.00 **CO-OPERATION WITH OTHER CONTRACTORS AND CONSULTING ENGINEERS**

The Contractor shall agree to cooperate with the Owner's other Contractors and Consulting Engineers and freely exchange with them such technical information as is necessary to obtain the most efficient and economical design and to avoid unnecessary duplication of efforts. The Engineer shall be provided with copies of all correspondences addressed by the Contractor to other Sub- contractors and Consulting Engineers in respect of such exchange of technical information.

- 4.00.00 **GUIDELINES FOR ENGINEERING SERVICES**
- 4.01.00 Prior to commencement of the engineering work as part of design submissions, all aspects of design viz., criteria for selection and sizing of all equipment and systems, design margins etc. including that for structural steel and civil work shall be outlined and these shall form the basis for the detailed engineering work.
- 4.02.00 Engineering work shall be performed on modern and proven concepts and internationally accepted good engineering practices but fully compatible with the Indian environments. Owner shall have the right to review and approve the engineering work by themselves and/or through consultant and ask for any clarifications and changes/modifications to the work performed by Contractor.
- 4.03.00 At any stage during the performance of assignment, the Contractor may be required to make certain changes/modification/improvements in design/drawing/other documents which are applicable to 800 MW Unit, which in the opinion of the Owner could result in better improved design, layout, operability, plant availability, maintainability, reliability or economy of the plant and its systems/sub-systems in view of revised and more accurate information/data available at a later date(s) or feedback(s) received during execution / operation of similar units. Such changes / modifications/improvements required could be identified by Owner and/or consultant and mutually discussed. Owner requires the Bidder to incorporate such action in the subject assignment appropriately without any additional cost liability and time implication to the Owner and same shall be within the responsibilities and scope of the Contractor.
- 4.04.00 During the course of review of detailed engineering stages, it may be essential in the opinion of Owner to obtain certain classified data for review purposes only. In case Owner so desires, the Bidder shall submit such data to Owner.
- 4.05.00 During the course of review of detailed engineering, it may be essential in Owner's opinion to obtain data and information on similar equipment and plants engineered by the Bidder. In case Owner so desires the Bidder shall submit such data and information to the Owner.
- 4.06.00 It is not the intent to give details of every single task covered in the total engineering work to be carried out by Contractor, however, all engineering work required for the satisfactory completion of the plant/systems as specified shall be carried out by the Contractor. Broadly, the following are the minimum requirements in respect of scope of major items of work:
- 4.06.01 Preparation, updating and finalisation of scheme drawings, control and interlock diagrams, detailed and fully dimensioned layout drawings (plant layout and equipment layout detailed plan, elevation and cross-sectional drawings at different elevations / floor levels) covering all mechanical, electrical, C&I, civil and structural items, equipment, systems and facilities. Drawings and Schedules prepared by the Contractor from time to time, as detailed designs are developed, shall be submitted for Owner's / Consultant's approval before the work is taken up. Revisions, corrections, additions to drawings and schedules shall not be considered to change the scope of work.

- 4.06.02 Preparation of detailed technical specifications including data sheets, tender drawings and bill of material for all bought out items, as also finalisation of corresponding sub-contractors.
- 4.06.03 Review of sub-contractor's data, drawings, design calculations, schedules, bill of materials, instruction manuals etc. for all equipment, before forwarding them to Owner/Consultant for approval.
- 4.06.04 Preparation of civil construction drawings for all equipment showing foundation details and full details regarding equipment loads, floor openings, details of embedments etc. required for preparation of civil construction drawings and also as referred at relevant sections of Scope, Terminal Points & Exclusions. These documents shall be preceded by appropriate design calculations, static and dynamic analysis as necessary.
- 4.06.05 Preparation and finalisation of process piping and instrumentation diagrams and schematics, complete in all respects for all systems/packages of the power plant.
- 4.06.06 Preparation of consolidated schedules and bills of materials, including line numbers, tag numbers, source of supply, service conditions, specifications, materials, types and connections details, quantities for items of the plant including dampers, steam traps, strainers, instrumentations, ducting.
- 4.06.07 Sizing of all piping and equipment as per the stipulated design criteria; carrying out of flexibility analysis/dynamic analysis as necessary; hangers & support engineering.
- 4.06.08 Final revision of all documents including preparation and compilation of Instruction Manuals for installation, commissioning, operation and maintenance for all equipment and systems. Refer clause 5.00.00 for the specific requirement in this regard.
- 4.06.09 Certification and submission of final as-built drawings for all areas.
- 4.06.10 Preparation and compilation of all drawings, schedules and instructions which may be required at site, whether separately mentioned or not.
- 4.06.11 All erection and assembly drawings which may be required at site.
- 4.06.12 For all bought out item packages, the Contractor shall provide complete material / component list along with detail specification, drawings, component part no. etc. during detail engineering stage prior to final approval. Such approved drawing/document shall be made available at site in adequate number prior to commencement of work. Moreover, such document/drawing shall be provided in soft form (CD)
- 4.06.13 Preparation of necessary documentation, design calculations etc. required for submission to statutory authorities like IBR, Chief Electric Inspector etc.

5.00.00 OPERATING MANUALS AND MAINTENANCE INSTRUCTIONS

5.01.00 The Contractor shall provide at least six (6) months before the time of commissioning and before taking over of the plant and equipment, all necessary maintenance manuals and operating instructions. The instruction manual shall be submitted in the form of one (1) soft copy in CD and 15 hard copies.

5.02.00 The information provided, which shall be contained in loose leaf stiff backed covers, shall include :

- a) A complete inventory of all main items of plant, with identification details.
- b) Service manuals for all plant and equipment giving full descriptions of the main items and auxiliary items such as power packs, hydraulic equipment, actuators, lubricating pumps, etc.
- c) A separate electrical manual covering items such as switchgear, cabling, instrumentation, controls, cabling layouts and wiring diagrams.
- d) A schedule of recommendations for routine maintenance of all electrical and mechanical equipment, recommended inspection point, information on detection, cause and rectifications of troubles & faults.
- e) A lubrication schedule with all necessary drawings diagrams to identify the lubrication points.
- f) Manufacturer's literature.

5.03.00 The instruction manual shall be subject to the approval of Owner.

6.00.00 PLANT HANDBOOK

The Contractor shall submit to the Engineer, a preliminary plant handbook preferably in A-4 size sheets which shall contain the design and performance data of various plant, equipment and systems covering the complete project including single line flow diagrams, within twenty four (24) months from the date of his acceptance of the letter of award. The final plant handbook complete in all respects shall be submitted by the Contractor six (6) months before start-up and commissioning activities. The plant handbook shall be submitted in the form of two (2) soft copy in CD (one to Owner and one to Consultant) and twenty five (25) hard copies in decent bound forms.

**7.00.00 CONTRACT STAGE DOCUMENT SUBMISSION AND APPROVAL
PROCEDURE**

7.01.00 Within fifteen (15) days of issue of Letter of Award (LOA) by the Owner, the Contractor shall furnish a schedule of drawings and design document to be submitted by him to the Owner/Engineer indicating dates against each document.

The documents shall be divided into two categories : a) for approval and b) for information/further engineering and co-ordination by the Owner.

In preparing this schedule, the Contractor shall allow four (4) weeks from date of receipt for review and comments by the Owner/Engineer for each submission of a document.

This document submission schedule shall require approval by the Owner/Engineer.

7.02.00 All contract documents shall be marked, without fail, with the name of the Owner, the Project, the specification title and number and the unit designation.

All dimensions shall be in metric units.

All notes, markings etc. shall be in English.

7.03.00 Documents/Drawings, submitted during tender stage, shall be revalidated or revised as required and submitted as certified contract document for approval / information of the Owner/Engineer.

7.04.00 Unless specified otherwise, the following categories of documents/drawings would require approval of the Owner/Engineer:

- a) List of sub-vendors (from Owner only)
- b) System scheme and instrumentation diagrams
- c) Design basis justifying selection of equipment & process parameters where not specified in the Contract
- d) Equipment data sheets and general arrangement drawings
- e) Materials of construction
- f) Layout drawings.
- g) Operation logic diagrams.
- h) Typical control circuit.
- i) Drawings of Instrumentation and control.

7.05.00 Unless specified otherwise, the following categories of documents/ drawings would be treated for information/further engineering by the Owner/Engineer. The Contractor shall, however, incorporate all additional information and clarifications in these documents / drawings as and when desired by the Owner/Engineer.

- a) Equipment foundation drawings.
- b) Equipment cross-section drawings, product literature etc. which are of proprietary nature.
- c) Predicted performance curves of equipment.
- d) Various bills of quantity, schedules etc.
- e) Piping fabrication drawings, isometrics etc.
- f) Panel wiring diagrams.
- g) Instruction/Operation manuals.
- h) Service manuals and trouble shooting guide for C & I system including field instruments.
- i) Cable schedule and interconnection chart.
- j) Drive/feederwise control scheme showing all external interfaces.

In essence, the Contractor is solely responsible for corrections and adequacy of design & engineering for documents under this category.

7.06.00 Upon review, the Owner/Engineer shall put his remarks and one of the following action stamps on the drawing/document:

- a) Approved.
- b) Approved except as noted, forward final drawing
- c) Approved except as noted, resubmission required.
- d) Disapproved.
- e) For information/reference only.

For action stamps in category (c) & (d), documents must be resubmitted for review by the Owner/Engineer. For action stamp in category (b), further review by Owner/Engineer would not be necessary provided the Contractor agrees & incorporates the comments made on the document.

Except for action stamp under category (c) & (d), the Contractor can proceed with manufacturing and other sequential activities for those areas of a drawing/document which do not have any review comment by the Owner/Engineer.

The Owner/Engineer may accord approval in category (c) or (d) in more than one submission of a document till he is satisfied that the intent of the specification has been fully complied with. The Contractor shall be responsible for delay in such cases and no extension of time shall ordinarily be allowed on such grounds. Approval of contract documents by the Owner/Engineer shall not relieve the Contractor of his responsibility for any errors and fulfillment of contract requirements.

The Contractor's work shall be in strict accordance with the finally approved drawings and no deviation shall be permitted without written approval of the Owner/Engineer.

7.07.00 Except key plan/general yard plan, any layout drawing requiring scrutiny shall not be drawn to a scale less than 1:50.

7.08.00 For review by the Consulting Engineer, the Contractor shall furnish soft copies of drawings & documents and three (3) prints of each drawing/document. Two (2) prints of such submission shall also be sent to the Owner. After review, comment/approval will be sent to the Contractor. Upon action under category (a) or (e), the Contractor shall directly distribute the documents to the various offices of the Owner and other agencies in number of copies as specified in the contract document. Such distribution copies shall be marked with the reference and date of the letter by which the Owner/Engineer has accorded his final approval. Penal action shall be taken against the Contractor for any unauthorised revision in the drawings so distributed from the drawings approved by the Owner/Engineer. The contractor shall furnish three (3) CDs of all as built/final drawings for Owner/Consultant site.

7.09.00 In case of contradiction between the stipulations above and those stated elsewhere in the specification, the stipulations herein shall prevail.

7.10.00 For details of documentation for Civil, Structural and Architectural works, Vol. II-G may be referred.

8.00.00 **TENDER STAGE DOCUMENT SUBMISSION**

8.01.00 The Bidder shall submit along with his bid all documents/drawings as requested in respective specifications. The documents shall include but not be limited to the following :

- a) All Bid proposal sheets duly filled up.
- b) Detailed experience list and financial resources of the prime bidder his collaborators/associates in this bid as well as the sub-vendors proposed.
- c) Scheme drawings indicating scope of supply and service as offered by the Bidder indicating clearly exclusions, if any.
- d) List of terminal points of the package offered together with quality and quantity of various input (i.e. water, air, electricity etc.) as required from the Owner at such interfaces.

- e) Equipment GA, Layout, Design Calculations, interlock and other write-up, catalogues/literature etc. as required for clear understanding of the bid submitted.
- f) L-1 network indicating target dates for intermediate milestones and final commissioning of equipment supplied; This network shall be supplemented by a detailed write-up on proposal procedure of project implementation, deployment schedule for Key personnel with their bio-data, schedule of construction machinery etc.
- g) List of suppliers for all bought out items.

CONTENT

CLAUSE NO.	DESCRIPTION
1.00.00	PROJECT MANAGEMENT SERVICES
2.00.00	SITE SERVICES

VOLUME : IIA

SECTION-V

PROJECT MANAGEMENT AND SITE SERVICES

1.00.00 **PROJECT MANAGEMENT SERVICES**

1.01.00 **Responsibility**

The Bidder shall identify a separate and independent project management team headed by a Project Manager for the execution of this project. Responsibilities of this project Management team shall cover the areas listed below :

- a) Planning and Monitoring
- b) Engineering Management
- c) Contracts Management
- d) Quality Assurance, Inspection & Expediting
- e) Construction Management
- f) Spares Management
- g) Erection & Commissioning Management

Detailed responsibilities in the above areas are discussed below :

1.02.00 **Organisation**

1.02.01 Headquarters

The headquarters of the project management team shall be headed by a senior level executive designated as the Project Manager who shall be responsible to Owner for the execution of the project. He should have adequate financial power and authority to give decision.

Separately, designated leaders shall be identified for each of the areas mentioned under 1.01.00, who, in turn, will report to the Project Manager for all matters relative to this contract.

1.02.02 Central Co-ordination Cell

The central coordination cell shall have sufficient technical personnel to coordinate technical matters and to quickly resolve day to day queries or references made by Owner and his Consultants without having the need to refer to his headquarters each time.

1.02.03 Site Organisation

The site should have a competent construction manager for all site operations with adequate financial power and sufficient level of authority to take site decisions. The organisation chart for site should indicate the various levels of experts to be posted for supervision in the various fields in civil construction, erection, commissioning etc.

1.02.04 Organisation Chart

The Bidder shall furnish a detailed organisation chart for the project management team, clearly identifying the key personnel in each of the areas mentioned at 1.01.00 above. The expected number of executives at different levels shall also be indicated, separately for headquarters, central coordination cell and site organisation.

1.03.00 **Implementation Schedule**

The schedule for the completion of the Project would be as follows :

	Period in Months from Zero date (Taken as the date of issue of Notice to Proceed)
a) Boiler Hydro-test	By Bidder
b) Boiler light up	By Bidder
c) Unit synchronisation	45
d) Commercial operation	48

To achieve these targets, the Contractor shall furnish to the Owner, various schedules as defined below:

1.03.01 Engineering Schedules

These schedules shall cover various design submissions indicating different engineering activities to be performed. Such schedules shall be furnished by the Bidder for each and every plant/systems/ equipment item covered in the scope of this specification.

1.03.02 Manufacturing Schedule

The Contractor shall submit to the Engineer his manufacturing and delivery schedules for all equipment within thirty (30) days from the date of issue of the Letter of Award (LOA). Such schedules shall be in line with the detailed network for all phases of the work of the Contractor. Such schedules shall be reviewed, updated and submitted to the Engineer, once in every two months thereafter, by the Contractor. Schedules shall also include the materials and equipment purchased from outside suppliers.

1.03.03 Erection Schedules

In order to achieve the overall completion schedule, the Contractor shall provide the Owner all the information covering erection sequence, testing and commissioning activities. These schedules may be based on the recommended erection procedures and will be subject to discussions/agreements with the Owner subsequent to the award of contract.

1.03.04 The successful Bidder shall have to provide all the above schedules (i.e. 1.03.01, 1.03.02 & 1.03.03) in a tabular form in addition to that in the form of L2 & L3 networks and these shall necessarily include information not limited to the earliest and latest dates for various activities/submissions and also any related constraints. However, the Bidder shall include in his proposal a Level-1 (L-1) network showing the major activities and various milestones to achieve the above mentioned completion schedule.

1.03.05 The Contractor shall provide the Owner the original disc/software for all such schedules alongwith requisite no. of copies (as required by the Owner) within an agreed time schedule. This time schedule will be agreed between Owner/Bidder at the time of award. The Contractor's project management software shall be compatible with that of the Owner and the input data shall be furnished to the Owner in a manner compatible with Owner's project management software, Primavera.

1.04.00 **Detailed Responsibilities**

1.04.01 Planning & Monitoring

a) Planning

The Bidder shall prepare a Master Network Schedule in the form of PERT network.

The network shall be prepared on a Work Breakdown Structure for the project which sub-divides the project into a set of manageable systems/sub-systems. The master network will identify milestones of key events for each system/package in the areas of engineering, procurement, manufacture and despatch and erection and commissioning. The master network shall represent the Level-I plan and will form the basis for development of detailed second and third tier execution plans. The master network shall conform to the overall schedule prescribed by Owner.

The master network should be submitted along with the bid which would be mutually discussed and finalised before the Award of Contract. This master network would clearly indicate the responsibility of the Bidder and project management team. This master network would form a part of the contract. The master network shall also identify a complete list of inputs to be furnished by the Owner which may be required for proper interfacing and tie-up. Scheduled dates for providing such inputs shall also be indicated, which will be mutually discussed and finalised.

b) Monitoring & Progress Reporting

The progress reports would be emanated every month, one from the head office of the Contractor and another from the site office. The progress report emanating from the head office should necessarily include the following sections:

- i) Report on key milestones.
- ii) Management summary indicating critical areas with details of actions initiated and effect of any on the project.
- iii) Action needing attention of the Owner/Consultant.
- iv) Detailed packagewise status of engineering submissions, quality plan submissions and approval, procurement manufacture and despatch.

The monthly report generated from the site office should necessarily include:

- i) Report on key milestones.
- ii) Management summary indicating critical areas with details of actions initiated and effect if any on the project.
- iii) Action needing attention of the Owner/Consultant.
- iv) This report would also cover the areas pertaining to the receipt of the equipment at the port, port clearance, transport, receipt at site, erection and commissioning.

In addition to the above, as the project execution progresses, the Contractor shall also be responsible for generating more frequent reports in the form of fax/e-mail information on progress in critical areas so that actions can be expedited. The exact format of the progress report shall be finalised after award of Contract.

1.04.02 Engineering Management

Based on the master network for the project (L-1) the Contractor will prepare an exhaustive list of engineering activities for the equipment/systems covered in his scope and a detailed programme of accomplishing the same within the time frame specified in the master network. This schedule will form the Level-2 (L-2) network for engineering activities.

Based on (L-2) network, the Bidder shall further develop the Level-3 (L-3) network for engineering activities which will indicate schedule for data availability, drawing release date and document submission dates.