

**DAMODER VALLEY CORPORATION(DVC)
2x660 MW - RAGHUNATHPUR TPP PHASE II-STG**


**TECHNICAL SPECIFICATION
FOR CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS).**

Specification No. : PE-TS-390-165-N001(REV 0)

VOLUME -IIB



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI BLDG., SEC-16A, PLOT NO. 25
NOIDA – 201301 (UP)**

	TITLE : TECHNICAL SPECIFICATION FOR CONDENSER ON LOAD TUBE CLEANING SYSTEMS (COLTCS). PREAMBLE	SPEC. NO. PE-TS-390-165-N001	
		VOLUME : II B	
		REV. NO. 0	DATE : 17.07.13
		SHEET 1	OF 2

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

1.1 **Volume -I CONDITIONS OF CONTRACT**

This consists of four parts as below :

Volume - I A : This part contains instructions to bidders for making bids to BHEL.

Volume - I B : This part contains general commercial conditions of the tender and include provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

Volume - I C : This part contains special conditions of contract.

Volume - I D : This part contains commercial conditions for erection and commissioning site work, as applicable.

1.2 **Volume - II TECHNICAL SPECIFICATIONS**

Technical requirements are stipulated in Volume II which comprises of :

Volume - II A : General Technical Conditions

Volume - II B : Technical specification including drawings, if any

1.2.1 **Volume - II B :**

This volume is sub-divided into following sections:

Section - A : This section outlines the scope of enquiry.

Section - B : This section provides "Project Information"

Section - C : This section indicates technical requirements specific to the contract, not covered in Section-D.

Section - D : This section comprises of standard technical specifications of equipments complete with data sheet A, B & C.

Data sheet-A specifies data and other requirements pertaining to the equipment.

Data sheet - B specifies data to be filled by the bidder (Data Sheet B is contained in Volume - III)

Data sheet - C indicates data documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
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PREAMBLE**

SPEC. NO. PE-TS-390-165-N001


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SHEET 2 OF 2

1.2.2 Volume - III TECHNICAL SCHEDULES

- 1.0** This volume contains technical schedules and Data Sheets - B, which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per instructions given in Document No.PES-100-901 in Volume-III.
- 2.0** The requirements mentioned in Section C/Data Sheets-A of Section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section -D.

	TITLE : TECHNICAL SPECIFICATION FOR CONDENSER ON LOAD TUBE CLEANING SYSTEMS (COLTCS).	SPEC. NO. PE-TS-390-165-N001	
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SECTION	TITLE
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B	PROJECT INFORMATION
C	SPECIFIC REQUIREMENTS
C1	SPECIFIC TECHNICAL REQUIREMENTS FOR CONDENSER ONLOAD TUBE CLEANING SYSTEMS .
C2	SPECIFIC TECHNICAL REQUIREMENTS (ELECTRICAL)
C3	SPECIFIC TECHNICAL REQUIREMENTS (C&I)
D	STANDARD TECH. SPECIFICATIONS
D1	CONDENSER ON LOAD TUBE CLEANING SYSTEMS <ul style="list-style-type: none"> ♦ STANDARD TECHNICAL SPEC.NO. PE-TS-999-165-N001 ♦ DATA SHEET-A ♦ DATA SHEET-C ♦ QUALITY PLAN
D2	ELECTRICAL SYSTEMS
D3	CONTROL & INSTRUMENTATION SYSTEMS



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS).**

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**SECTION - A
SCOPE OF ENQUIRY**

	TITLE : TECHNICAL SPECIFICATION FOR CONDENSER ON LOAD TUBE CLEANING SYSTEMS (COLTCS).	SPEC. NO. PE-TS-390-165-N001	
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1.00.0 SCOPE

This enquiry covers the design, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-contractors works properly packed for delivery of the items as follows:

1.01.0 Condenser On Load Tube Cleaning Systems :

Condenser On Load Tube Cleaning Systems (COLTCS) complete with all accessories as per the requirements specified in different sections of this specification **for** :

- 2X660 MW -DVC RAGHUNATHPUR TPP PHASE II- STG

The bidder's scope also includes installation checks, commissioning, trial runs & PG Testing at site of COLTCS.

1.01.0 The bids shall be evaluated as per NIT.

Equipments shall be ordered separately for each project.

In the event of more than one order being placed on the same bidder, the drawings/ documents etc. shall be submitted separately for each project during detailed engg. stage for approval.

2.00.00 GENERAL TECHNICAL INSTRUCTIONS:

- 2.01.00 It is not the intent to specify herein all the details of design and manufacture. However the equipment shall conform in all respects to high standard of design, engineering and workmanship, and shall be capable of performing the required duties in a manner acceptable to Engineer/ Owner, who will interpret the meaning of drawing and specifications, and shall be entitled to reject any component or material, which in his judgement is not in full accordance herewith.
- 2.02.00 The omission of specific reference to any component/ accessory necessary for the proper performance of the equipments shall not relieve the bidder of the responsibility of providing such facilities to complete the supply of the equipments at quoted prices.
- 2.03.00 In case of any deviation from this Technical specification (Vol. IIB) and General Technical Conditions (Vol. IIC), the same shall be indicated in the schedule of deviations enclosed in Volume-III, Part-A. In the absence of duly filled schedules it will be assumed that the bid strictly conforms to the specification.
- 2.04.00 BHEL's/ Customer's representatives shall be given full access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.
- 2.05.00 The equipments covered under this specification shall not be despatched unless the same have been finally inspected, accepted and shipping release issued by BHEL/ Customer
- 2.06.00 Un-priced copy of price bid shall be furnished alongwith the technical bid.



**TITLE : TECHNICAL SPECIFICATION
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SYSTEMS (COLTCS)**

SPEC. NO. PE-TS-390-165-N001

VOLUME : II B

SECTION : B

REV. NO. 0

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of


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SECTION – B

PROJECT INFORMATION

CLAUSE NO.	PROJECT INFORMATION			<div>एनटीपीसी NTPC</div>																																																			
1.00.00	<div>INTRODUCTION</div> <div>BACKGROUND</div> <div>Details of proposed Stage / Units</div> <div>Project name : RAGHUNATHPUR Thermal Power Project Phase-II</div> <div>No. of existing Units x Phase-I 2 X 600 MW - Under construction capacity :</div> <div>No. of Proposed Units x Phase-II 2x660 MW capacity :</div> <div>Project setting up by : Damodar Valley Coporation</div> <div>Employer's consultant : NTPC Ltd.</div>																																																						
1.01.00	<div>LOCATION AND APPROACH</div> <table><tr><th colspan="3">SITE DATA</th></tr><tr><td>Location</td><td>:</td><td>Raghunathpur sub-division of Purulia District, West Bengal.</td></tr><tr><td>Latitude and longitude</td><td>:</td><td>23° 37' 20" N, 86° 39' 50" E</td></tr><tr><td>Nearest Town</td><td>:</td><td>Raghunathpur – 7 Km</td></tr><tr><td>District Head Quarters</td><td>:</td><td>Purulia – 38 Km</td></tr><tr><td>Approach Road</td><td>:</td><td>Neamatpur-Purulia State Highway– 7 Km</td></tr><tr><td>Nearest Railhead</td><td>:</td><td>Sanka R.S. on Adra-Bhajudih Broad Gauge line of S.E. Railway – 11 Km.</td></tr><tr><td>Perennial Source of Cooling and Consumptive Water</td><td>:</td><td>Damodar River – 2 Km crow flight distance form the proposed plot.</td></tr><tr><td>Source of Coal</td><td>:</td><td>Most probable source- 'F' grade from coalfields of ECL.</td></tr><tr><td>Route Distance</td><td>:</td><td>60 Km from the site.</td></tr><tr><td>Distance of receiving S/S from TPS</td><td>:</td><td>Maithon Right Bank 400 kV sub-station – 36 Km and Ranchi 400 kV sub-station – 165 Km.</td></tr><tr><th colspan="3">NATURE OF LAND</th></tr><tr><td>Level</td><td>:</td><td>Within 20 m contour variation. This plot is above highest flood level of the area.</td></tr><tr><td>Soil</td><td>:</td><td>Fallow, moorum covered plot with alluvial soil underneath followed by rocky sub-strata.</td></tr><tr><td>Land Use</td><td>:</td><td>Fallow, unused.</td></tr><tr><td>Crops</td><td>:</td><td>Rainfed single-crop cultivation only on 10-15% of the area.</td></tr><tr><td>Irrigation</td><td>:</td><td>None.</td></tr></table> <div>Vicinity Plan is enclosed as Annexure –A-I</div>				SITE DATA			Location	:	Raghunathpur sub-division of Purulia District, West Bengal.	Latitude and longitude	:	23° 37' 20" N, 86° 39' 50" E	Nearest Town	:	Raghunathpur – 7 Km	District Head Quarters	:	Purulia – 38 Km	Approach Road	:	Neamatpur-Purulia State Highway– 7 Km	Nearest Railhead	:	Sanka R.S. on Adra-Bhajudih Broad Gauge line of S.E. Railway – 11 Km.	Perennial Source of Cooling and Consumptive Water	:	Damodar River – 2 Km crow flight distance form the proposed plot.	Source of Coal	:	Most probable source- 'F' grade from coalfields of ECL.	Route Distance	:	60 Km from the site.	Distance of receiving S/S from TPS	:	Maithon Right Bank 400 kV sub-station – 36 Km and Ranchi 400 kV sub-station – 165 Km.	NATURE OF LAND			Level	:	Within 20 m contour variation. This plot is above highest flood level of the area.	Soil	:	Fallow, moorum covered plot with alluvial soil underneath followed by rocky sub-strata.	Land Use	:	Fallow, unused.	Crops	:	Rainfed single-crop cultivation only on 10-15% of the area.	Irrigation	:	None.
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RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS–9575/9571/0370/0360/9586-102-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 1 OF 19																																																			

CLAUSE NO.	PROJECT INFORMATION	एनटीपीसी NTPC		
1.02.00	Land Total area of land available for Phase-I and Phase-II : 1800 Acres			
1.03.00	Water Nearest Water Source Damodar River – 2 Km crow flight distance form the proposed plot. Proposed water requirement : 6500 m ³ /hr. (without ash water recovery) for the Phase-II : 4938 m ³ /hr. (with ash water recovery)			
1.04.00	Railway Siding Employer intends to construct the Railway siding to project site from the nearest existing railway line. However, the same may not be available to the bidder for his use to transport equipment & material. Bidder may visit the site and acquaint themselves with the facilities available.			
1.05.00	Coal Availability and Transportation			
1.05.01	Coal Availability and Linkage Proposed Coal for the Phase-II Coal available will be of 'F' grade Design Coal GCV : 3200 Kcal/kg			
1.05.02	Coal Quality Parameters and Fuel Oil Characteristics The Coal quality parameters and Fuel Oil Characteristics are as specified in Table-1, Table-3 and Table-4 at Sub-Section-V, Part-A, Section-VI of the Specification.			
1.06.00	Capacity Phase-I : 2 x 600 MW - Under construction Phase-II : 2 x 660 MW - Present proposal			
1.07.00	Meteorological data Data of RAGHUNATHPUR is enclosed as Annexure-A-II .			
1.08.00	Plant Water Scheme The Plant water scheme is described below:.			
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9575/9571/0370/0360/9586-102-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 2 OF 19

CLAUSE NO.	PROJECT INFORMATION			
1.08.01	Condenser Cooling (CW) Water System It is proposed to provide recirculating type CW system with cooling towers. For the recirculating type CW system it is proposed to supply clarified water as make up. Raw water from the make-up water pump house shall be pumped to a Water Pretreatment Plant. The treated clarified water shall be led to the cold water channel of CW system. CW system shall be operated at a C.O.C of about 4 . The expected circulating water analysis is given in this sub-section. For carrying circulating water from CW pump house to TG-area and from TG area to cooling tower, steel lined concrete encased duct would be provided. For interconnecting CW duct with CW pump, condenser and cooling towers, steel pipes would be used. Cooled water from cooling tower will be led to CW pump house through the cold water channel by gravity.			
1.08.02	Equipment Cooling Water (ECW) System (Unit Auxiliaries) The plant auxiliaries of Steam Generator and Turbine Generator shall be cooled by Demineralized (DM) water in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system. It is proposed to provide independent primary cooling water circuit for Steam Generator & auxiliaries and TG & its auxiliaries.			
1.08.03	Station Auxiliaries Cooling Water System The station auxiliaries such as Air compressors, Compressors of ash handling plant, Cooling water circuit of Air Conditioning system, compressor of mill reject system etc. shall be cooled by separate cooling water System using separate set of pumps and cooling towers.			
1.08.04	Ash Water System Necessary LP & HP water pumps, flushing water pumps & seal water pumps for slurry disposal pump gland sealing are provided.			
1.08.05	Other Miscellaneous Water Systems a) CW system blow down water shall be used for the plant service water requirement, dust suppression system of coal handling plant, makeup to the Ventilation system, ash slurry pumps sealing, sealing of Vacuum pumps (if applicable) of Ash Handling plant, make-up to fire water storage tanks and cooling water requirement of hydrogen generation plant. The service (wash water) water collected from various areas shall be treated using oil water separators, tube settlers, coal settling pits etc. as per requirement and treated water from liquid effluent treatment plant shall be recycled back to the service water system for re-use. The excess service water shall be led to central monitoring basin for disposal. b) Separate water Pre-treatment plants are proposed for Circulating Water (PT-CW) system, Demineralization Plant (PT-DM) plant and potable (PT-Pot) water systems. c) The drinking water requirement of the plant and colony shall be provided from the above mentioned Water (PT-Pot) pretreatment plant. d) Steam Cycle make-up water, makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water and makeup to the hydrogen generation plant shall be provided from Dematerializing plant.			
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9575/9571/0370/0360/9586-102-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 3 OF 19

CLAUSE NO.	PROJECT INFORMATION			<div>एनटीपीसी NTPC</div>	
1.09.00	e) The quality of cooling water & DM water is given in this sub-section at Annexure-A-III .				
	Criteria for Wind Resistant Design of Structures and Equipment All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given in Annexure-A-IV of this sub section.				
1.10.00	Criteria for Earthquake Resistant Design of Structures and Equipment All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in Annexure-A-V of this sub section.				
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS--9575/9571/0370/0360/9586-102-2		PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 4 OF 19

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	ANNEXURE-A-I			
	VICINITY PLAN (9586-999-NOG-J-001)			
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660 MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9575/9571/0370/0360/9586-102-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 5 OF 19	

Table
Climatological data

Ministry of Water Resources
Government of India

STATION : PURULIA LAT: 23.20 N LONG: 86.25 E HV. ABOVE M.S.L. 255 METERS
DATA 1951 TO 1980

Annexure - 4.1
Sheet 1 of 2

CLIMATOLOGICAL TABLE OF PURULIA

Mean Temperature										Extremes				Cloud				Rainfall				
MN	SLP	DB	WB	WB	MAX	MIN	HIGH	LOW	MAX DT	MIN DT	RB	VP	TOT LOW	TOT RAINY	WET	DRY	HEAVY	DAY	WS			
1	988.5	16.4	12.8	25.3	12.4	29.3	8.7	33.4	01	5.9	17	64	11.9	1.7	1.3	12.9	1.2	50.8	0.0	34.8	04	3.1
	984.9	22.5	16.2						1977	1962	50	13.5	2.0	1.3		1971						
2	986.4	19.3	14.4	28.5	15.2	33.7	10.6	37.3	22	7.2	08	37	12.5	1.4	1.0	19.3	1.8	75.6	0.0	62.2	02	3.9
	982.4	26.3	17.6						1967	1956	40	13.1	1.9	1.5		1979						
3	983.8	24.8	17.9	34.0	19.8	38.7	15.4	41.7	31	12.5	10	48	14.7	1.7	1.0	21.6	2.1	67.9	0.0	35.6	26	4.5
	979.4	31.6	20.0						1955	1979	32	14.3	2.4	1.6		1956						
4	980.2	29.9	21.3	36.5	24.5	42.5	19.5	44.3	30	13.5	02	46	18.5	1.9	1.1	32.8	2.5	99.0	0.5	60.0	25	5.5
	975.5	35.5	22.2						1980	1965	31	16.3	3.2	2.2		1971						
5	976.0	31.4	24.4	39.6	26.5	44.1	21.6	46.3	20	17.9	08	56	24.9	2.5	1.2	47.9	3.5	162.0	4.3	50.8	31	6.7
	971.7	36.0	24.3						1972	1977	39	21.1	4.3	2.7		1977						
6	972.3	29.8	25.5	36.2	26.2	42.3	22.5	46.2	10	19.2	18	71	29.2	5.5	3.4	190.4	10.0	378.0	75.1	122.8	26	6.7
	969.0	31.8	25.6						1966	1980	63	27.8	6.6	4.8		1968						
7	972.3	27.6	25.4	32.1	25.1	35.6	22.5	38.9	05	17.6	14	83	30.7	6.7	5.2	284.3	16.4	502.7	106.3	148.3	06	6.0
	969.5	29.0	25.8						1965	1953	78	30.7	7.1	5.3		1952						
8	973.5	27.3	25.3	31.5	24.8	34.5	22.6	37.8	03	17.2	27	85	30.7	6.7	5.5	315.4	15.9	520.0	200.5	150.8	28	5.4
	970.4	28.7	25.8						1972	1953	79	30.8	7.2	5.5		1967						
9	977.4	27.2	25.0	31.6	24.4	34.3	22.3	36.1	07	17.2	10	83	29.9	5.4	4.2	280.9	12.7	773.6	52.4	181.5	15	4.9
	974.2	28.4	25.3						1955	1953	78	29.8	6.5	4.9		1978						
10	983.1	25.5	22.4	31.1	21.8	33.9	18.3	39.4	01	15.8	24	76	24.7	3.0	2.3	89.6	4.9	233.1	3.2	116.8	19	3.5
	979.8	27.9	23.4						1974	1964	67	24.9	3.8	2.8		1973						
11	987.0	21.4	17.5	28.6	17.0	31.3	13.6	34.6	23	10.9	27	66	16.9	1.6	1.0	12.6	1.0	78.5	0.0	55.4	08	2.9
	983.6	24.5	19.3						1979	1987	57	18.0	2.0	1.2		1955						
12	988.9	17.3	13.7	25.6	12.9	28.8	9.6	33.3	01	5.7	26	64	12.8	1.4	0.7	3.2	0.4	19.0	0.0	14.8	03	2.8
	985.3	22.0	16.4						1955	1961	54	14.3	1.6	0.8		1978						
13	977.1	28.7	21.8							5.7		67	23.5	3.3	2.3	1347.1	72.4	2138.6	927.6	181.5		4.7
	976.3	30	30	30	30	30	30	30	31	31	31	30	30	30	30	30	30	31	31	31	31	30

DO NOT WRITE BELOW THIS LINE

CLAUSE NO.

PROJECT INFORMATION



ANNEXURE-A-II
PAGE 2 OF 2

Divided Project Report
for 2x660 (+20%) MW Coal Based TPS at Raghunathpur
Annexure - 4.1
Sheet 2 of 2


STATION : Purulia LAT: 23° 20' N LONG: 86° 25' E HT. ABOVE M.S.L.: 255 METERS
DATA 1951 TO 1980



		Weather		Wind Speed		Wind Direction				Total Cloud		Low Cloud		Visibility																				
MN PPT BAIL THUN		FOG D.SEM	SQUA	62	61	19	0	N NE	E SE	S SW	W NW	0	0 T-2	3-5	6-7	8	PS	<1	1-4	4-10	10-20	>20												
1	1.8	0.0	0.5	0.1	0.0	0.0	0.0	8	3	1	2	1	5	18	40	22	18	4	4	2	3	24	2	2	1	2	0	0.1	4.3	6.6	2.4	17.6		
2	2.5	0.0	1.5	0.0	0.1	0.0	0.0	7	3	0	3	2	12	14	36	21	18	3	3	1	3	22	2	2	1	1	0	0.0	3.5	4.2	3.3	17.0		
3	3.2	0.1	2.9	0.3	0.4	0.0	0.0	8	8	1	3	1	4	5	27	43	14	5	4	2	3	18	4	3	1	2	0	0.0	0.9	3.7	7.6	15.8		
4	3.4	0.2	4.6	0.1	0.7	0.0	0.0	7	6	3	1	5	5	13	35	20	19	4	4	3	3	24	2	2	3	1	2	0	0.0	1.1	3.8	4.3	21.8	
5	5.2	0.1	6.8	0.0	0.8	0.0	0.0	4	3	1	15	9	16	13	35	14	17	4	5	2	2	23	1	2	1	1	0	0.0	0.1	1.3	3.8	24.8		
6	12.7	0.0	9.6	0.0	0.4	0.0	0.0	7	10	4	27	8	9	4	21	10	6	4	5	6	4	18	6	6	2	2	0	0.0	0.3	1.5	2.5	28.7		
7	20.7	0.0	7.8	0.0	0.0	0.0	0.0	3	7	4	30	18	6	10	8	4	4	2	7	6	11	11	3	6	4	6	0	0.0	0.6	2.4	4.8	22.2		
8	19.7	0.0	8.3	0.0	0.0	0.0	0.0	3	10	6	24	11	22	4	8	12	0	1	5	8	17	5	3	8	5	10	0	0.0	0.5	3.1	7.3	20.1		
9	15.5	0.0	7.9	0.1	0.0	0.0	0.0	4	10	6	35	10	11	4	9	14	0	0	4	6	20	2	9	12	4	10	0	0.0	0.7	5.9	7.6	16.8		
10	6.8	0.0	2.3	0.1	0.0	0.0	0.0	7	12	5	3	15	2	2	2	7	23	0	2	6	16	2	5	11	3	9	0	0.0	0.4	2.4	7.5	20.6		
11	1.4	0.0	0.2	0.0	0.0	0.0	0.0	6	10	5	0	2	1	4	12	43	21	13	4	4	2	2	23	2	2	1	2	0	0.0	1.3	3.1	3.8	21.8	
12	0.6	0.0	0.1	0.0	0.0	0.0	0.0	5	5	1	0	1	1	4	17	49	21	20	4	3	2	2	26	1	2	1	1	0	0.0	2.4	12.6	5.5	9.5	
13	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
14	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
15	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
16	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
17	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
18	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
19	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
20	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
21	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
22	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
23	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
24	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
25	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
26	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
27	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
28	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
29	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
30	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
31	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
32	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
33	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
34	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
35	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
36	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
37	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
38	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
39	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
40	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
41	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
42	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
43	93.5	0.4	52.3	0.7	2.4	0.0	0.0	0	308	57	6	3	14	7	12	10	35	16	143	40	57	45	80	213	29	47	28	48	0	0.1	37.0	36.4	50.7	260.8
44	93.5	0.4	52.3	0.7	2.4																													


COOLING WATER ANALYSIS


CONSTITUTUENTS	As	CONTENTS
Calcium	CaCO ₃	95.0 ppm
Magnesium	CaCO ₃	58.0 ppm
Sodium & Potassium	CaCO ₃	68.0 ppm
TOTAL CATIONS	CaCO ₃	221.0 ppm
(except iron in solution)		
Bicarbonate	CaCO ₃	115.0 ppm
Carbonate	CaCO ₃	-- ppm
Sulphate	CaCO ₃	80.0 ppm
Chloride	CaCO ₃	26.0 ppm
Nitrate	CaCO ₃	-- ppm
Phosphate	CaCO ₃	-- ppm
TOTAL ANIONS	CaCO ₃	221.0 ppm
Silica	SiO ₂	13.5 ppm
pH value at 25°C		8.1
Total Suspended Solids		1000 ppm (maximum)
Turbidity		1000 NTU (maximum)

CLAUSE NO.	PROJECT INFORMATION											
	<div>Annexure – A-IV</div> <div>CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT</div> <p>All structures shall be designed for wind forces in accordance with IS:875 (Part-3) and as specified in this document. See Appendix-I to Annexure-A-IV for site specific information.</p> <p>Along wind forces shall generally be computed by the Peak (i.e. 3 second gust) Wind Speed method as defined in the standard.</p> <p>Along wind forces on slender and wind sensitive structures and structural elements shall also be computed, for dynamic effects, using the Gust Factor or Gust Effectiveness Factor Method as defined in the standard. The structures shall be designed for the higher of the forces obtained from Gust Factor method and the Peak Wind Speed method.</p> <p>Analysis for dynamic effects of wind must be undertaken for any structure which has a height to minimum lateral dimension ratio greater than “5” and/or if the fundamental frequency of the structure is less than 1 Hz.</p> <p>Susceptibility of structures to across-wind forces, galloping, flutter, ovaling etc. should be examined and designed/detailed accordingly following the recommendations of IS:875(Part-3) and other relevant Indian standards.</p> <p>It should be estimated if size and relative position of other structures are likely to enhance the wind loading on the structure under consideration. Enhancement factor, if necessary, shall suitably be estimated and applied to the wind loading to account for the interference effects.</p> <div>Damping in Structures</div> <p>The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for:</p> <table><tr><td>a) Welded steel structures</td><td>: 1.0%</td></tr><tr><td>b) Bolted steel structures</td><td>: 2.0%</td></tr><tr><td>c) Reinforced concrete structures</td><td>: 1.6%</td></tr><tr><td>d) Steel stacks</td><td>: As per IS:6533 & CICIND Model Code whichever is more critical.</td></tr></table>				a) Welded steel structures	: 1.0%	b) Bolted steel structures	: 2.0%	c) Reinforced concrete structures	: 1.6%	d) Steel stacks	: As per IS:6533 & CICIND Model Code whichever is more critical.
a) Welded steel structures	: 1.0%											
b) Bolted steel structures	: 2.0%											
c) Reinforced concrete structures	: 1.6%											
d) Steel stacks	: As per IS:6533 & CICIND Model Code whichever is more critical.											
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9575/9571/0370/0360/9586-102-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 11 OF 19								

CLAUSE NO.	PROJECT INFORMATION			<div>एनटीपीसी NTPC</div>
	<div>Appendix-I to Annexure-A-IV</div> <p>The various design parameters, as defined in IS: 875 (Part-3), to be adopted for the project site shall be as follows:</p> <div><div>a) The basic wind speed “V_b” at ten metres above the mean ground level</div><div>: 47 metres/second</div><div>b) The risk coefficient “K₁”</div><div>: 1.07</div><div>c) Category of terrain</div><div>: Category-2</div></div> <p>Note: Notwithstanding the values of the above mentioned parameters, the design wind pressure so computed at any point shall not be taken less than 1500 N/Sq. metre for all classes of structures, i.e. A, B & C, as defined in IS: 875 (Part-3).</p>			
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660 MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9575/9571/0370/0360/9586-102-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 12 OF 19	

CLAUSE NO.	PROJECT INFORMATION			<div>एनटीपीसी NTPC</div>																
	<div>Annexure-A-V</div> <div>CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT</div> <p>All structures and equipment shall be designed for seismic forces adopting the design parameters provided in this document and using the provisions in accordance with IS:1893 (Part 1):2002 and IS:1893 (Part 4):2005. Pending finalization of Parts 2, 3 and 5 of IS:1893, provisions of part 1 shall be read along with the relevant clauses of IS:1893:1984, for structures other than the buildings and industrial structures including stack-like structures.</p> <p>The peak ground horizontal acceleration for the project site, the acceleration spectral coefficients (in units of gravity acceleration ‘g’) in the horizontal direction for the various damping values and the multiplying factor (to be used over the spectral coefficients) for evaluating the design acceleration spectra are as given at Appendix-I to Annexure-A-V.</p> <p>Vertical acceleration spectral values shall be taken as 2/3rd of the corresponding horizontal values.</p> <p>The design acceleration spectra specified at Annexure-I shall be used in place of the response acceleration spectra, given at figure-2 in IS:1893 (Part 1) and Annex B of IS:1893 (Part 4) is used. The acceleration spectra along with multiplying factors specified in Annexure-I includes the effect of the seismic environment of the site, the importance factor related to the structures and the response reduction factor. Hence, the design spectra do not require any further consideration of the zone factor (Z), the importance factor (I) and response reduction factor (R) as used in the IS:1893 (Part 1 and Part 4).</p> <div>Damping in Structures</div> <p>The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for:</p> <table><tr><td>a)</td><td>Steel structures</td><td>:</td><td>2%</td></tr><tr><td>b)</td><td>Reinforced Concrete structures</td><td>:</td><td>5%</td></tr><tr><td>c)</td><td>Reinforced Concrete Stacks</td><td>:</td><td>3%</td></tr><tr><td>d)</td><td>Steel stacks</td><td>:</td><td>2%</td></tr></table>				a)	Steel structures	:	2%	b)	Reinforced Concrete structures	:	5%	c)	Reinforced Concrete Stacks	:	3%	d)	Steel stacks	:	2%
a)	Steel structures	:	2%																	
b)	Reinforced Concrete structures	:	5%																	
c)	Reinforced Concrete Stacks	:	3%																	
d)	Steel stacks	:	2%																	
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9575/9571/0370/0360/9586-102-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 13 OF 19																


CLAUSE NO.	<div data-bbox="646 153 977 180" data-label="Page-Header">PROJECT INFORMATION</div> <div data-bbox="1268 121 1409 191" data-label="Page-Header">  </div>		
	<p data-bbox="391 258 643 285">Method of Analysis</p> <p data-bbox="391 321 1419 548">Since most structures in a power plant are irregular in shape and have irregular distribution of mass and stiffness, dynamic analysis for obtaining the design seismic forces shall be carried out using the response spectrum method. The number of vibration modes used in the analysis should be such that the sum total of modal masses of all modes considered is at least 90 percent of the total seismic mass and shall also meet requirements of IS:1893 (Part 1). Modal combination of the peak response quantities shall be performed as per Complete Quadratic Combination (CQC) method or by an acceptable alternative as per IS:1893 (Part 1).</p> <p data-bbox="391 583 1419 663">In general, seismic analysis shall be performed for the three orthogonal (two principal horizontal and one vertical) components of earthquake motion. The seismic response from the three components shall be combined as specified in IS:1893 (Part 1).</p> <p data-bbox="391 699 1419 869">For buildings, if the design base shear (V_B) obtained from modal combination is less than the base shear (\bar{V}_B) computed using the approximate fundamental period (T_a) given in IS:1893:Part 1 and using acceleration spectra with appropriate multiplying factor specified at Annexure-I, the response quantities (e.g. member forces, displacements, storey forces, storey shears and base reactions) shall be enhanced in the ratio of \bar{V}_B / V_B. However, no reduction is permitted if \bar{V}_B is less than V_B.</p> <p data-bbox="391 905 1419 1157">For regular buildings less than 12m in height, design seismic base shear and its distribution to different floor levels along the height of the building may be carried out as specified under clause 7.5, 7.6 & 7.7 of IS:1893 (Part 1) and using design acceleration spectra specified at Annexure-I. The design horizontal acceleration spectrum value (A_h) shall be computed for the fundamental natural period as per clause 7.6 of IS:1893 (Part 1) using spectral acceleration coefficients with appropriate multiplying factor given in Annexure-I. Further, the spectral acceleration coefficient shall get restricted to the peak spectral value if the fundamental natural period of the building falls to the left of the peak in the spectral acceleration curve.</p> <p data-bbox="391 1192 954 1220">Design/Detailing for Ductility for Structures</p> <p data-bbox="391 1255 1419 1335">The design acceleration spectra is a reduced spectra and has an in-built allowance for ductility. Structures shall be engineered and detailed in accordance with relevant Indian/International standards to achieve ductility.</p>		
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660 MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9575/9571/0370/0360/9586-102-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 14 OF 19


CLAUSE NO.	PROJECT INFORMATION			
	<div>Appendix-I to Annexure-A-V</div> <div><u>SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT</u></div> <div>The various seismic parameters for the project site shall be as follows:</div> <div><div><div>1)</div><div>Peak ground horizontal acceleration (MCE)</div><div>: 0.16g</div></div><div><div>2)</div><div>Multiplying factor to be applied to the horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra</div><div></div></div><div><div>a)</div><div>for ordinary moment resisting steel frames designed and detailed as per IS:800</div><div>: 0.047</div></div><div><div>b)</div><div>for braced steel frames designed and detailed as per IS:800</div><div>: 0.035</div></div><div><div>c)</div><div>For special moment resisting RC frames designed and detailed as per IS:456 and IS:13920</div><div>: 0.028</div></div><div><div>d)</div><div>for steel chimney</div><div>: 0.070</div></div><div><div>e)</div><div>for design of structures not covered under 2 (a) to 2 (d) above and under 3 below</div><div>: 0.047</div></div><div><div>3)</div><div>Multiplying factor to be applied to the horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted</div><div>: 0.093</div></div></div> <div>Note: g = Acceleration due to gravity</div> <div>The horizontal seismic acceleration spectral coefficients are furnished in subsequent pages.</div>			
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9575/9571/0370/0360/9586-102-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 15 OF 19

Appendix-I to Annexure-A-V

HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS**(In units of 'g')****For Raghunathpur Project**

Time Period (Sec)	Damping Factor (as a percentage of critical damping)	
	2%	5%
0.000	1.000	1.000
0.020	1.500	1.300
0.040	2.000	1.600
0.060	2.500	1.900
0.080	3.000	2.200
0.090	3.250	2.350
0.100	3.500	2.500
0.120	3.500	2.500
0.140	3.500	2.500
0.160	3.500	2.500
0.180	3.500	2.500
0.200	3.500	2.500
0.220	3.500	2.500
0.240	3.500	2.500
0.260	3.500	2.500
0.280	3.500	2.500
0.300	3.500	2.500
0.320	3.500	2.500
0.340	3.500	2.500
0.360	3.500	2.500
0.380	3.500	2.500
0.400	3.500	2.500
0.420	3.333	2.381
0.440	3.182	2.273
0.460	3.043	2.174
0.480	2.917	2.083
0.500	2.800	2.000
0.520	2.692	1.923
0.540	2.593	1.852
0.550	2.545	1.818
0.560	2.500	1.786
0.580	2.414	1.724
0.600	2.333	1.667
0.620	2.258	1.613
0.640	2.188	1.563

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	Appendix-I to Annexure-A-V																																																																																																																					
	<div><u>HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS</u> <u>(In units of 'g')</u> <u>For Raghunathpur Project</u></div>																																																																																																																					
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CLAUSE NO.	PROJECT INFORMATION			
	Appendix-I to Annexure-A-V			
	<u>HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS</u> <u>(In units of 'g')</u> <u>For Raghunathpur Project</u>			
	Time Period	Damping Factor (as a percentage of critical damping)		
	(Sec)	2%	5%	
	1.360	1.029	0.735	
	1.380	1.014	0.725	
	1.400	1.000	0.714	
	1.420	0.986	0.704	
	1.440	0.972	0.694	
	1.460	0.959	0.685	
	1.480	0.946	0.676	
	1.500	0.933	0.667	
	1.520	0.921	0.658	
	1.540	0.909	0.649	
	1.560	0.897	0.641	
	1.580	0.886	0.633	
	1.600	0.875	0.625	
	1.620	0.864	0.617	
	1.640	0.854	0.610	
	1.660	0.843	0.602	
	1.680	0.833	0.595	
	1.700	0.824	0.588	
	1.720	0.814	0.581	
	1.740	0.805	0.575	
	1.760	0.795	0.568	
	1.780	0.787	0.562	
	1.800	0.778	0.556	
	1.820	0.769	0.549	
	1.840	0.761	0.543	
	1.860	0.753	0.538	
	1.880	0.745	0.532	
	1.900	0.737	0.526	
	1.920	0.729	0.521	
1.940	0.722	0.515		
1.960	0.714	0.510		
1.980	0.707	0.505		
2.000	0.700	0.500		
2.020	0.693	0.495		
2.040	0.686	0.490		
2.060	0.680	0.485		
RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2X660 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9575/9571/0370/0360/9586-102-2	PART-A SUB-SECTION-II PROJECT INFORMATION	PAGE 18 OF 19

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PROJECT INFORMATION



Appendix-I to Annexure-A-V

HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS**(In units of 'g')****For Raghunathpur Project**

Time Period (Sec)	Damping Factor (as a percentage of critical damping)	
	2%	5%
2.080	0.673	0.481
2.100	0.667	0.476
2.150	0.651	0.465
2.200	0.636	0.455
2.250	0.622	0.444
2.300	0.609	0.435
2.350	0.596	0.426
2.400	0.583	0.417
2.450	0.571	0.408
2.500	0.560	0.400
2.550	0.549	0.392
2.600	0.538	0.385
2.650	0.528	0.377
2.700	0.519	0.370
2.750	0.509	0.364
2.800	0.500	0.357
2.850	0.491	0.351
2.900	0.483	0.345
2.950	0.475	0.339
3.000	0.467	0.333



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO. PE-TS-390-165-N001

VOLUME : II B

SECTION : C

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SECTION – C

SPECIFIC REQUIREMENTS

- SECTION C1 : CONDENSER ONLOAD TUBE CLEANING**
- SECTION C2 : ELECTRICAL SYSTEMS**
- SECTION C3 : C&I SYSTEMS**



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**SECTION C1
CONDENSER ONLOAD TUBE CLEANING SYSTEMS
(MECHANICAL DETAILS)**



**TITLE : TECHNICAL SPECIFICATION
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1.0 GENERAL

The Condenser On load Tube Cleaning Systems (COLTCS) complete with all accessories shall conform to the standard technical specifications (Section-D) and Data Sheet-A enclosed herewith. In addition the requirements of this section C shall also be complied with. However, wherever the details given in Section-D and Data Sheet-A are different, the requirements of Data Sheet-A shall prevail. Similarly in the event of contradictions between Section-C & Section-D/ Data Sheet-A, Section-C shall prevail.

Section C consists of 3 parts viz. Sec. C1, C2 and C3 for Mechanical, Electrical and C&I respectively, the requirements of all 3 sections shall be complied with.

2.0 DESCRIPTION OF EQUIPMENTS :

2.1 Condenser on load tube cleaning systems (COLTCS) :

The condenser on load tube cleaning system (COLTCS) is intended to prevent formation of various forms of fouling and scaling in the condenser tubes. The cooling water system is of closed circuit type with cooling towers or open circuit type as specified. The water analysis is indicated in project information in section B.

3.0 SCOPE OF SUPPLY UNDER THE SPECIFICATION IN THE BIDDER'S SCOPE FOR COLTCS.

3.1 The scope of supply for COLTCS covered under this specification is as under.

The size, MOC's and other particulars of the equipments for various projects are detailed in Data Sheet A annexed with Section – D of the specification.

SL.NO.	PROJECT	COLTCS
1.	2x660 MW DVC RAGHUNATHPUR TPP PHASE II -STG	2 SETS PER UNIT viz. TOTAL 4 SETS FOR BOTH UNIT.



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3.2 SCOPE OF SUPPLY IN THE BIDDER'S SCOPE FOR COLTCS:

3.2.1 Each set of COLTCS for each projects shall comprise of following :

- a) One No. Ball Separator at Condenser CW outlet pipe.
- b) One No. Ball recirculation pump with drive motor.
- c) One No. Ball collector.
- d) One No. Manual ball sorter (Bucket type sorter with sieves to manually sort out the undersized balls by shaking the sieved bucket manually) for each set of COLTCS.
- e) Differential pressure measuring system for ball separator. DP measuring system shall comprise of 2 nos. DPT +1 no. DPG for each COLTCS. Instrument shall be with *Remote seal* arrangement. Stubs for DPT and DPG shall be independent.
- f) Ball monitoring system comprising of an independent balls recirculation monitor and an independent balls oversize monitor. If bidder is not manufacturing Ball over size monitor then they can offer other alternatives like automatic ball sorter etc.
- g) Length of Ball separator, Scope of Counter Flange, Nuts and bolts shall be as per Annexure- I of section C1.
Thickness of body flange and counter flange shall be as per Drg no PE-DG-999-141-MO17 enclosed at enclosures at Annexure-II.
- h) Complete Pipe work, including interconnection piping, flanges/counter flanges for valves & pipes, bends, fittings, distributors, nozzles and support installation materials shall be in Bidder's scope. Bidder shall finalize the pipework to suit the layout at contract stage in such a way that no site welding is required for his pipework otherwise the same shall be carried out by bidder at site.
- i) The Electrical and C&I item / accessory as specified in succeeding clause/ respective sections herein.
- j) Power and Control cables between starter Panel (Switch Gear) and various drives in bidder's scope of supply for all projects.
- k) Starter Panel (Switch Gear Panel) shall be as follows:
 - a) 2 Sets of COLTCS shall have one Common Starter Panel (Switch Gear Panel) for DCS based control system.



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Switch Gear Panel should have suitable arrangement like Bus Coupler for providing redundancy to incoming supply feeder (1 Working + 1 Standby feeder).

- l) Control cables between field instruments and control panel.
- m) All the field instruments stipulated in this specification shall be in Bidder's scope.
- n) Commissioning balls and other commissioning spares on "As required basis".
- o) Set of mandatory spares as indicated in Data Sheet A.
- p) Supporting arrangement complete with foundation plates, anchor bolts, nuts, sleeves, inserts, all installation materials, fixing bolts, clamps and other accessories etc for complete equipment supplied under this package.
- q) Finish paints for touch up painting of equipment after erection at site, in sealed containers.
- r) Set of special tools and tackles if required for maintenance and erection of the equipment supplied.
- s) Various drawings, data test reports/ certificates instruction manuals for erection operation and maintenance etc. as specified in Data Sheet-C. and cables schedule indicating BOQ for power & control cables.
- t) Panels & Instruments: Scope and Type as specified in C&I section wherever required.

Any item not specified but required to make COLTCS a complete package shall also be in bidder's scope.

4.0 SCOPE OF SERVICES INCLUDED IN THE BIDDER'S SCOPE :

The bidder's scope also includes following services at site, for scope under this specification for COLTCS for respective projects

- a) Installation checks (Erection in BHEL's scope).
- b) Commissioning of equipment.
- c) Trial run for requisite period
- d) Performance Testing.



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The trial run of equipment shall be generally conducted immediately after commissioning while PG testing shall be conducted at a later date. These activities for different units shall be timed separately.

The no. of visits may be suitably assessed by bidders as per their experience with site stay periods on as required basis.

In the event of order number of visits as follows shall be made as a minimum with charges included in the bidder's base price itself.

• **For drawings/documents approval**

In the event of order all drawings / documents in soft as well as hard copy shall be submitted within 2 weeks of LOI for approval.

Further on receipt of Customer comments, if required bidder's engineer shall visit BHEL/ Customer alongwith soft copy to resolve all issues and incorporate comments in the soft copy for across the table finalisation and Category-I approval.

• **Site Visits :**

- i. No. of site visits for combined activities of erection checks and commissioning for COLTCS as applicable shall be one per unit - for both sets of equipments of one unit. Time duration for erection and commissioning shall be "on as required basis" with equipments run for trial operation thereafter for requisite period to demonstrate satisfactory operation.

However the no. of visits may be suitably assessed by bidders as per their experience with site stay periods on as required basis.

- ii. Bidder shall demonstrate guarantees including balls recovery, life of balls, pressure drops, etc. at site during subsequent visit for COLTCS of each unit.
- iii. For trouble shooting on "as required basis".



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5.0 EXCLUSIONS :

The following are excluded from the bidder's scope .

- 5.1 Civil foundation works required for installation
- 5.2 Erection of Equipment at site.

6.0 DESIGN CONSTRUCTION :

In addition to the requirements of Section-D the following shall also be complied with for packages/ projects under scope of this specification:

- 6.1 For COLTCS - Layout Piping Arrangement Drg. are enclosed in the specifications and same is enclosed at Annexure-III. No Autocad drawing shall be furnished to bidder at tender stage.
- 6.2 Thickness of body flange and counter flange of COLTCS shall be as per Drg no PE-DG-999-141-MO17 enclosed at enclosures at Annexure-II.
- 6.3 The materials of construction specified in Data Sheet-A are minimum requirements and materials of construction for other components not specified shall be similarly selected by the bidder for the intended duty which shall be subject to purchaser's approval during detailed engineering in the event of order.
- 6.4 Housing/ body of COLTCS shall be designed and manufactured as per the applicable codes for pressure vessels and to take care of force and moments as enclosed in the specification. However in no case thickness of housing/ body shall be less than connecting pipe thickness as specified in Data Sheet-A of COLTCS.
- 6.5 Adequate provision for future installation of Cathodic Protection for COLTCS (Sacrificial type) shall be kept by the bidder in the equipment.
- 6.6 Any flow straightner for streamlining the CW flow in balls collecting strainer if required shall be supplied by the bidder along with mounting arrangement and the fixing details.
- 6.7 Velocity in the pipe work shall be less than 1.5 m/ sec for pump suction and less than 2.2 m/ sec. in other pipe work. All valves upto 150 NB shall be ball valves. For higher sizes, gate/ globe/ B.F. valves shall be provided. All instrument valves shall be needle valves.



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7.0 Performance Guarantee and Testing :

The Tube Cleaning Systems shall be guaranteed to meet the performance requirements specified in Section-D and also for trouble free operation after commissioning. Schedule of performance guarantees (enclosed in Volume III) duly filled and signed shall be furnished with the bid.

The Performance guarantees of equipments shall stand valid till the satisfactory completion of performance testing & its acceptance by BHEL/ Consultant/Customer. If the guarantee period specified in the Commercial Specification is higher, same shall prevail.

8.0 Performance Guarantee and Bid Evaluation criteria for Condenser on Load Tube Cleaning System.

8.1 Condenser On Load Tube Cleaning Systems.

8.1.1 Performance Parameters to be guaranteed by bidders for COLTCS of all projects shall be as under :

- i) Pressure drop in ball separator in clean condition viz. after back washing.
- ii) Percentage recovery of balls (min. 90% recovery)
- iii) Life of Sponge Rubber Ball (Min. 3 weeks).

Any deviation to above balls life and percentage recovery will not be accepted.

Bidder to indicate the life of sponge rubber ball and nos. of balls lost during 1000 hours of plant operation and pressure Drop in Ball separator in clean condition in the Guarantee schedule and shall demonstrate same at site.

In case the successful bidder fails to demonstrate any of these parameters he shall carry out modifications at his own cost, to purchasers approval.

In case bidder fails to demonstrate above parameters to purchaser's satisfaction even after modification carried by him at site, the purchaser has the right to reject the equipment out rightly.



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8.1.2 Bidder to note that bids shall be evaluated on account of pressure drop across ball collecting strainer (in clean condition) and liquidated damages on account of not meeting the same during PG test shall be in accordance with following:

A) Bid Evaluation Criteria & Liquidated Damages:

The bids received shall be evaluated for Pressure drop across balls collecting strainers:

- The permissible limit of pressure drop across balls collecting strainers in clean condition shall be 0.15 MWC.
- If the pressure drops quoted are higher than above limit, the bids shall be technically loaded @ Rate as mentioned in Data Sheet-A for respective projects per **0.05 MWC** pressure drop across each balls collecting strainer.
- However no advantage shall be given for pressure drops quoted less than above permissible limit.
- The maximum acceptable limit for pressure drop across balls collecting strainer shall be (with technical loadings) 0.2 MWC.
The bids will be technically rejected for pressure drops quoted higher than above maximum limit.
- The guaranteed pressure drops shall be demonstrated at site by bidder and if found higher shall be subject to LD @ twice the bid evaluation factor as above.

9.0 SPARES :

9.1 Recommended Spares :

The supply of spare parts as necessary recommended by the manufacture for three (3) years of reliable operation and maintenance of COLTCS of respective projects shall be supplied. List of such spares along with the unit price shall not be included in base price but indicated separately in the schedule of prices for recommended spares enclosed in Vol. -III.

9.2 Mandatory Spares

Mandatory Spares shall be as per Data Sheet-A or annexure enclosed with data sheet of the respective packages applicable for specific projects, prices for same shall be included by bidder in the equipment base price itself.

10.0 Quality Plan

Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ Customer approval and customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. Charges for 3rd party inspection (TUV/ equivalent) for imported components wherever required shall be included by bidder in the base price itself. Witness for all the test identified under agency "C" & "N" in Quality plan shall be by third party.



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If BHEL or BHEL customer decides to witness the tests along with third party, the cost of travel of BHEL or BHEL customer shall be borne by BHEL or BHEL customer themselves.

11.0 DELIVERY & DRAWINGS/ DOCUMENTS DISTRIBUTION SCHEDULE :

- a. Delivery of Equipment for each project shall be as per NIT.
- b. The drawings to be submitted by bidder in event of award of contract for COLTCS for each project shall be as follows:
 - Technical Data Sheets, P&ID, Installation Plan , for COLTCS.
 - GA drawings, Details of BR Skid and C& I Document(Part-I & II) of COLTCS as applicable.
 - Quality Plan.
 - O & M Manual.
- c. Drawings submission schedule shall be as per NIT/as advised by Project Group.:

12.0 The makes of various bought out items shall be subjected to purchaser's approval in the event of order.

13.0 It is mandatory for the bidders to submit along with the bid the deviations if any whether major or minor in the schedule of deviations only. ***In the absence of deviations listed in the schedule of deviations the offer shall be deemed to be in full conformity with the specification "non-withstanding" any thing else stated elsewhere in bidder's offer, data sheets etc. The implied/ indirect deviations in data sheets etc. Shall not be binding on the purchaser.***

14.0 The following documents shall be furnished by the bidder with his offer :

- Compliance certificate duly signed and stamped (Enclosed at Schedules).
- Guarantee schedule duly signed and stamped (Enclosed at Schedules).
- GA drawings of following with empty/ filled-ups.
 - Balls Collecting Strainers (as applicable).
 - Balls recirculating Skids.
 - Debris Flushing pumps (if applicable)
 - Other equipments considered necessary for Layout/ Civil.



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO: PE-TS-390-165-N001

VOLUME : II B

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- Electrical Load Data (Enclosed at Vol. III of Specification)
- Schedule of Deviation (Enclosed at Schedules).

The bidder to note that load requirement furnished and finalised during tender stage shall only be provided by BHEL and any changes or additional requirement of Electrical load by bidder during contract stage shall be provided by BHEL with cost repercussions to the bidder.

NOTE: Apart from above, no other drawing/ document/ data sheet etc. shall be submitted along with the offer. If any drawing/ document etc. is submitted with the offer, same shall be considered as for 'Reference' purpose only and shall not be reviewed/ commented upon and any deviation, exclusion to scope, etc. taken in documents but not highlighted in the deviation schedule shall not be taken cognizance of.



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ANNEXURE- I

COLTCS

SL.NO.	Projects	Size (NB)	Length of Ball Separator (Excluding Counter Flange)	Scope of Counter Flange	Scope of nuts and bolts.
1	2x660 MW DVC RAGHUNATHPUR TPP PHASE II -STG	2300 NB	4200 mm	In Purchaser's Scope.	In Bidder's Scope

NOTE: As per CW Piping layout drawing attached as Annexure-III, Ball Separator shall be mounted directly on the existing Butterfly Valve. Bidder to consider the length of Ball separator without counter flange as 4200mm (i.e face to face) as indicated in drawing at Annexure-III.

Flap of the Butter Fly valve shall be extended to 950 to 1000 mm inside the ball separator (GA of Butter fly valve has been enclosed as Annexure-IV).

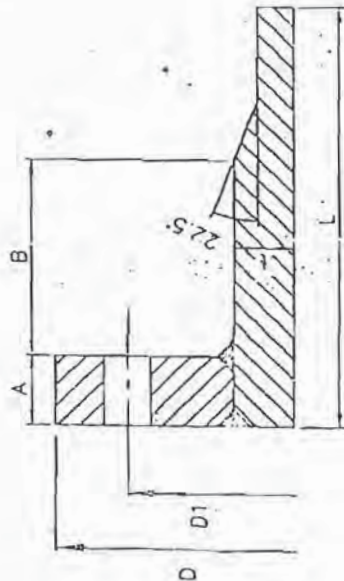
ALL DIMENSIONS ARE IN MM

DRAWING NO. PE-DG-999-1A1-M017

ANNEXURE-I)

NOTES:-

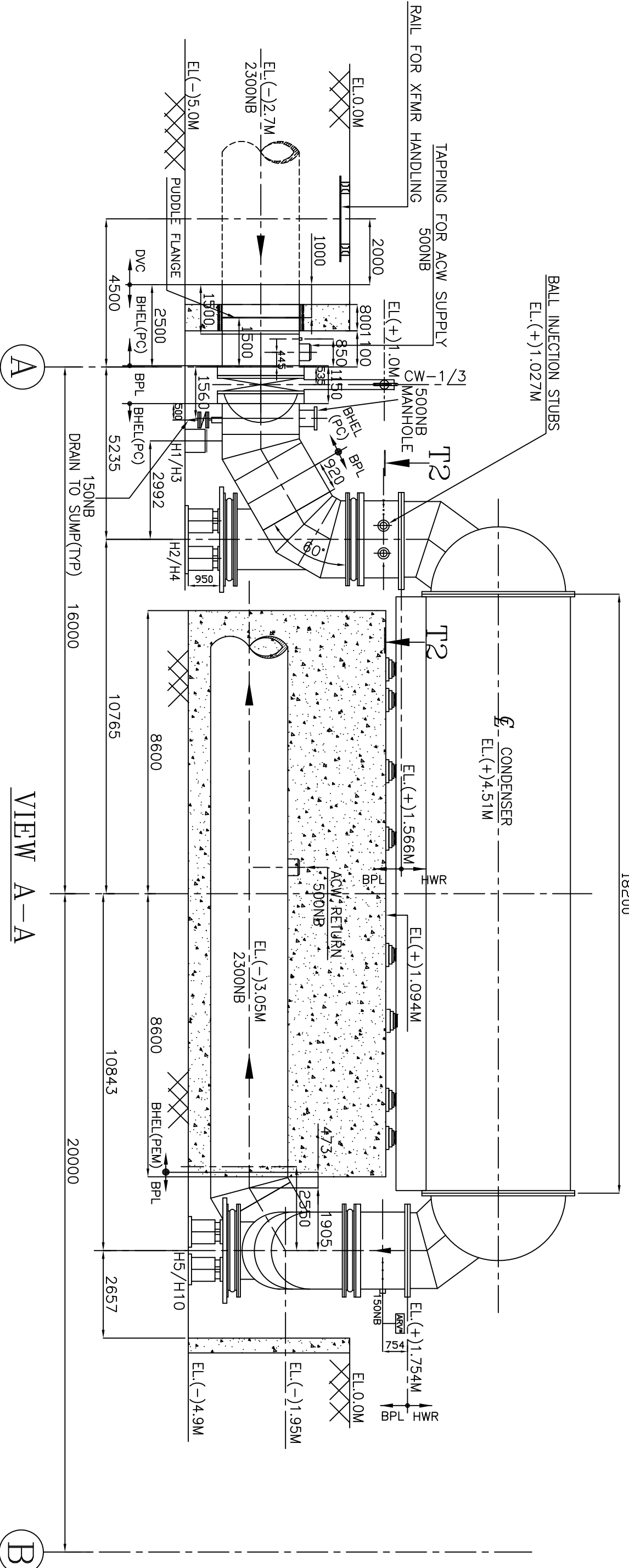
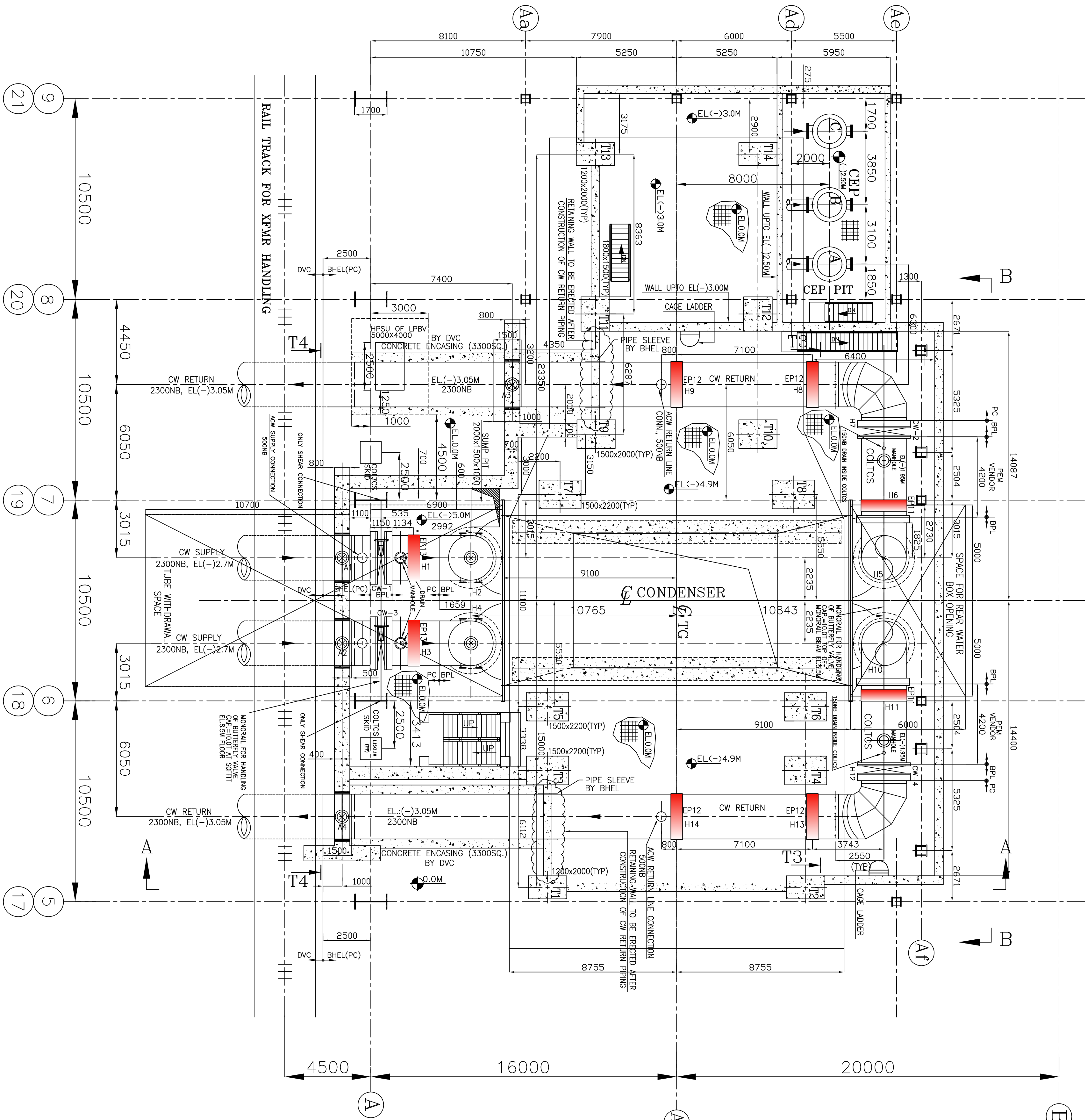
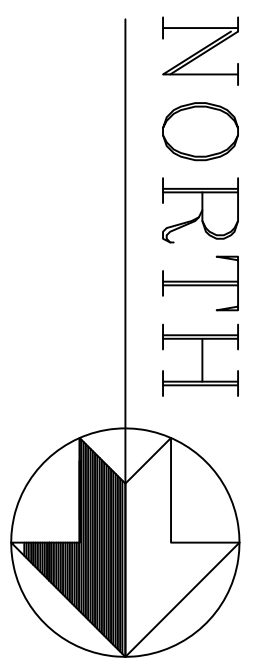
Flange thicknesses listed are for Design pressure=5kg/cm²(g) and Flange dimensions as given in the table. Final thickness of the flange is to be checked for actual OD/Balling PCD/Neck dimensions.



PIPE SIZE	PIPE THK.	FLANGE OD "D"	Bolt PCD "D1"	WELD NECK FLANGE			SLIP-ON FLANGE THICKNESS	
				FLANGE THK. "A"	NECK THK. "L"	NECK Length "L"		Appx. Total Length "L"
1200	10-12	1465	1300	40	24	70	200	90
1400	14	1675	1500	50	24	70	200	100
1600	14	1915	1920	60	32	80	220	110
1800	14-16	2115	2020	70	32	90	250	120
2200	18	2550	2420	80	36	100	300	140
2300	20			90	38	110	325	150
2500	20			90	38	110	325	150
2700	20			90	38	110	325	150

DRAWING FOR BALL SEPARATOR COUNTER FLANGE

REV.	DATE	CHG	APPD	JOB NO.	999
				STATUS	-
				DISTRIBUTION	
GHARAT HEAVY ELECTRICALS LTD POWER GROUP PROJECTS ENGINEERING MANAGEMENT PPEI, NOIDA					
DEPT CODE		DESIGN	DATE	SIGN	DATE
		CHG	25.06.07	SPV	25.06.07
		APPD	25.06.07	SM	25.06.07
DRAWING NO.					
PE-DG-999-141-M017					
SHEET 01 OF 01					
REV 00					
TITLE					
COUNTER FLANGE DETAILS					



REFERENCE DRAWINGS:

- EQUIPMENT PLAN AT 0.0M
- TG HALL CROSS SECTION
- P&ID - COOLING WATER AND AUX COOLING WATER SYSTEM
- PG TEST INSTRUMENTATION SCHEME
- CONDENSER ASSEMBLY
- G.A. DRAWING OF R.E. JOINT AT CONDENSER INLET/OUTLET
- ARGGT. OF 2300NB B.F. VALVE
- PURGE OF 2300NB BALL SEPARATOR
- PUDDLE FLANGE ASSEMBLY

- PE-DG-390-100-M003 (PEM)
PE-DG-390-100-M007 (PEM)
PE-DG-390-165-M001 (PEM)
PE-DG-390-100-XXXX (PEM)
01601070059C200 (HWR)
BP-DG-390-133-XXX (BPL)
BP-DG-390-165-XXXX (BPL)
PE-V2-390-165-XXX (PEM)
3-80-468-XXXX (PC)

PLAN

LOAD DETAILS:-

SL. HANGER/ NO SUPPORT	FX	FY	FZ	MX	MY	MZ
1.	H-1, H-3	T	-40	12	-	-
2.	H-2/H-4	0	-30	0	-	-
3.	H-5/H-10	0	-30	0	-	-
4.	H-6/H-11	-5/4	-35	8	-	-
5.	H-7, H-12	1	-40	8	-	-
6.	H-8/H-13	4/-3	-42	13	-	-
7.	H-9	-3	-30	14	-	-
8.	H-14	-3	-30	14	-	-
9.	ANCHOR A1	-3	-12	-20	7	18
10.	ANCHOR A2	1	-12	-20	7	5
11.	ANCHOR A3	-1	-12	-33	31	19
12.	ANCHOR A4	-1	-12	-33	31	-15

- NOTES:-
1. THESE ARE LOADS OF ANCHORS ARE TO BE SPRING FROM R.E. JOINT UPON ANCHOR.
2. THESE FORCES ARE FROM CONDENSER SIDE ONLY.
3. THE EFFECT OF AIRLIFT PUMP (GROUND ANCHOR) INCLUDING PRESSURE, THRUST, CALCULATING THE TOTAL LOAD ON ANCHOR.
4. BE CONSIDERED SUITABLE.
5. BE CONSIDERED SUITABLE.

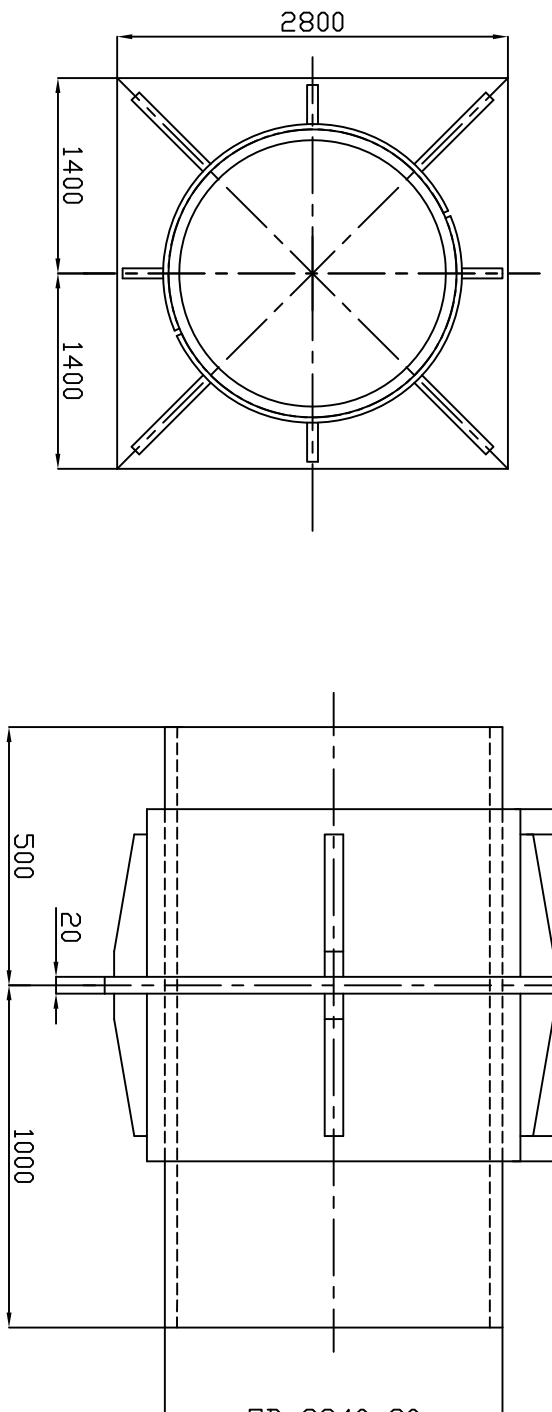
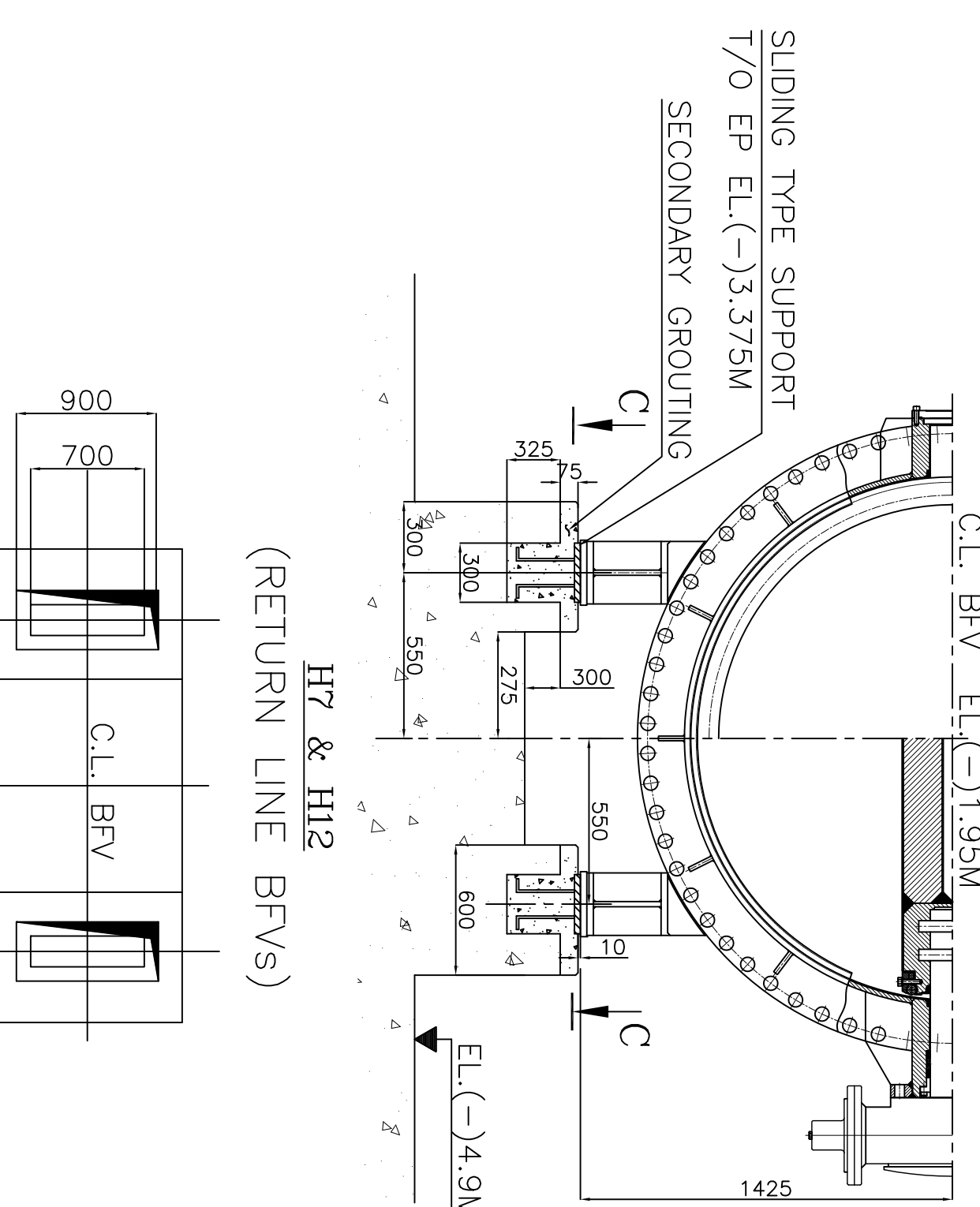
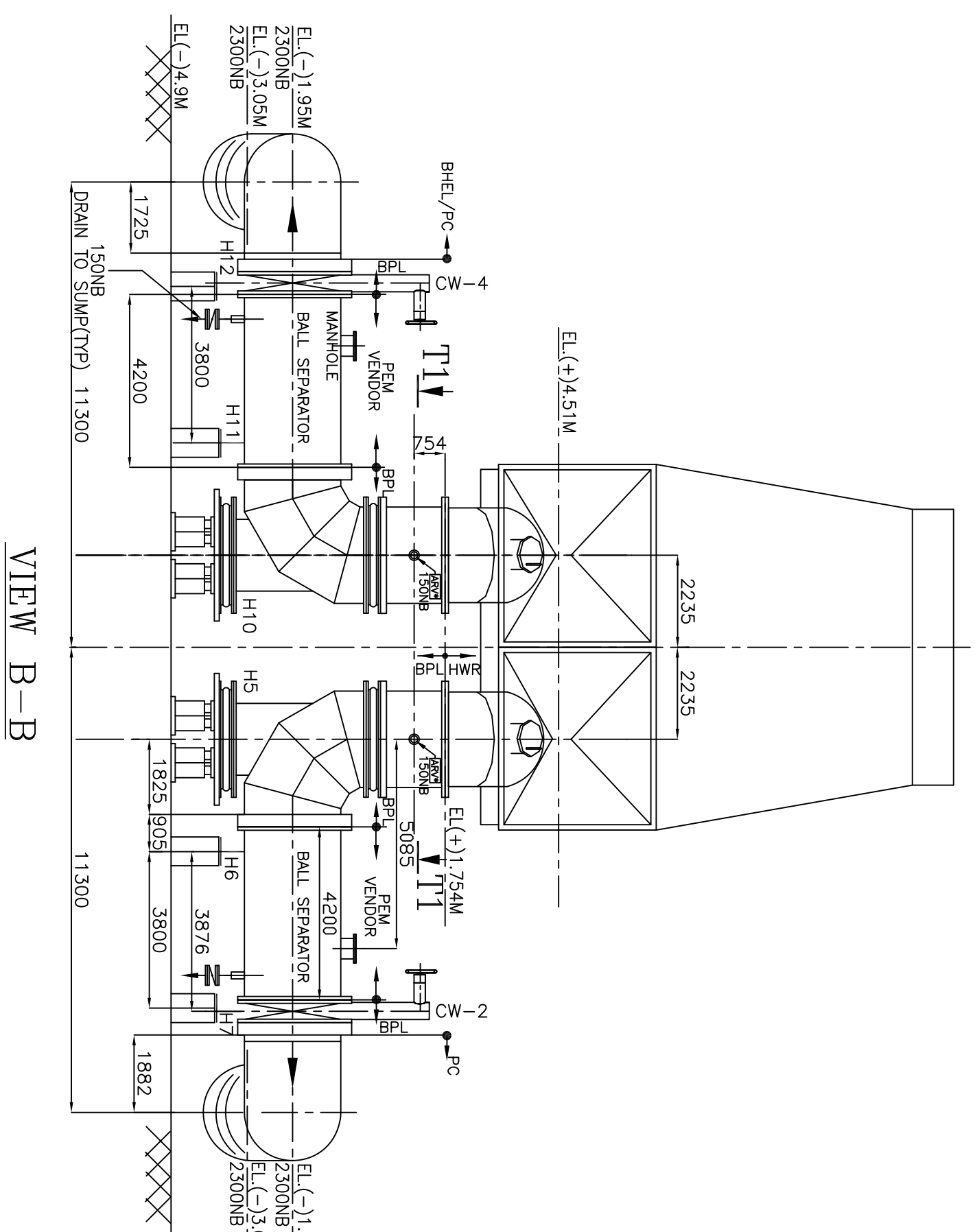
FROM OF LOOSELY SUPPLIED DRAINS, VENTS & IMPULSE PIPES (UP TO ROOF VALVES)

- 150NB PIPE = 60M
- 150NB ELBOW = 12Nos.
- 150NB EQUAL TEE = 2Nos.
- 15NB PIPE = 50M
- 15NB COUPLING = 10Nos.

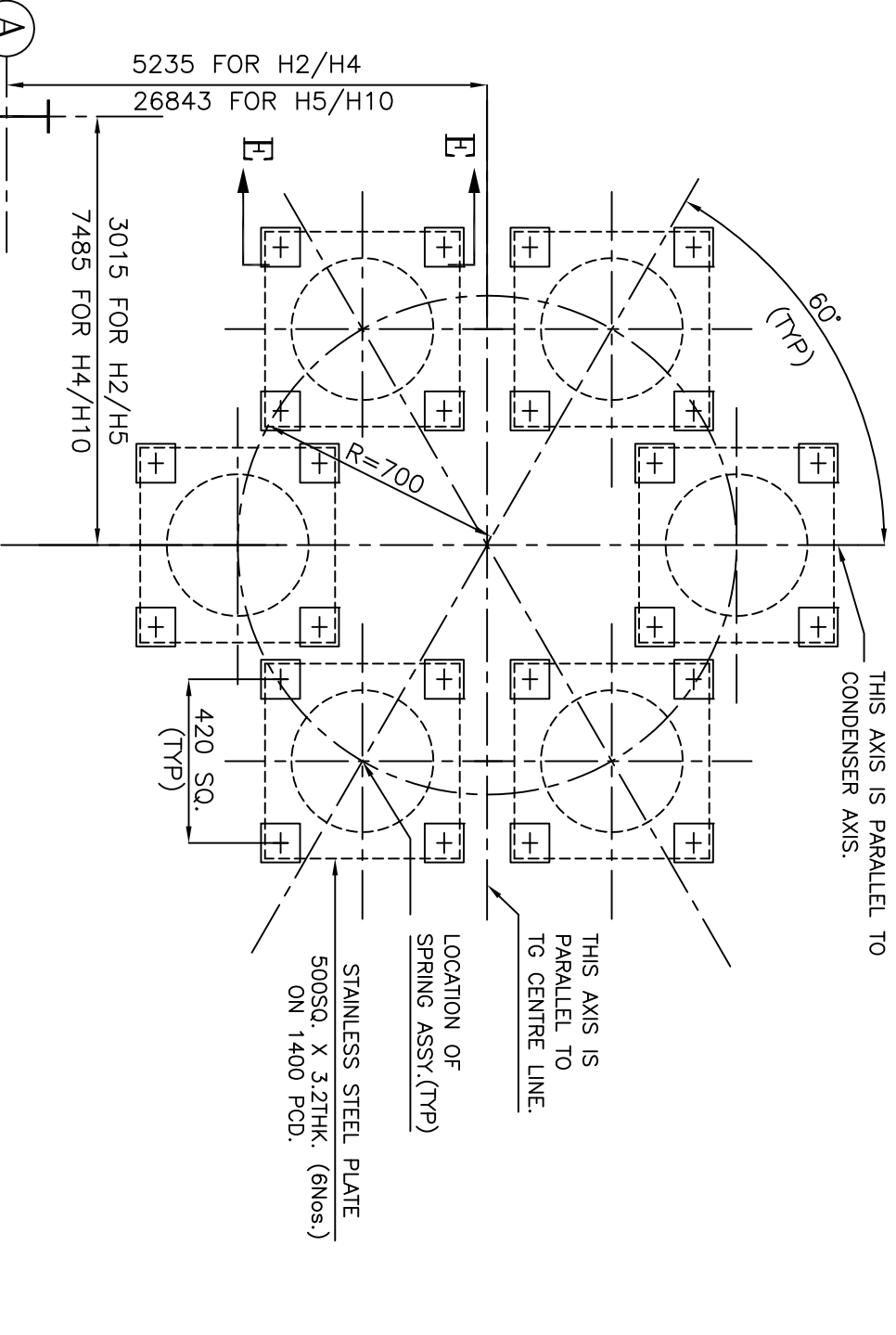
VALVE DETAILS- HOLD

SL. NO.	VALVE TAG NO.	SIZE (NB)	TYPE	END TYPE	LENGTH (MM)	SUPPLIED BY
1.	CW1 TO CW4	2300	BRV	FLGD.	1156	BHEL-BHPC&E
2.	FROM DRAIN LINE	150	BRV	FLGD. #125	127	PEM

WITH WARMING FLANGE AND NECK PIECE



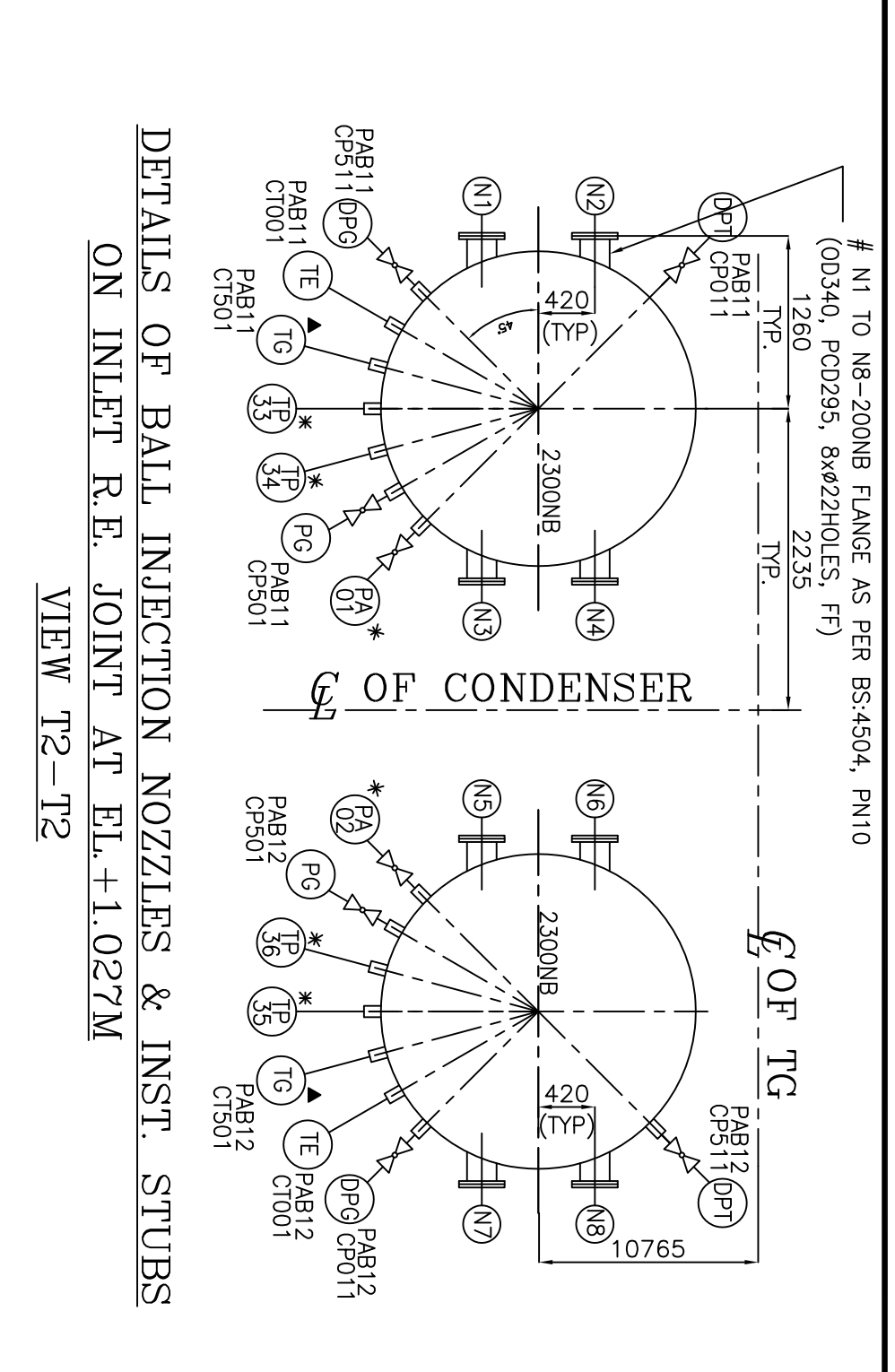
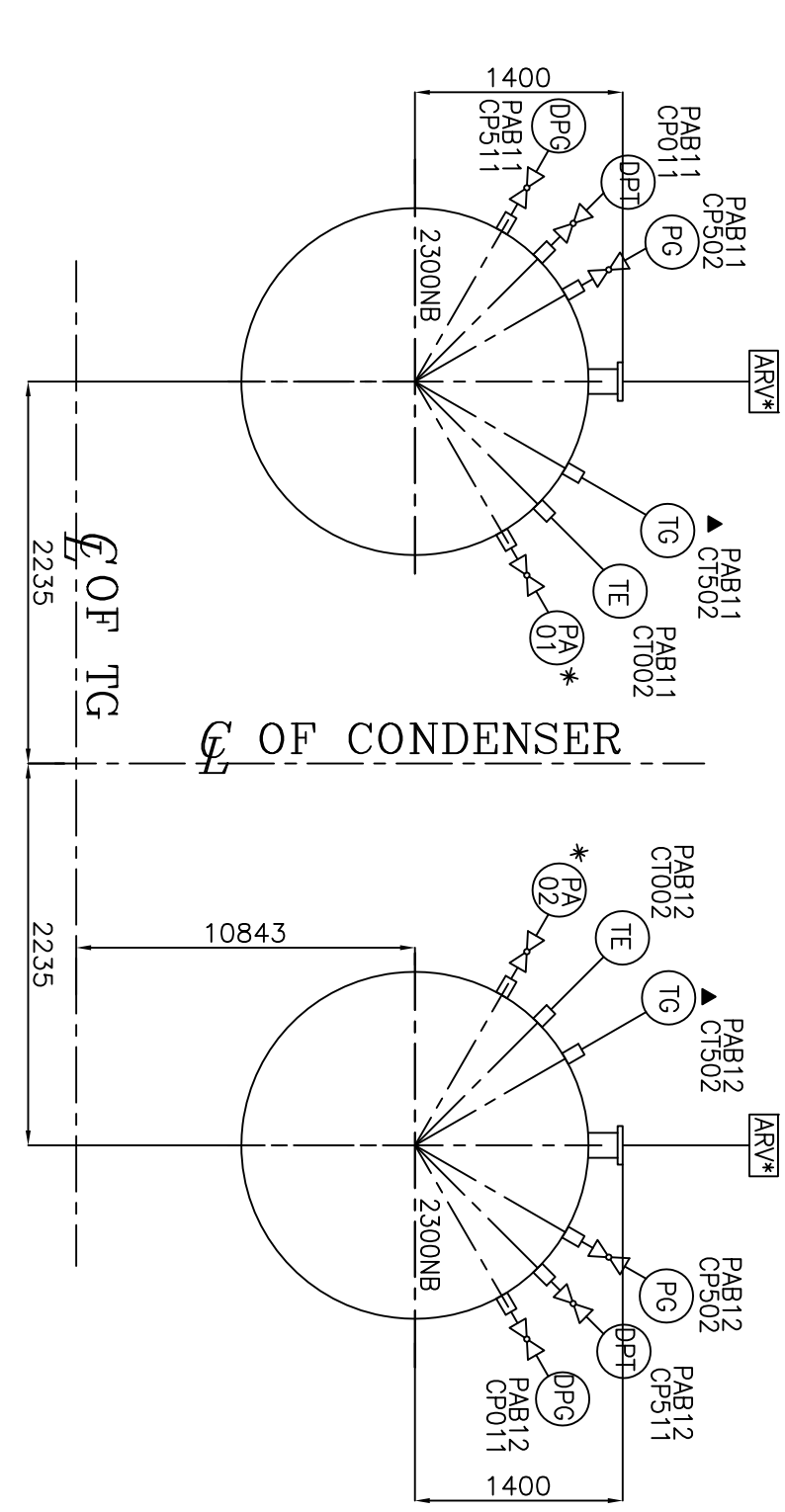
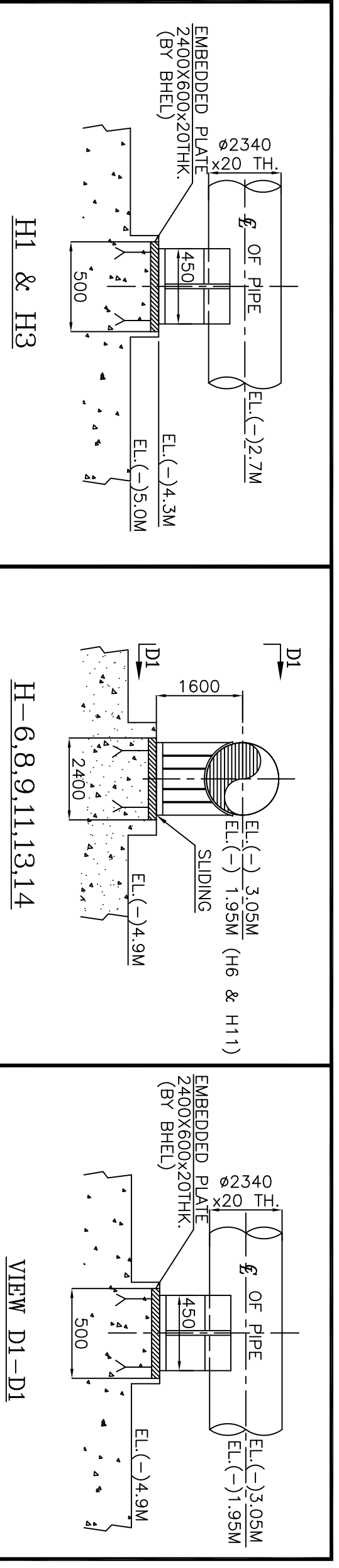
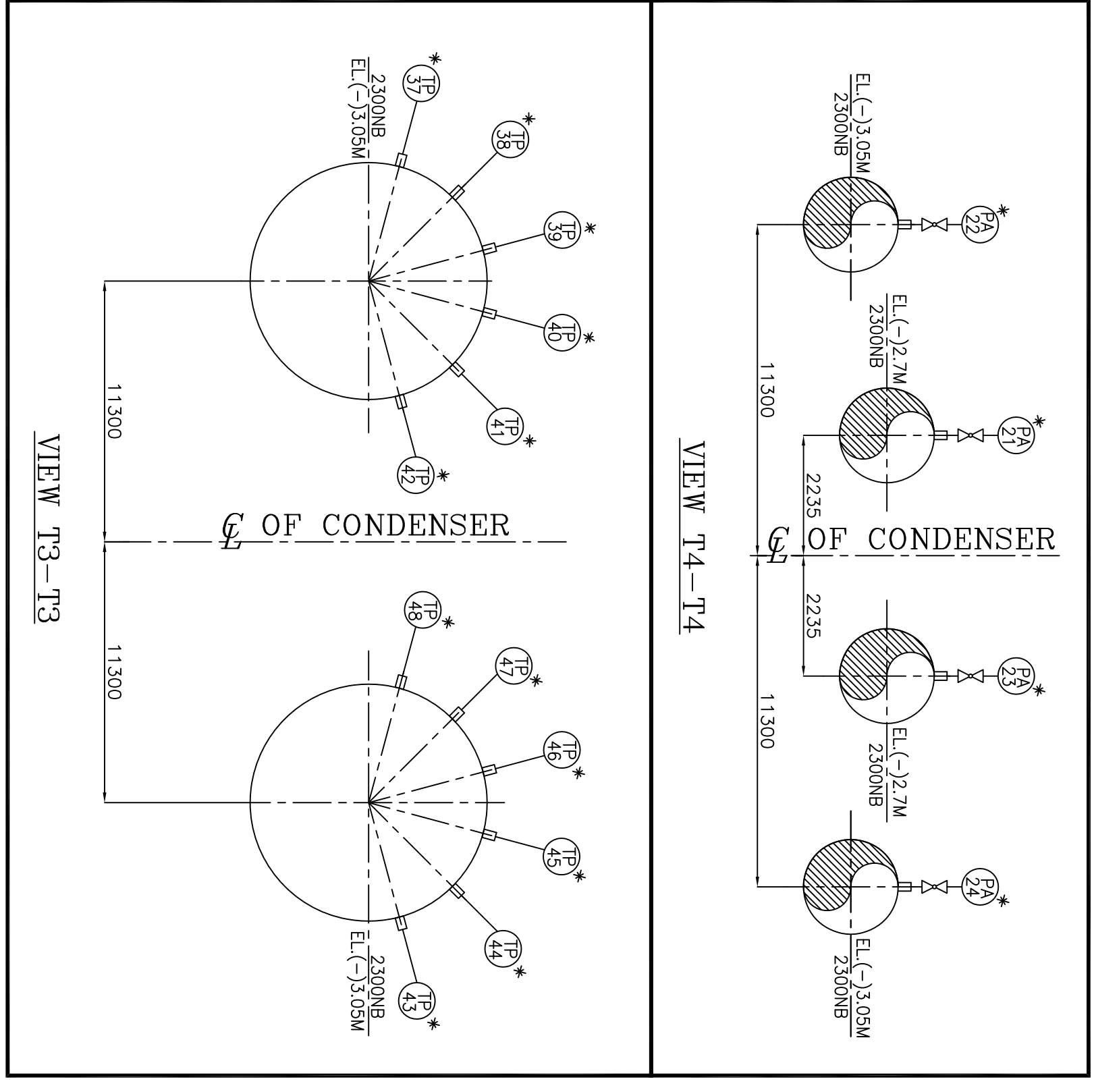
PUDDLE FLANGE DETAILS AT LOCATIONS A1 TO A4



FOUNDATION POCKET DETAILS FOR SUPPORT H2/H4/H5/H10

SECTION - EE

FOUNDATION DETAILS FOR EACH SPRING (H2,H4,H5&H10)



NOTES:-

- ALL DIMENSIONS ARE IN MM AND ELEVATIONS IN METERS UNLESS STATED OTHER WISE.
- ALL ELEVATIONS ARE MARKED WRT TG. HALL FINISHED FLOOR LEVEL AS +0.0M.
- DESIGN PARAMETERS:
PRESSURE : 5 kg /sqcm (g) & 0.1 kg /sqcm (a)
HMD TEST PRESSURE : 7.5 kg/sqcm, TEMPERATURE : 60°C
PUMPING UPTO 150NB SHALL BE CARBON STEEL EPW (S-1239/C)
2300NB - 2340 OD x 20 THK., 150NB - 166.5 OD x 5.4THK.
ALL BENDS ARE OF WIRE TYPE WITH RADIUS = 1728MM (0.750) FOR 2300NB.
INSTRUMENTS MARKED WITH * ARE FOR PERFORMANCE GUARANTEE TEST.
MATING FLANGES FOR BRV & BALL COLLECTING STRAINERS ARE WITH NECK PIECES AND SHALL BE SUPPLIED WITH RESPECTIVE EQUIPMENT.
* ARV'S ARE IN CUSTOMER SCOPE.
* ARV'S ARE IN CUSTOMER SCOPE.

DVC DRAWING No. 9586-110-PYM-P-101

RAJCHUNATIPUR THERMAL POWER PROJECT
PHASE-II (2 x 660MW)

REV.	DATE	BY	CHK	APPD	REVISION
1	12/12/2013	AD	AD	AD	1

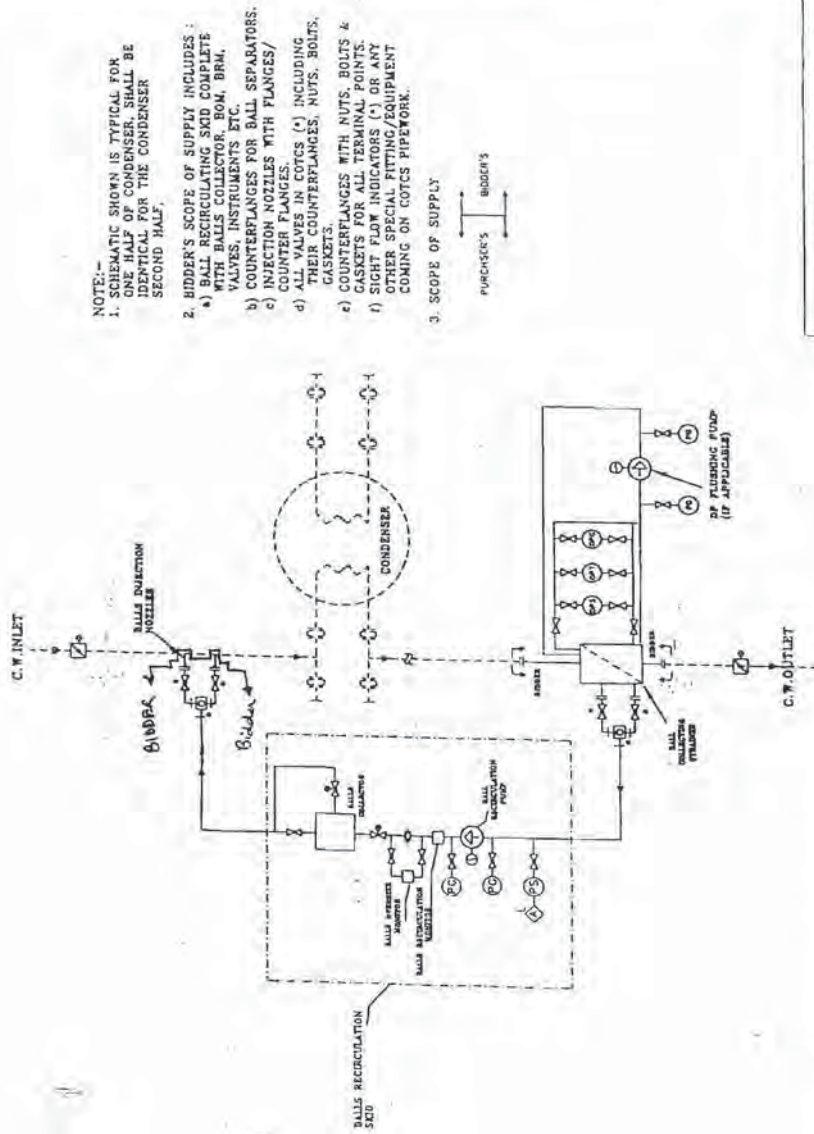
DESIGNED BY	CHKD BY	APPD BY	DATE
AD	AD	AD	12/12/2013

PROJECT ENGINEER	PROJECT MANAGER	DATE
AD	AD	12/12/2013

SCALE 1:125	DWG NO.	DATE
1:125	PE-DG-390-165-M001	12/12/2013

SHEET 1 OF 1	REV. 00
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ANNEXURE -V



TYPICAL FLOW DIAGRAM FOR
ON LOAD TUBE CLEANING SYSTEM

INVESTMENT IN THE FUTURE



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO. PE-TS-390-165-N001

VOLUME : IIB

SECTION : C

REV. NO. 0

DATE : 17.07.13

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SECTION C2

CONDENSER ONLOAD TUBE CLEANING SYSTEMS

ELECTRICAL DETAILS

ANNEXURE – I TO SECTION – C : STANDARD ELECTRICAL SCOPE BETWEEN BHEL/NTPC AND VENDOR
 PACKAGE : COLTCS
 REV : 0

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL/NTPC	BHEL/NTPC	1. 415 V AC/240 V AC supply shall be provided by BHEL/NTPC based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract including power supply equipment (battery charger etc) required for the PLC/control panel (as applicable) for the system supplied by vendor. 2. Interposing relays (RE 302 of Jyoti make or equivalent), if required for PLC and microprocessor based systems, shall be provided by BHEL/NTPC in MCCs. Requirement of these relays shall be furnished by vendor during detailed engineering stage.
2	Local Push Button Station (for motors)	Vendor	Vendor	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL/NTPC's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	BHEL/NTPC Vendor BHEL /NTPC	BHEL/NTPC BHEL/NTPC BHEL/NTPC	1. Sizes and quantity of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL/NTPC). Finalisation of cable sizes shall be done by BHEL/NTPC. Vendor shall provide lugs & glands accordingly. 2. Laying of cables by BHEL/NTPC. 3. Termination at BHEL/NTPC equipment terminals by BHEL/NTPC. 4. Termination at Vendor equipment terminals by Vendor.
4	Any special type of cable like compensating, co-axial, prefab, MICC, fibre optical etc.	Vendor	Vendor	
5	Cable trays, accessories & cable trays supporting system	BHEL/NTPC	BHEL/NTPC	
6	Cable glands and lugs for equipments supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power cables 3. Solder less crimping type heavy duty copper lugs for control cables.
7	Conduit and conduit accessories for cabling between equipments supplied by vendor	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537. Makes of conduits shall be subject to

REV : 0

ANNEXURE – I TO SECTION – C : STANDARD ELECTRICAL SCOPE BETWEEN BHEL/NTPC AND VENDOR

PACKAGE : COLTCS

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
8	Lighting	BHEL/NTPC	BHEL/NTPC	customer/ BHEL/NTPC approval at contract stage.
9	Equipment grounding & lightning protection	BHEL/NTPC	BHEL/NTPC	
10	Below grade grounding	BHEL/NTPC	BHEL/NTPC	
11	L.T Motors with base plate and foundation hardware	Vendor	Vendor	Makes shall be subject to customer/ BHEL/NTPC approval at contract stage.
12	Mandatory spares	Vendor	-	Vendor to quote as per specification.
13	Recommended O & M spares, E & C spares, erection & maintenance tools & tackle.	Vendor	-	As per specification
14	Any other equipment/material/service required for completeness of system but not specified above (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	
15	a) Input cable schedules (C & I) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for C & I systems for vendor supplied equipment shall be furnished during detail engineering by vendor in soft copies in the BHEL/NTPC cable schedule format.
16	Equipment layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipments requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Electrical equipment layout drawing shall be to BHEL/NTPC approval.
17	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

1. Make of all electrical equipments/items supplied shall be reputed make & shall be subject to approval of BHEL/NTPC/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/NTPC/customer after award of contract without any commercial implication.
3. For skid mounted system, 2 nos. (1W+1S) supply of 415 V, 3 phase AC shall be provided by BHEL/NTPC. Complete electrical distribution for the skid including changeover between feeder/starters/LCP/inter-locks/protection devices / any other supply etc. shall be in bidder's scope.



TITLE

LV MOTORS**DATA SHEET-A**

SPECIFICATION NO.

VOLUME II B

SECTION D

REV NO. DATE

SHEET 1 OF 1

- 1.0 Design ambient temperature : 50 °C
- 2.0 Maximum acceptable kW rating of LV motor: Below 200KW
- 3.0 Installation (Indoors/ Outdoors) : As required
- 4.0 Details of supply system
- a) Rated voltage (with variation) : 415V \pm 10%
 - b) Rated frequency (with variation) : 50 Hz +3 to -5%
 - c) Combined voltage & freq. variation : 10% (sum of absolute values)
 - d) System fault level at rated voltage : 45 kA RMS for 1 sec
 - e) Short time rating for terminal boxes
 - o 110 kW and above (Breaker : 45 KA for 0.20 sec. controlled)
 - o Below 110 kW (Contactor : 45 KA protected by fuse controlled)
 - f) LV System grounding : Solidly
- 5.0 Class of insulation : Class 'F', with temp rise limited to class B.
- 6.0 Minimum voltage for starting : 85% of rated voltage
(As percentage of rated voltage)
- 7.0 Power cables data : Shall be given during Detailedengg
- 8.0 Earth Conductor Size & Material : Shall be given during Detailedengg
- 9.0 Space heater supply : 240 V, 1 ϕ , 50 Hz
- 10.0 Rating up to which Single phase motor : Acceptable below 0.20 kW
- 11.0 The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following
(Without any further tolerance) : As per clause no. 7.16 of technical spec sec-VI part-B (page 5 of 8)
- 12.0 Additional tests : As per QP
- 12.1 Flame-proof motor
- a) Enclosure suitable (As per IS:2148) : As per requirement
 - b) Classification of Hazardous area : As per requirement
(As per IS: 5572 part-I)
- 12.0 Makes : As per customer approved vendors



**ELECTRICAL EQUIPMENT SPECIFICATION
FOR COLTCS**

SPECIFICATION NO.

PE-TS-

VOLUME NO. : II-B

SECTION : C

REV NO. : 00 DATE : 9.1.12

SHEET : 1 OF 1

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER :

- a) Services and equipment as per "Electrical Scope between BHEL and Vendor".
- b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The same shall be provided by the bidder without any extra charge.
- c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
- d) Erection and Commissioning spares.
- e) Erection & Maintenance tools & tackles.
- f) Electrical load requirement for COLTCS.
- g) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- h) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer /BHEL approval without any commercial and delivery implications to BHEL.
- i) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.

2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:

Refer "Electrical Scope between BHEL and Vendor".

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

- 3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/quality assurance requirements stipulated. In line with this two signed and stamped copies of the following shall be furnished by the bidder as technical offer:

- a) A copy of this sheet "Electrical equipment Specification for "COLTCS" and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
- b) List of Erection and Commissioning spares.
- c) List of Erection & Maintenance tools & tackles.
- d) Electrical load requirement

- 3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

4.0 List of enclosures :

- a) Specification AC/DC Motors
- b) Data sheet of AC/DC Motors,
- c) Quality Plan.
- d) Load data format.



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO. PE-TS-390-165-N001

VOLUME : IIB

SECTION : C

REV. NO. 0

DATE : 17.07.13

SHEET 1 of 1

SECTION C3

CONDENSER ONLOAD TUBE CLEANING SYSTEMS

C&I DETAILS

SPECIFIC C&I TECHNICAL REQUIREMENT FOR COLTCS

Sl.No.		2X660 MW RAGHUNATHPUR
1.00	SYSTEM	COLTCS
2.00	COMMON / PER UNIT	PER UNIT
3.00	CONTROL SYSTEM	DCS (TG C&I)
3.10	PROCESSOR CONFIGURATION FOR PLC SYSTEM	NA
4.00	LOCATION OF CONTROL SYSTEM	CCR
4.10	CONTROL SYSTEM SCOPE (BIDDER/ BHEL/ CUSTOMER)	BHEL
5.00	HARDWIRED INTERFACE WITH DCS (Y/N)	NA
5.10	PURPOSE OF HARDWIRED INTERFACE WITH DCS	
5.11	a) COMMAND FROM DCS (Y/N)	NA
5.12	b) STATUS FEEDBACK TO DCS (Y/N)	NA
5.13	c) GROUP FAULT ALARM TO DCS (Y/N)	NA
6.00	SOFTLINK TO DCS (Y/N)	NA
6.10	PURPOSE OF SOFTLINK TO DCS	
6.11	a) COMMAND INTERFACE WITH DCS (Y/N)	NA
6.12	b) STATUS MONITORING IN DCS (Y/N)	NA
7.00	PROTECTION CLASS FOR PLC / RIO PANEL	NA
8.00	CONTROL FROM PB's ON LCP/OWS ON LCP	NA
9.00	ANNUNCIATION ON LCP (Y/N) – IF Y, MIN NO. OF HARDWIRED ALARMS / INDICATIONS	NA
9.10	MIMIC ON LCP (Y/N)	NA
10.00	CONTROL FROM DCS IN CCR (Y/N)	Y
11.00	TYPE OF SOFTLINK (TP/OFC)	NA
11.10	COMMUNICATION CABLE SCOPE (BIDDER/ PEM/ EDN/ CUSTOMER)	NA
11.20	REDUNDANT CABLE (Y/N)	NA
11.30	PROTOCOL	NA
12.00	RIO / RPU (Y/N)	NA
13.00	## NO. OF OWS / LAPTOP	NA
13.10	SIZE OF OWS/ CRT OR LCD	NA
14.00	NO. OF PRINTER	NA
14.10	PRINTER SIZE AND TYPE	NA
15.00	\$\$ POWER SUPPLY AVAILABLE FOR BALL MONITOR (24V DC / 110 V AC UPS / 230 V AC UPS)	24V DC

15.10	&& POWER SUPPLY AVAILABLE FOR PLC PANEL (3PHASE, 415 V AC/ 1PHASE, 110 V UPS/ 1PHASE, 230 V UPS)	NA
15.20	REDUNDANT FEEDERS (R) / NON-REDUNDANT (NR) FEEDERS FOR POWER SUPPLY	NA
15.30	UPS BATTERY CONFIGURATION (1X100% / 2X100%)	NA
15.40	BATTERY TYPE (LEAD ACID/ Ni-Cd)	NA
15.50	BATTERY BACK-UP TIME (in minutes)	NA
16.00	ACTUATOR WITH INTEGRAL STARTER (Y/N)	Y
17.00	PG/ DPG/ PS/ DPS/ PT/ DPT per Balls Collecting Strainer	DPT = 2 nos. DPG = 1 no.
19.00	REMARKS	
20.00	PROJECT SPECIFIC INFO	

NOTES:

1. \$\$ THIS IS APPLICABLE FOR DCS CONTROLLED SYSTEMS ONLY.
2. IN CASE OF DCS CONTROLLED SYSTEMS, BIDDER TO TERMINATE ALL INSTRUMENTATION AND CONTROL ELEMENTS IN JUNCTION BOXES FOR FURTHER CABLING TO DCS BY BHEL/CUSTOMER. BIDDER TO PROVIDE INPUT/OUTPUT LIST, DRIVES LIST, JUNCTION BOX SCHEDULE AND TERMINATION DETAILS, RECOMMENDED CONTROL LOGICS / WRITE-UP ETC. DURING DETAILED ENGINEERING
3. FOR THE PROJECTS IN WHICH CONTROL ARE ENVISAGED WITH DCS CONTROL SYSTEM FOR COLTCS- 2 SETS OF COLTCS/ SHALL HAVE ONE COMMON STARTER PANEL (SWITCH GEAR PANEL).
4. INSTRUMENT RACK AND JUNCTION BOXES SHALL BE IN BIDDER'S SCOPE OF SUPPLY.
5. BIDDER TO FURNISH ELECTRICAL LOAD DATA DURING DETAILED ENGINEERING.
6. ALARM FACIA SHALL BE UNDER BIDDER'S SCOPE. NO. OF FACIA SHALL BE DECIDED DURING DETAILED ENGINEERING.

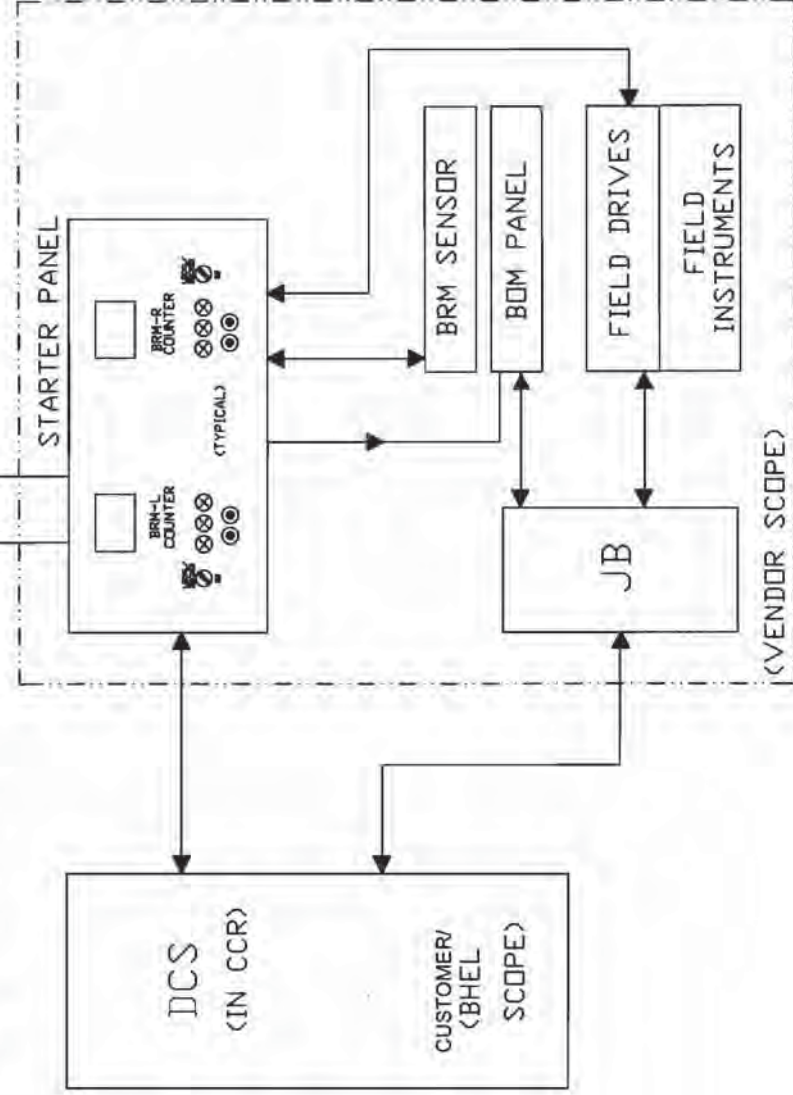
LEGEND:

DCS- DISTRIBUTED CONTROL SYSTEM
 PLC- PROGRAMMABLE LOGIC CONTROLLER
 RPU - REMOTE PROCESSING UNIT

STANDARD BLOCK DIAGRAM FOR COLTCS PACKAGE WITH DCS CONTROL

415V AC, 3P, 4WIRE
REDUNDANT FEEDER (BY CUSTOMER/BHEL)

CONFIGURATION A:
WITH STARTER PANEL IN VENDOR SCOPE





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SECTION – D

STANDARD TECHNICAL SPECIFICATION

**SECTION D1 : CONDENSER ONLOAD TUBE CLEANING
SYSTEM**

SECTION D2 : ELECTRICAL SYSTEMS

SECTION D3 : C&I SYSTEM



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO. PE-TS-390-165-N001

VOLUME : IIB

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SECTION D1

STANDARD TECHNICAL SPECIFICATION FOR CONDENSER ONLOAD TUBE CLEANING SYSTEMS

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1.00.00

GENERAL

This specification covers the design, performance and operational requirements, configuration and constructional features, manufacture, assembly, inspection and testing at the manufacturer's and/or his sub-contractor's works and painting for delivery of condenser on-load tube cleaning system (sponge rubber balls type) complete with all accessories as specified hereinafter. Each half of the condenser shall be provided with an independent tube cleaning system.

2.00.00

CODES AND STANDARDS

2.01.00

The design, materials, manufacture, inspection and testing of the condenser on-load tube cleaning system complete with all accessories, shall comply with the requirements of the latest versions of the following appropriate codes and standards.

2.01.01

IS/BS/DIN/US Standards regarding pressure vessels, pumps, piping, flanges and others as necessary.

2.01.02

IS/BS/DIN/ASTM Standards for materials specification and testing procedures.

2.01.03

IS/BS/DIN/AWWA Standards for valves and the testing.

2.02.00

In case of any conflict between the above codes/standards and this specification, the later shall prevail and in case of any further conflict in the matter, the interpretation of the specification by the Engineer shall be final and binding.

3.00.00

DESIGN AND CONSTRUCTION

3.01.00

General Requirements

3.01.01

Unless otherwise necessary, manufacturer's standard and proven models of the tube cleaning system shall be supplied.

3.01.02


The tube cleaning system shall be capable of safe, continuous and trouble-free operation for removal of fouling and scaling materials from condenser tubes. Vibration, noise, mechanical stresses shall be kept within allowable limits specified by relevant codes/standards. In design, due attention shall be given to ease of maintenance, repair and cleaning.


3.01.03


Suitable Corrosion allowance shall be provided whenever necessary. Adequate provision for future installation of cathodic protection shall be provided.


3.01.04

The tube cleaning system shall consist of ball separator at condenser outlet, recirculating pump, ball collector, differential pressure measuring system for ball separator, ball monitoring system, cleaning balls, piping valves, distributors, injection nozzles, instrumentations, control panel, interconnecting cables and others as necessary. The configuration of the tube cleaning system shall be as described in section C and / or as per the scheme enclosed.

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3.02.00	<u>Performance Requirements.</u>		
3.02.01	The tube cleaning system with all accessories shall be designed and guaranteed to meet the following requirements : The tube cleaning system shall perform satisfactorily under the flow and pressure drop conditions (in the condenser) specified in Data Sheet - A and shall be capable of removing the various forms of fouling and scaling from condenser tubes.		
3.02.02	The ball separator at the condenser outlet, shall be designed such that the pressure drop across the ball separator under clean conditions shall not be more than that specified in Data Sheet - A. The performance of the ball separator shall be continuous with minimum number of backwashing operations.		
3.02.03	The power consumption by ball recirculation pump during various operations shall be minimum possible. The quantity of cleaning balls worn out and / or lost, shall be minimum possible.		
3.03.00	<u>Operational Requirements.</u>		
	The tube cleaning system and other accessories shall be designed for the following operation modes :		
3.03.01	Complete automatic start-up of tube cleaning system initiated by pressing the push button (manual command).		
3.03.02	Complete automatic shut-down of tube cleaning system with ball collection, effected by the following : <ul style="list-style-type: none"> ◆ Push button (manual command). ◆ Adjustable timer (after a defined cleaning period). ◆ Ball monitoring system (when the number of oversized balls falls below a set value). 		
3.03.02	Complete automatic backwashing of ball separator with ball collection, effected by the following : <ul style="list-style-type: none"> ◆ Differential pressure measuring system at a pre-determined differential across the ball separating strainer/ screen. ◆ Adjustable timer ◆ Push button 		
3.03.04	Complete automatic emergency backwashing of ball separator with alarm indication, effected by differential pressure measuring system.		
3.03.05	Manual operation for start-up, shut-down with ball collection backwashing of ball separator, flushing of differential pressure measuring system etc., in case of failure of control system.		

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3..04.00	<u>Ball Separator</u>		
3.04.01	Ball separator body shall be of rigid construction and shall be designed and manufactured as per the applicable codes for pressure vessels. It shall house the ball separating screen / strainer and shall have flanged inlet, outlet, ball extraction opening and pressure measuring tappings etc. Body shall be designed and manufactured as per the applicable codes for pressure vessels and to take care of forces and moments as enclosed in the specification. However in no case thickness of housing/body shall be less than the connecting pipe thickness as specified in data sheet A		
3.04.02	The ball separator shall be provided with manhole with bolted cover and sight glass to observe its internals.		
3.04.03	If specified in Data Sheet -A, ball separator body shall be Epoxy lined.		
3.04.04	The ball separating screen / strainer shall be designed for the maximum differential pressure across the separator and shall be securely mounted in the body. Screen / strainer shaft shall be sized adequately considering the overloading of screens / strainer due to debris accumulation.		
3.04.05	The ball separating strainers / screens shall have electric actuators for swivelling to allow for their backwashing. Also suitable handwheels shall be provided to enable manual swivelling of strainers / screens.		
3.05.00	<u>Ball Recirculating Pump</u>		
3.05.01	The ball recirculating pump shall be horizontal centrifugal type. The casing shall be designed to withstand 1.5 times the shut-off pressure or twice the operating pressure, whichever is higher.		
3.05.02	The impeller shall be non-clog type and shall be contoured suitably to avoid damage to the cleaning balls. The impeller shall be secured suitably to the shaft and shall be retained against circumferential movement by keys, pins or lock rings. Loctite compound shall be applied after tightening of locknuts to prevent dislocation of impeller.		
3.05.03	Replaceable type wearing ring shall be provided to prevent damage to the casing and impeller.		
3.05.04	Pumps shall be provided with mechanical seals to the extent feasible. If Gland packing is provided it should be of good quality to be provided to prevent leakage of water from pump glands.		
3.05.05	Shaft size selected shall take into Consideration the critical speed which shall be away from the operating speed as recommended in applicable codes / standards. Renewable type fine finished shaft sleeves shall be integral with water thrower plates at the end and the length must extend beyond the outer faces of gland packing so as to distinguish between the leakage between shaft and the shaft sleeve and that past the seals / glands.		

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3.05.06	Bearings of adequate design shall be provided for taking the entire pump load arising from all probable conditions of continuous operation through its range of operation. The bearings shall be designed on the basis of 20,000 working hours minimum for the load corresponding to the duty point. Proper lubricating element does not contaminate the liquid being pumped. Bearings shall be easily accessible without disturbing the pump assembly		
3.05.07	Stuffing box of suitable design to permit replacement of packing without removing any part other than the gland shall be provided. The stuffing boxes shall be sealed / cooled by the fluid being pumped.		
3.05.08	Pumps shall be of self-lubricated, self - sealed and self-cooled type. All pipework, fitters etc., for sealing, cooling and lubricating purpose shall be supplied and no external cooling/lubricating/sealing water will be supplied. Pump capacity shall take into account the cooling/lubricating/sealing water requirement.		
3.05.09	All rotating components shall be statically and dynamically balanced.		
3.05.10	The pump shall be designed such that pump impellers and other accessories of the pump, are not damaged due to flow reversal.		
3.05.11	The pump shall be capable of developing the required total head at rated capacity for continuous operation. Also the pumps shall be capable of being operated to give satisfactory performance at any point on the head Vs. flow characteristic curve over a range or 40% of rated flow to 120 -130 % of rated flow.		
3.05.12	The pump shall preferably be non-overloading type. The total head Vs. capacity curve shall be continuously rising from the maximum flow point towards shut-off without any zone of instability.		
3.05.13	The pump shall run smoothly without undue noise and vibration. Peak to peak vibration limits and noise level shall be within the acceptable values of applicable codes/standards.		
3.05.14	The pump and motor shafts shall be connected through a pin and rubber bush flexible type of couplings. Suitable coupling guards shall be provided for the couplings.		
3.05.15	The pump shall be capable of being started with discharge valve fully opened. Motor rating shall be adequate for this condition. The output KW rating of the pump drive motor shall not be less than the larger of the following :		
	a) Maximum power input to the pump over the entire range for maximum flow to shut-off condition.		
	b) 125% of power input to the pump at duty point corresponding to 103% of the rated speed.		
3.06.00	<u>Ball Collector</u>		
3.06.01	The body of the ball collector shall be designed to withstand 2.0 times the operating pressure or 1.5 times the recirculating pump shut-off pressure, whichever is higher.		

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The ball collector shall be designed and manufactured as per the applicable codes for pressure vessels.

3.06.02 Ball collector shall be provided with an inspection window/sight glass for visual inspection of the cleaning balls.

3.06.03 Ball collector shall be provided with suitable ports with covers for ball feeding and removal.

3.06.04 The ball collector shall be provided with vent and drain connections with isolating valves.

3.06.05 Provision shall be made in the ball collector for separating the undersized balls and ball collector shall have a separate chamber for collecting the undersized balls.

3.06.06 If specified in Data Sheet -A, ball collector body shall be lined with suitable resilient material.

3.06.07 The differential pressure measuring system shall be provided with D.P. transmitter ,DPS & DPGof remote seal arrangement.

3.07.00 **Differential Pressure Measuring System.**

3.07.01 The ball separator shall be provided with a measuring system for differential pressure across the ball separating strainer/screen, to check debris accumulation and to initiate ball catching and backwashing operations. This shall consist of a differential pressure switch/transmitter for automatic backwashing operation, a differential pressure guage for manual observation with adequate number of tappings with isolating valves.

3.07.02 The contacts for differential pressure switch/transmitter and for differential pressure guage shall be independent, so that in the event of failure of one, the other is available.

3.07.03 The differential pressure measuring system shall be with remote seal arrangement .

3.08.00 **Ball Monitoring System**

3.08.01 Ball monitoring system shall be provided for continuously monitoring the quantity and size of the cleaning balls in circulation. The monitoring system shall perform the following functions :

a) Continuously counting the oversize balls in circulation and giving an alarm calling for investigation of ball losses, when the number of oversize circulating balls falls below a set valve.

b) Continuously measuring the size of the balls in circulation and initiating the shut-down of the tube cleaning system with alarm calling-for replacement of balls when the number of oversized balls falls below a set valve.

c) Bidder's if not manufacturing ball oversized monitor, can supply automatic ball sorter in lieu of same for automatic sorting of the undersized balls.



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- 3.08.02 The monitoring system shall be of proven and reliable design and shall be complete with necessary transducers, amplifiers, transmission lines, power cables and electronic processor etc.
- 3.08.03 The electronic processor of the ball monitoring system shall be housed in the control panel and shall consist the following : -
- Indicators for
 - ♦ required basic ball charge.
 - ♦ recirculating ball quantity.
 - ♦ oversized ball quantity.
 - Time counters for
 - ♦ total cleaning system operating hours.
 - ♦ cleaning system operating hours with sufficient number of oversized balls.
 - Recorder for ball consumption.
- 3.08.04 The ball monitoring system shall have provisions for self-testing and self-calibration.
- 3.09.00 **Cleaning Balls**
- 3.09.01 The sponge rubber cleaning balls shall be slightly oversized to the internal diameter of condenser tubes and should be able to remove all fouling and scaling deposits in the condenser tubes.
- 3.09.02 The specific gravity of the cleaning balls shall be such that good distribution of balls across the tube sheet and cleaning of all tubes are ensured.
- 3.09.03 The composition of the cleaning balls shall be based on natural rubber and shall be suitable for temperature upto 100°C. Hardness of the cleaning balls shall be compatible to tube material and corrosion/fouling behaviour. If cleaning balls consist of abrasive coated balls, the abrasive material shall also be compatible for use with the tube material.
- 3.09.04 Calculations and basis for selection of cleaning balls circulation quantity, type, size, hardness, cleaning frequency etc., shall be furnished during contract stage.
- 3.10.00 **Piping, Valves, Distributors and Injection Nozzles.**
- 3.10.01 Interconnecting piping, valves, injection nozzles and other fittings shall be designed to withstand 2.0 times the operating pressure or 1.5 times the pump shut-off pressure whichever is higher.
- 3.10.02 Interconnecting piping shall be sized and routed optimally. Velocity in the pipe work shall be less than 1.5 m/s for pump suction and less than 2.2 m/s in other pipe work.
- 3.10.03 Necessary isolation valves, vent and drain valves for various equipments shall be provided. Valves shall conform to appropriate standards. Valves provided in ball transport piping shall be ball type. Gland packing of all valve shall be of superior quality to avoid leakage. All valves upto 150 Nb shall be ball valves. For higher sizes ,

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gate / globe / B.F. valves shall be provided. All instrument valves shall be needle valves.

3.10.04 Adequate number of ball injection nozzles shall be provided for proper distribution of cleaning balls in condenser inlet. Ball injection nozzles shall be flanged type and shall have two sets of flanges, one for connecting to ball transport pipe and other for connecting to the stub on condenser inlet pipe for ease of removal during repairs or checking.

3.10.05 Distributors (if applicable) with sight glass shall be provided wherever ball transport piping branching out or joining together for proper guidance of cleaning balls.

3.10.6 Type of valves shall be ball valves, no diaphragm type valve shall be used.

3.11.00 **Actuators**

3.11.00 Tube cleaning system shall be provided with actuators wherever necessary for various automatic operations. The actuators shall be electric motor operated and shall meet the requirements of the enclosed specification. The actuator shall be provided with auxiliary handwheel for manual operation in the event of control system failure.

3.12.00 **Electric Motors**

The drive motors for recirculating pump and differential pressure measuring system flushing pump shall conform to the requirements of the enclosed specification.

3.13.00 **Instrumentation and Control System.**


3.13.01 Complete instrumentation and control system for automatic operation of tube cleaning system, protection, interlocking, indication / annunciation of differential pressure and other malfunctions etc., shall be provided. This shall consist of adequate operational hardware, local control panel (As applicable) and interconnecting control and power cabling between the control panel and various equipments in the tube cleaning system.


3.13.02 The control panel shall house all necessary instruments, indicating / annunciation lamps, alarms, differential pressure indicator, timer, function selection switches, ball monitoring system processor, relays, protection and interlocking systems, start / stop push button etc., and shall be complete with internal wiring. The control panel shall meet the requirements of the enclosed specification.

3.13.03 Pressure gauges shall be provided at recirculating pump suction and discharge. All instrumentation shall be of reputed make and shall meet the requirements of the enclosed specifications.

3.14.00 **Other Accessories.**

3.14.01 Counter flanges, complete with gaskets, bolts and nuts etc., shall be supplied for ball separator inlet, outlet connections and all other terminal points. Fabrication, dimensions and drilling of the flanges shall conform to the codes/standards specified in

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<p>Data Sheet-A / Section -C.</p> <p>3.14.02 Ball recirculating pump, ball collector with interconnecting piping and valves, shall be mounted on a frame. For fixing the frame, necessary foundation plates, bolts, nuts etc. shall be provided.</p> <p>3.14.03 Suitable lifting arrangement shall be provided for various equipments of the tube cleaning system, for handling during erection and maintenance.</p> <p>3.15.00 <u>Materials of Construction</u></p> <p>Materials of various equipments in the tube cleaning system shall be corrosion resistant and consistent with the fluid handled. However, material specification for various components shall be equal to or superior to those specified in Data Sheet-A.</p> <p>4.00.00 <u>PAINTING</u></p> <p>4.01.00 The surface preparation of the various equipments / components of the tube cleaning system shall be done as per the standard mentioned in Data Sheet - A and shall include the following :</p> <p>a) Removal of oil, grease, dirt and swarf etc.</p> <p>b) Removal of rust and scale etc.</p> <p>c) Sand blasting / shot blasting.</p> <p>4.02.00 All internal surfaces of the various equipments / components of the tube cleaning system, which are subjected to immersion or water spray and which are not made of stainless steel or other corrosion resistant materials after surface preparation, shall be coated with epoxy paint of approved make and quality over a coat of zinc chromite primer, unless otherwise specified in Data Sheet - A.</p> <p>4.03.00 The external surfaces of the various equipments / components of the tube cleaning system after surface preparation, shall be coated with synthetic enamel paint of approved make and quality over two coats of red oxide primer, unless otherwise specified in Data Sheet -A.</p> <p>5.00.00 <u>SHOP INSPECTION AND TESTS</u></p> <p>5.01.01 <u>General</u></p> <p>5.01.01 Manufacturer shall conduct all tests and stage inspections as per the approved</p>		

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quality plan to ensure that the various equipments and other accessories of the tube cleaning system shall conform to the requirements of this specification and of the applicable codes / standards.

5.01.02 All materials used for manufacture /fabrication of the various equipments of the tube cleaning system shall be of tested quality. Relevant test certificates for chemical analysis, mechanical tests and heat treatment shall be made available before the final shop inspection. In case the relevant test certificates are not available, the manufacturer shall arrange to carry out the necessary tests as per the approved quality plan and applicable codes at his cost for which samples shall be identified by BHEL's representative.

5.01.03 All shop tests shall be conducted as per approved quality plan and test certificates / reports for the same shall be furnished to BHEL for approval.

5.01.04 Qualification of welding procedures and welders shall be as per ASME B&PV code, Section - IX / applicable codes.

5.2.00 **Ball Separator**

5.02.01 Chemical analysis, mechanical tests shall be carried out on materials used for body, strainer / screen, strainer / screen shaft and other appurtenances as per the applicable material specification standards.

5.02.02 All butt welded joints shall be subjected to radiographic/ ultrasonic testing as per applicable codes. However, all welded joints shall be subjected to 100% magnetic particle / penetrant testing to ensure freedom from defects.

5.02.03 Strainer / screen shaft shall be subjected to ultrasonic test as per ASTM-A388 for subsurface defects with acceptance norms as per ASME B&PV code, Section VIII, Division 1.

5.03.00 **Ball Recirculating Pump**


5.03.01 Chemical analysis, mechanical tests shall be carried out on materials used for casing, impeller, shaft, sleeves, wear rings etc., as per the applicable material specification standards.

5.03.02 The casting used for pump casing and impeller shall be sound, clean and free from porosity, blow holes, hard spots, cold shuts, distortion and other harmful defects. All accessible surfaces of the impeller shall be subjected to penetrant test as per ASTM-E165 for surface defects with acceptance norms as per ASME B&PV code, Section VIII, Division 1. No welding or repairs shall be carried out without prior permission of BHEL.

5.03.03 Pump shaft and sleeves shall be subjected to ultrasonic test as per ASTM - A388 for sub-surface defects and penetrant test after finish machining as per ASTM-E165 for surface defects.

5.03.04 Wear rings shall be subjected to penetrant test as per ASTM-E165.

5.03.05 Pump impellers and rotor assembly shall be statically and dynamically balanced as

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5.04.00 Ball Collector

5.04.01 Chemical analysis, mechanical tests shall be carried out on materials used for body and other appurtenances / accessories as per the applicable material specification standards.

5.04.02 All but welded joints shall be subjected to radiographic / ultrasonic testing as per applicable codes. However, all welded joints shall be subjected to 100% magnetic particle / penetrant testing to ensure freedom from defects.

5.05.00 Piping, Valves, Distributors, and Injection Nozzles.

5.05.01 Chemical analysis, mechanical tests shall be carried out for materials used for piping, fittings, valves, distributors and injection nozzles.

5.05.02 All welded joints of distributors & injection nozzles shall be subjected to penetrant test as per ASTM-E165 for surface defects with acceptance norms as per ASME B&PV code, Section VIII, Division 1.

5.05.03 Inspection and testing of valves including leakage test shall be carried out as per the requirements of the applicable standards. Valve stem and ball shall be subjected to penetrant test as per ASTM-E165.

5.05.04 All materials for various nozzles, stubs, gaskets, nuts, bolts etc. shall be of tested quality and correlating test certificates for chemical and mechanical properties shall be furnished.

5.06.00 Rubber Lining (as applicable)

Rubber lining shall be subjected to surface crack test, 100% spark and hardness tests and shall be checked for layer thickness, defects etc.

5.07.00 Flanges

5.07.01 Chemical and mechanical test certificates shall be furnished for flange materials.

5.07.02 In case of fabricated flanges, all the welds shall be subjected to 100% radiography as per ASME B&PV code, Section VIII, Division 1.

5.07.03 In case of forged flanges, ultrasonic testing shall be carried out as per ASTM-A 388.

5.07.04 If the thickness of the plate used for flanges is 40mm or more, the same shall be checked ultrasonically as per ASTM-A435 to demonstrate the absence of lamination and lack of fusion etc.

5.07.05 Flanges shall be checked for edge preparation, fit up and satisfactory working with matching parts.

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5.08.00 Dimensional Checks.

Dimensional checks for various equipments/components of the tube cleaning system shall be carried out as per assembly drawing approved by BHEL. Alignment and fit up of movable parts shall be checked.

5.09.00 Hydrostatic Test

Hydrostatic test shall be conducted on various assemblies / equipments / components of the tube cleaning system at a pressure of 1.5 times and design pressure. The duration of the test shall be minimum 30 minutes.

5.10.00 Leakage Test

Leakage test shall be conducted at the design pressure on all assemblies of the tube cleaning system to demonstrate that the assemblies are leak tight and no water seepage shall take place at various nozzles and valve connections.

5.11.00 Performance Test on Recirculating Pump

Performance test on recirculating pump with drive motor shall be conducted as per BS-599 / ASME PTC 8.0. Performance curves i.e., discharge flow Vs head, discharge flow Vs power consumption and discharge flow Vs efficiency shall be plotted and acceptance norms shall be as per BS-599 / ASME PTC 8.0. Vibration and noise shall be measure and acceptance norms shall be as per Hydraulic Institute (USA) standard.

5.12.00 Functional Tests

Various assemblies / equipments / components of the tube cleaning system shall be subjected to functional tests and the following shall be checked.

5.12.01 Smooth and free operation of all movable parts.


5.12.02 Interlock and sequential operation.

5.12.03 Satisfactory operations of ball monitoring system.

5.12.04 Satisfactory operations of actuators torque switches, limit switches etc.

6.00.00 TESTING AT SITE

After completion of installation at site, the tube cleaning system will be tested to check that the tube cleaning system performance meets the requirements of this specification. Rectification of all defects shall have to be done by the supplier at no extra cost to the owner / purchaser. However, the owner / purchaser reserves the right to reject the equipments / parts not meeting the requirement if the deficiency still persists.

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7.0.0 Performance Guarantee and Bid Evaluation criteria for Condenser on Load Tube Cleaning System.

The Tube Cleaning Systems shall be guaranteed to meet the performance requirements specified in Section-D , Data Sheet A and Guarantee schedule and also for trouble free operation after commissioning. Schedule of performance guarantees (enclosed in Volume III) duly filled and signed shall be furnished with the bid.

The Performance guarantees of equipments shall stand valid till the satisfactory completion of performance testing & its acceptance by BHEL/ Customer. If the guarantee period specified in the Commercial Specification is higher, same shall prevail.

7.01.00 Performance Parameters to be guaranteed by bidders shall be as under :

- Pressure drop in ball separator in clean condition viz. after back washing.
- Percentage recovery of balls (min. 95% recovery)
- Life of Sponge Rubber Ball (Min. 4 weeks)

7.02.00 Bidder to note that bids shall be evaluated on account of pressure drop across ball collecting strainer (in clean condition) and liquidated damages on account of not meeting the same during PG test shall be in accordance with following :

A) Bid Evaluation Criteria & Liquidated Damages:

The bids received shall be evaluated for Pressure drop across balls collecting strainers :


- The permissible limit of pressure drop across balls collecting strainers in clean condition shall be 0.15 MWC.
- If the pressure drops quoted are higher than above limit, the bids shall be technically loaded @ indicated in Data Sheet A .
- However no advantage shall be given for pressure drops quoted less than above permissible limit.
- The maximum acceptable limit for pressure drop across balls collecting strainer shall be (with technical loadings) 0.2 MWC.


The bids will be technically rejected for pressure drops quoted higher than above maximum limit.

- The guaranteed pressure drops shall be demonstrated at site by bidder and if found higher shall be subject to LD @ twice the bid evaluation factor as above.

7.03.00 Other Guaranteed Parameters to be demonstrated at site

- Life of sponge rubber balls shall be minimum 4 weeks.
- Percentage recovery of balls shall be minimum 95%.

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		<p>Any deviation to above balls life and percentage recovery will not be accepted.</p> <p>Bidder to indicate the life of sponge rubber ball and nos. of balls lost during 1000 hours of plant operation in the Guarantee schedule and shall demonstrate same at site.</p> <p>In case the successful bidder fails to demonstrate any of these parameters he shall carry out modifications at his own cost, to purchasers approval.</p> <p>In case bidder fails to demonstrate above parameters to purchaser's satisfaction even after modification carried by him at site, the purchaser has the right to reject the equipment out rightly.</p> <p>8.00.00 <u>QUALITY ASSURANCE & QUALITY PLAN</u></p> <p>8.01.00 The tube cleaning system and other accessories to be supplied, shall have assured quality and workmanship.</p> <p>8.02.00 Typical quality plans are enclosed herewith this specification for bidder's guidance. The bidder shall furnish his own quality plan based on materials, equipments and components of the tube cleaning system being offered.</p> <p>9.00.00 <u>NAME PLATE AND TAG NUMBERS</u></p> <p>9.01.00 Ball separator, recirculating pump, ball collector shall be provided with a permanently attached brass or stainless steel plate indicating the following details :-</p> <p> a) Design and maximum flow rates.</p> <p> b) Design and test pressures.</p> <p> c) Design temperature.</p> <p> d) Empty and operating weights.</p> <p>9.02.00 Each valve in the tube cleaning system shall be provided with a name plate indicating the following :-</p> <p> a) Service.</p> <p> b) Design and test pressures.</p> <p> c) Maximum flow and flow direction.</p> <p> d) Size.</p> <p> e) Tag Number.</p> <p> Tag Numbers will be indicated on the drawings submitted for approval during contract stage.</p> <p>9.03.00 Each motor shall be provided with a name plate indicating the following details :</p> <p> a) Supply conditions.</p> <p> b) KW Rating.</p> <p> c) Make.</p>	

	TITLE : STANDARD TECHNICAL SPECIFICATION CONDENSER ON - LOAD TUBE CLEANING SYSTEM (Sponge Rubber Ball Type)	SPECIFICATION NO. PE-TS-999-165-N001	
		VOLUME : II B	
		SECTION : D	
		REV. NO. 00	DATE : 27.09.07
		SHEET 14	OF 14
10.00.00	<u>DRAWING, DATA & INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT.</u>		
<p>The drawings, data and other documents as required in Data Sheet-C shall be furnished after the award of contract.</p>			

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Manufacturer's Name & Address		STANDARD QUALITY PLAN		BHEL Doc No.:	PEQP-889-165-N008 REV-01
INDEX		Vendor Q.P. NO.	PACKAGE : COLTCS	PROJECT:	
SL. NO.		DESCRIPTION		PAGE NO.	
1	BALL SEPARATOR			2 TO 5	
	WORM GEAR			6	
	ACTUATORS			6	
2	BALL RECIRCULATION SHUD			7	
	BALL VESSEL			7,8	
	BALL INJECTION NOZZLE			8	
	BALL RECIRCULATING PUMP			9	
	BALL VALVE			10	
	RECIRCULATING PUMP MOTOR			11	
3	WORM GEAR			11	
4	BALL OVERSIZE MONITOR			12	
5	PRESSURE GAUGE/DP GAUGE/DP SWITCH & DP TRANSMITTER			13	
	CLEANING BALLS			13	
7	ALL COMPONENT & EQUIPMENT			13	
8	STARTER PANEL			14	
9	FASTENERS			15	
Note: Items not included in quality plan to be inspected as per approved data sheets drawings					
<p align="center">ANNEXURES</p> <p align="center">DRY RUN TEST PROCEDURE FOR BALL SEPARATOR</p> <p align="center">HYDRO STATIC TEST PROCEDURE</p> <p align="center">LEAK TIGHTNESS TEST PROCEDURE</p> <p align="center">PACKING PROCEDURE</p>					
<p align="center">LEGEND</p> <p>* Records identified with "STAR" shall be essentially included by contractor in QA Documentation</p> <p>** M-Manufacturer / Manufacturer's Sub-contractor</p> <p>C- Contractor D- Owner</p> <p>Indicate - "IP" - Perform, "W" - Witness and "V" - Verification</p>		<p align="center">Contractor</p> <p align="center">Signature</p>			


Manufacturer's Name & Address		STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N008	
P.O. No.		Vendor Q.P. No.				PROJECT:	
Item : Ball Separator		PACKAGE: COLTCS				PURCHASER:	
Date :		Page 02 of 15				CONSULTANT:	
Characteristics Checked		Type of Check		Quantum of Check		Format of Record	
Class		4		6		g	
1.0.0 Component / Operation		2		7		11	
1.1.0 Ball Separator (Raw Material)							
(a)	Housing Shell, Nozzle Ranges	Chemical properties & Physical properties	Major	One sample / test / batch	Approved sheet	Approved sheet	ML Test Certificate / Lab test report / Raw material flow sheet
	Surface defects	Visual	Minor	100%	Approved sheet	Approved sheet	Inspection report / Raw material flow sheet
	Sub Surface Defects	Ultrasonic test	Major	100%	ASME SA 435 / Approved sheet	ASME SA 435 / Approved sheet	Inspection report
(b)	Nozzle Pipes	Chemical properties & Physical properties	Major	One sample / test / batch	Approved sheet	Approved sheet	ML Test Certificate / Lab test report / Raw material flow sheet
	Surface defects	Visual	Minor	100%	Approved sheet	Approved sheet	Inspection report / Raw material flow sheet
	Leak Tightness	Hydrostatic test	Major	100%	Approved sheet	Approved sheet	ML Test Certificate
(c)	Main Flange	Chemical properties & Physical properties	Major	One sample / test / batch	Approved sheet	Approved sheet	Manufacturer's Certificate
	Heat treatment (Normalizing)	Verification	Major	HT Chart	Approved sheet	Approved sheet	Manufacturer's Certificate
	Surface defects	Magnetic particle test	Critical	100%	Approved sheet	Approved sheet	Inspection report
	Sub-surface defects	Ultrasonic test	Critical	100%	ASME SA 500 / SA 435 / Approved sheet	ASME SA 500 / SA 435 / Approved sheet	Inspection report
(d)	Screen Shaft	Chemical properties & Physical properties	Major	One sample / test / batch	Approved sheet	Approved sheet	ML Test Certificate / Lab test report / Raw material flow sheet
LEGEND:							
* Records identified with "STAR" shall be essentially included by contractor in QA Documentation							
** M Manufacturer / Manufacturer's Sub-contractor							
C Contractor							
Manufacturer / Sub-Contractor Signature							
Contractor Signature							
Reviewed By		Name & Sign. Of approving authority & Seal					

Manufacturer's Name & Address		STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N008	
P.O. No.		Item: Ball Separator		Vendor Q.P. NO: PACKAGE : COLTCS		PROJECT:	
Component / Operation		Type of Check		Date:		PURCHASER:	
Characteristics Checked		Class		Page 03 of 15		CONSULTANT:	
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Manufacturer's Name & Address		STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N008	
P.O. No.		Item : Ball Separator		Vendor O.P. NO.		PROJECT:	
Characteristics Checked		Class		Type of Check		Date	
Component / Operation		Type of Check		Reference Documents		Acceptance Criteria	
1		2		3		4	
1.2.6 Weld quality for Pressure Parts							
(a) Root run		Major		Pendant test / Visual		100%	
(a) Completed butt welds		Major		Pendant test		100%	
2 Sub-surface defects		Critical		Radiography test		10% of total weld length & 100% of joints	
(b) Completed fillet welds		Major		Pendant test		100%	
1 Dimensions, Orientation		Major		Measurement by visual		100%	
2 Hydro test		Critical		Hydrostatic Pr. @ 1.5 times design pr. (positive) Duration 30 minutes		100%	
Pickling and Passivation		Major		Visual		100%	
Final tests (completed equipments) After assembly		Major		Measurement by visual		100%	
2 Leak tightness for assembly		Critical		Leak Tightness @ design pr. (positive) Duration 30 minutes		100%	
3 Dry function test for Ball Separator		Critical		Operational test		100%	
LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation ** M: Manufacturer / Manufacturer's Sub-contractor C: Contractor O: Owner Indicate: "Pr" - Perform, "W" - Witness and "V" - Verification							
Manufacturer / Sub-Contractor Signature		Contractor Signature		Reviewed By		Name & Sign. Of Approving authority & Seal	


Manufacturer's Name & Address		STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-M008	
P.O. No.		Item : Ball Separator		Vendor Q.P. NO: PACKAGE : COLTCS		PROJECT:	
Characteristics		Quantum of Check		Date : 05/15		CUSTOMER:	
Checked		Type of Check		Reference Documents		PURCHASER:	
3		4		7		CONSULTANT:	
2		5		8		M C O	
1		6		9		D* 10	
1.3.0 Rubber Lining for ball Separator shell, V-Place & also IC Pipe.						Remarks	
1.3.1	Rubber formulation	Tensile elongation and hardness	Major	Physical test	One per lot	Manufacturer's procedure	BS 6374/Equivalent
		Polymer identification	Major	Flame test	One per lot	For Semi Ebonite	For Semi Ebonite
		% Change in weight after 24 hrs immersion in sea water at 70 degrees	Major	Immersion (bleeding test)	One per lot	ASTM D 471	± 1 %
1.3.2	Surface preparation of items to be lined	Free from rust, scale, dust and grease	Major	Visual	100%	SA 2.5	SA 2.5
1.3.3	Vulcanizing	Temperature, Pressure and time	Major	Process monitoring	100%	Manufacturer's procedure	Manufacturer's inspection
1.3.4	Vulcanized rubber lined items	a) Chip test	Major	Chip test	One per lot	Approved drawing and drawing	BS 6374/Equivalent
		b) Adhesion defects, thickness and hardness	Major	Measurement-visual inspection	100%	Approved drawing and drawing	BS 6374/Equivalent
		c) Spark test for pin holes at 5 kV/mm	Major	Spark test for pin holes	100%	Approved drawing and drawing	BS 6374/Equivalent
LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M Manufacturer / Manufacturer's Sub-contractor C Contractor G Other Inside "P" - Perform "W" - Witness and "V" - Verification							
Manufacturer / Sub-Contractor Signature				Reviewed By			
				Name & Sign. Of approving authority & Seal			

Manufacturer's Name & Address		STANDARD QUALITY PLAN									
P.O. No.		Item : WORM GEAR & ACTUATORS		Vendor Q.P. NO:		BHEL Doc No.: PE-QP-999-165-N008		PROJECT:			
Characteristics Checked		Class	Type of Check	Quantity of Check	Reference Documents	Date of 15	Approved Date	Form of Record	Agency	Remarks	
1		2	3	4	5	6	7	8	9	10	11
1.4.0	Complete Unit of Worm gear	Critical	Functional Test	100%	Approved Sheet						
	Reduction Ratio										
	Angle of Rotation										
	Input Torque										
	Output Torque										
	Degree of protection	Critical	Water & Dust Ingress test	Type test	Approved Data Sheet						
1.5.0	Actuators	Major	Electrical test	100%	Supplier catalogue / ADS						
	Routine Test										
	Make, Range, Model	Major	Visual	100%	Supplier catalogue / ADS						
	Assembly check alongwith bell valves	Major	Visual	100%	Supplier catalogue / ADS						
	Functional check alongwith jacking/auxiliary contacts	Major	Visual	100%	Supplier catalogue / ADS						
	Note: ADS - APPROVED DATA SHEET										
<p>LEGEND</p> <p>* Records identified with "STAR" shall be essentially included by contractor in QA Documentation.</p> <p>** M - Manufacturer / Manufacturer's Sub-contractor</p> <p>C - Contractor</p> <p>Indicate: "P" - Perform, "W" - Witness and "V" - Verification</p>											
Manufacturer / Sub-Contractor Signature										Reviewed By	
										Name & Sign. Of approving authority & Seal	

		Manufacturer's Name & Address		STANDARD QUALITY PLAN		BHEL Doc No.: PE-QP-599-165-N008	
P.O. No.		Item : Ball Rectification Skid & PACKAGE : COLTCS		Vendor Q.P. NO:		PROJECT:	
Component / Operation		Class		Date :		PURCHASER:	
Characteristics Checked		Type of Check		Page 07 of 15		CONSULTANT:	
3		4		Reference Documents		Agency	
2		5		Quantum of Check		Format of Record	
1		6		7		10	
2.0.0 Complete Skid		100%		Approved Drawing		11	
Rectifying Skid with ball vessel and ball cowsize monitor		Visual & Measurement		Approved Drawing		Inspection report	
2.1.0 Ball Vessel		Major		Approved Drawing		Inspection report	
2.1.0.1 Housing Shell, Nozzle flanges and dished end		Chemical Analysis & Mechanical test		Approved Drawing		Inspection report	
Surface defects		Visual		Approved Drawing		Inspection report	
Sub-surface defects		Ultrasonic test		Approved Drawing		Inspection report	
2.2.0 Inprocess Quality Control		Major		Approved Drawing		Inspection report	
2.2.1 Welding procedure specification		Critical		Approved Drawing		Inspection report	
2.2.2 Welding procedure qualification		Critical		Approved Drawing		Inspection report	
2.2.3 Welder performance qualification		Critical		Approved Drawing		Inspection report	
2.2.4 Dished end for ball vessel		Major		Approved Drawing		Inspection report	
Surface defects		Penetrant test		Approved Drawing		Inspection report	
LEGEND		Records identified with "STAR" shall be essentially included by contractor in QA Documentation		Approved Drawing		Inspection report	
Manufacturer / Sub-Contractor		Contractor		Approved Drawing		Inspection report	
Signature		Signature		Approved Drawing		Inspection report	
Reviewed By		Reviewed By		Approved Drawing		Inspection report	
Name & Sign. Of approving authority & Seal		Name & Sign. Of approving authority & Seal		Approved Drawing		Inspection report	

Manufacturer's Name & Address										STANDARD QUALITY PLAN					BHEL Doc No.: PE-OP-599-165-N008											
P.O. No.										Item: Ball Vessel & Ball Injection Pipe					Vendor Q.P. NO.		PROJECT:									
Characteristics										Quantum of					Acceptance					CUSTOMER:						
Checked										Check					Documents					Norms					PURCHASER:	
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Manufacturer's Name & Address				STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-889-165-NQ08	
P.O. No.				Vendor Q.P. NO:				PROJECT:	
Item: RECIRCULATING PUMP				PACKAGE: COLTCS				CUSTOMER:	
Date: Page 9 of 15				PURCHASER:				CONSULTANT:	
Reference Documents				Format of Record				Agency	
7				8				10	
8				9				11	
2.3.0	Raw material control	Characteristics Checked	Class	Type of Check	Quantity of Check	Reference Documents	Approved dtp/ Data sheet	Approved dtp/ Data sheet	Test
2.3.1	Casing	Chemical/Physical properties	Major	Chemical & Physical analysis	One Sample/Cast/Heat	Approved dtp/ Data sheet	Approved dtp/ Data sheet	Manufacturer's Certificate	★ P V
2.3.2	Impeller, Sleeve	Surfaces defects	Minor	Visual	100%	Approved dtp/ Data sheet	Approved dtp/ Data sheet	MTC / Inspection report	★ P V
2.3.3	Shaft	Physical and Chemical properties	Major	Physical and Chemical analysis	One Sample/Cast/Heat	Approved dtp/ Data sheet	Approved dtp/ Data sheet	Manufacturer's Certificate	★ P V
2.3.4	In-process control	Sub-Surface defects	Major	Ultrasonic Test	100%	ASME SA 745	ASME SA 745	MTC / Inspection report	★ P V
2.3.5	Casing	Leak tightness	Critical	Hydro test @ 1.5 times design pr. (cooling) (Duration 30 minutes)	100%	Manufacturing Standard	ASME Sec VIII Div.1 Appendix 8	Inspection report	★ P V
2.3.6	Shaft	Surfaces defects	Critical	Perpetent test	100%	ASME Sec VIII Div.1	ASME Sec VIII Div.1	Inspection report	★ P V
2.3.7	Impeller	Residual static dynamic unbalance	Major	Static/dynamic balancing	100%	ISO 1940, Gr 6.3	ISO 1940, Gr 6.3	Inspection report	★ P V
2.3.8	All components	Workmanship, finish and dimensions	Major	Measurement, visual examination	100%	Manufacturing drawing	Manufacturing drawing	Log book / Job card	★ P V
2.3.9	Assembly control, final inspection / test	a) Q Vs. Head, Q Vs. Pump efficiency / Overall efficiency, Q Vs. Power, Vibration and Noise b) Dimensions, workmanship and finish c) Noise level	Critical	Performance test	100%	Approved curve, approved data sheet, IS 5120	Approved data sheet	Inspection report, plotted curves	★ P V
2.3.10	Complete pump	Compliance, correctness, cleanliness	Major	Visual examination	100%	Approved data sheet / Mfg. Dwg.	Approved data sheet / Mfg. Dwg.	Check list / Inspection report	★ P V
LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M Manufacturer / Manufacturer's Sub-contractor C Contractor O Owner I Indicate - "P" - Perform, "V" - Witness and "V" - Verification									
Manufacturer / Sub-Contractor Signature Contractor Signature Reviewed By Name & Sign. Of approving authority & Seal									

		Manufacturer's Name & Address				STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-899-165-N008		
		P.O. No.				Item: RECIRCULATING PUMP MOTOR V PIECE				PROJECT: CUSTOMER: PURCHASER: CONSULTANT:		
Sl. No.	Component / Operation	Characteristics	Class	Type of	Quantum of	Reference	Acceptance	Format of	Agency			Remarks
		Checked		Check	Check	Documenta	Norms	Record	M	C	O	
1	2	3	4	5	6	7	8	9	10	11		
2.5.0	Motor	Routine test, Load test & R.	Major	Electrical test	100% test	IS 325	IS 325	Manufacturer test certificate	P	V	V	Review of supplier TC
		Make, Rating	Major	Verification	100%	Approved dtp/Data sheet	Approved dtp/Data sheet	Inspection report	V	V	V	
		Degree of Protection	Critical	Verification	Type test	IP 55	IP 55	Manufacturer's test Certificate	V	V	V	
3.1.0	V - Piece											
	Raw material inspection	Chemical & Physical properties	Major	Chemical mechanical tests	One sample/test	Approved dtp/Data sheet	Approved dtp/Data sheet	MTI Test Certificate / lab test report / raw material flow sheet	P	V	V	
	In process inspection	b) Surface defects	Major	Visual	100%	Approved dtp/Data sheet	Approved dtp/Data sheet	MTI / Inspection report	P	V	V	
		c) Sub-surface defects	Critical	Radiography test	10% of total butt ASME Sec. VIII Div. 1 weld length	ASME Sec. VIII Div. 1 Appendix 4	ASME Sec. VIII Div. 1 Appendix 4	Radiographs and inspection report	P	V	V	
		d) Hydro Static Test	Critical	Hydraulic Pr. @ 1.5 times design pressure (positive) (Duration 30 minutes)	100%	ASME Sec. VIII Div. 1	No leakage	Inspection report	P	V	V	
LEGEND * Records identified with "STAR" shall be essentially included by Contractor in QA Documentation. ** M - Manufacturer / Manufacturer's Sub-contractor C - Contractor O - Owner Indicate "P" - Perform, "V" - Witness and "V" - Verification												
Manufacturer / Sub-Contractor Signature												Name & Sign. Of approving authority & Seal

Manufacturer's Name & Address		STANDARD QUALITY PLAN				SHEL Doc No.: PE-QP-999-185-N008					
P.O. No.		Vendor Q.P. NO.		PROJECT:		CUSTOMER:					
Item: Ball Monitoring System (Ball Oversize Monitor)		PACKAGE: COLTCS		PURCHASER:		CONSULTANT:					
Date: 12/15		Page 12 of 15									
Srl No.	Component / Operation	Characteristics	Class	Type of Check	Quantity of Check	Reference Documents	Acceptance Norms	Format of Record	Agency	Remarks	
1	2	3	4	5	6	7	8	9	10	11	
4.1.0	Raw Material Housing shell, Flanges	Chemical properties	Major	Chemical Analysis	One sample/heat	Approved org/Data sheet	org/Data sheet	Mill test Certificate / Imp test report/raw material flow sheet	* P V V	if fabricated type	
		Physical properties	Major	Physical test	One sample each/heat/batch	Approved org/Data sheet	org/Data sheet	Mill test Certificate / Imp test report/raw material flow sheet	* P V V		
		Surface defects	Minor	Visual	100%	Approved org/Data sheet	org/Data sheet	Mill Test Certificate/Inspection report	* P V V		
		Sub-surface defects	Major	Ultrasonic test	100%	ASME SA 435	ASME SA 435	Mill Test Certificate	* P V V	Plates > 20mm Thk only (UT - Full Volume)	
4.2.0	Inprocess Quality Control										
4.2.1	Welding procedure specification	Correctness	Critical	Scrutiny	100%	ASME Sec IX	ASME Sec IX	QW 482 of ASME Sec IX	* P V V		
4.2.2	Welding procedure qualification	Weld soundness	Critical	Physical test	100%	ASME Sec IX	ASME Sec IX	QW 483 of ASME Sec IX	* P V V	Welding procedure already approved by BHEL/RQAGLON/TUV shall be employed for this job.	
4.2.3	Welder performance qualification	Weld soundness	Critical	Radiography	100%	ASME Sec IX	ASME Sec IX	QW 484 of ASME Sec IX	* P V V	Welders already qualified by BHEL/RQAGLON/TUV shall be employed for this job.	
4.2.4	Fabricated Shell	1 Surface defects (flat welds) 2 Dimensions, Orientation	Major	Penetrant test	100%	ASME Sec VIII Div 1	ASME Sec VIII Div 1 Appendix 8	Inspection report	* P V V		
		3. Hydro test	Critical	Measurement by visual	100%	Approved doc / Data sheet	Approved documents / Data sheets	Inspection report	* P V V		
		4 Functional Test	Major	Hydrostatic Pressure Test (Duration 30 minutes)	100%	ASME Sec VIII Div 1	No leakage	Inspection report	* P W V	Hydrostatic test shall be conducted alongwith Recirculating acid assembly	
					100%	Approved procedure	Approved procedure	-	* P V V	Functional test to be done at site	
LEGEND * Records identified with "STAMP" shall be essentially included by contractor in QA Documentation. ~ M Manufacturer / Manufacturer's Sub-contractor C Contractor I Insulate : IP - Perform, "Y" - Witness and "V" - Verification											
Manufacturer / Sub-Contractor Signature										Reviewed By	Name & Sign. Of approving authority & Seal

Manufacturer's Name & Address		STANDARD QUALITY PLAN		BHEL Doc No.: PE-QP-888-165-N008							
P.O. No.		Vendor Q.P. NO:		PROJECT:							
Item : Pressure Gauge, DP Gauge, DP Switch, DP Transmitter		PACKAGE : COLTCS		CUSTOMER:							
Cleaning Balls		Date :		PURCHASER:							
				CONSULTANT:							
		Page 13 of 15		PACKAGE : COLTCS							
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency	Remarks	
1	2	3	4	5	6	7	8	9	10	11	
5.0.0	In process quality control	Make, Range and Model	Critical	Visual	100%	Approved Sheet	Approved Data Sheet	Manufacturer's test certificate	P	V	
		Calibration	Critical	Calibration test	100%	Approved Sheet	Approved Data Sheet	Manufacturer's test certificate	V	V	
		Degree of Protection	Critical		Type Test Certificate	Approved Sheet	Approved Data Sheet	Manufacturer's test certificate	V	V	
6.0.0	Cleaning Balls -- Normal balls -- Abrasive balls	Dimensions	Critical	Measurement	Random	Approved Data Sheet	Approved Data Sheet	Manufacturer's test certificate	P	V	
		Type Size								Quantity and type of balls to be checked with data sheets	
7.0.0	All Components / Equipments	Painting, Dry film thickness and Visual	Major	Measurement	Random	Painting schedule	Painting schedule	Inspection report	P	V	
		Packing	Major	Measurement	100%	MFG. Procedure	MFG. Procedure	Inspection report	P	V	
<p>LEGEND</p> <p>* Records identified with "STAR" shall be essentially included by contractor in QA Documentation.</p> <p>** M. Manufacturer / Manufacturer's Sub-contractor</p> <p>C. Contractor</p> <p>Indicate : "P" - Perform; "W" - Witness and "V" - Verification</p>											
Manufacturer / Sub-Contractor Signature									Reviewed By		Name & Sign. Of approving authority & Seal

Manufacturer's Name & Address		STANDARD QUALITY PLAN				BHEL Doc No.:					
Item : Starter Panel		Vendor Q.P. NO:		PROJECT:		PE-OP-999-165-N008					
P.O. No.		PACKAGE : COLTCS		CUSTOMER:							
		Date :		PURCHASER:							
		Page 14 of 15		CONSULTANT:							
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency	Remarks	
1	3	3	4	5	6	7	8	9	10	11	
8.0.0	Starter panel Incoming Material										
08.1.0	Fabricated & Painted Panel	Dimension	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	P		
		Panel G.A.	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	P		
		Paint thickness	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	P		
		Paint Shade, Adhesion	Major	Visual	Sample	Approved Drgs.	Approved Drgs.	Inspection report	P		
08.1.2	Wire	Size / Colour / Rating / Surface Defects	Major	Visual / Dimension	Sample	IS 694	Specification drawings	Inspection report	P	SI-Measr 4th	
08.1.3	Panel Mounting	Make, Functional, Type & Rating	Major	Visual / Electrical	100%	Approved BOM	Approved BOM	Inspection report	P		
08.2.0	In Process Inspection										
08.2.1	Name, Place, Component Mounting, Etc.	Workmanship, Finish, Correctness	Major	Visual	100%	Approved Drgs.	Approved drawings	Inspection report	P		
08.2.2	Electrical Wiring of Panels	Continuity, Colour of wires, Bundling and Grouping	Major	Visual	100%	Mounting drawing	Approved drawings	Inspection report	P		
08.2.3	Terminating of Cables	Start & End	Major	Visual	100%	Manufacturer's drawing	Manufacturer's drawing	Inspection report	P		
08.3.0	Final Inspection										
08.3.1	Workmanship, Finish & Paint shade / Thickness	Visual	Major	Visual	100%	G.A Drawing	Approved drgs.	Inspection report	P	W V	
08.3.2	Overall Dimension, G.A. of starter panel	Measurement	Major	Visual	100%	G.A Drawing	Approved drgs.	Test Certificate	P	W V	
08.3.3	Component Identification	Visual	Major	Visual	100%	G.A Drawing	Approved drgs.	Inspection report	P	W V	
08.3.4	Degree of Protection	Ingress Protection IP55	Critical	Environmental	Verification	Approved drgs.	IS 2147	Inspection Report	P	V V for enclosure	
08.3.5	IR - HV - IR	Electrical	Critical	Electrical	100%	Approved Procedure	Approved Procedure	Inspection report	P	V V	
08.3.6	Functional & Continuity	Functional	Major	Functional	100%	Appd Drawing	Appd Drawing	Inspection report	P	W W	
<p>LEGEND</p> <p>* Records identified with "STAR" shall be essentially included by contractor in QA Documentation.</p> <p>** M : Manufacturer/ Sub-contractor</p> <p>C : BHEL ID : Owner</p> <p>Indicate : "P" - Perform, "W" - Witness and "V" - Verification</p>											
Manufacturer / Sub-Contractor Signature										Name & Sign. Of approving authority & Seal	

Manufacturer's Name & Address		STANDARD QUALITY PLAN										BHEL Doc No.: PE-QP-999-165-N008	
P.O. No.		Item : FASTENERS		Vendor Q.P. NO.		PACKAGE : COLTCS		PROJECT:		CUSTOMER:		PURCHASER:	
Characteristics Checklist		Type of Check		Quantum of Check		Reference Documents		Acceptance Norms		Format of Record		CONSULTANT:	
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1		2		3		4		5		6		7	
Component / Operation		Class		Type of Check		Quantum of Check		Reference Documents		Acceptance Norms		Format of Record	
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844		845		846		847		848		849		850	
851		852		853		854		855		856		857	
858		859		860		861		862		863		864	
865		866		867		868		869		870		871	
872		873		874		875		876		877		878	
879		880		881		882		883		884		885	
886		887		888		889		890		891		892	
893		894		895		896		897		898		899	
900		901		902		903		904		905		906	
907		908		909		910		911		912		913	
914		915		916		917		918		919		920	
921		922											

TITLE : STANDARD TECHNICAL SPECIFICATION DATA SHEET-A CONDENSER ON - LOAD TUBE CLEANING SYSTEM (Sponge Rubber Ball Type)		SPEC. NO. PE-TS- 387/388-165-N001 VOLUME : II B SECTION-D REV. NO. 0 DATE: 04.02.2013 2X660 MW RAGHUNATHPUR TPP PH-II STG	
SL.NO	PROJECT		
1	GENERAL		
1.1	Nos. of tube cleaning systems sets required for station	NOS.	
1.2	Liquid handled		
1.3	Size of COLTCS	Nb	
2.0	DESIGN		
2.1	Operating pressure at Condenser inlet flange	kg/cm2 (g)	
2.2	Design Pressure for ball separator	kg/cm2 (g)	
2.3	Design Mechanical Temperature	Deg. C	
2.4	Condenser Details		
	a) Type of condenser		
	b) No. of Condenser sections	Nos.	
	c) No. of passes per condenser section (viz. condenser half)	Nos.	
	d) No. of tubes per condenser	Nos.	
	• Top two rows		
	• Remaining		
	e) Tube Dia. OD x Thickness	mm x mm	
	• Top two rows	mm x mm	
	• Remaining	mm	
	f) Length of tubes between ends.		
	g) Tube material	MWC	
	h) Pressure drop across condenser		
	- At Normal flow		
	(between Inlet and Outlet flanges of condenser)		
2.5	CW flow rate through each ball separator		
	- Normal	cu.m/hr	
	- Maximum	cu.m/hr	
2.6	Design differential pressure for ball separator strainer/screen	Kg/cm ² (g)	
2.7	Pressure drop across ball separator i.e. between inlet & outlet flanges in clean condition at normal flow.	MWC	
2.8	Pressure drop across ball separator in choked condition when strainer backwashing starts	MWC	
2.9	No. of balls required for COLTCS per condenser section	Nos.	
3	CONNECTING PIPE DETAILS		
3.1	Condenser inlet pipe		
	a) Material		
	b) O.D. X Thickness		
3.2	Condenser outlet pipe		

Four (04) Nos. for two Unit viz. One independent set for each half of condenser Clarified Water as per Analysis Attached along with project information in section B. 2300 NB
Approx 1.5 to 2.0
5.0 kg/cm ² (g) & vacuum 0.1 kg/cm ² (abs) 60
Single Pass 2 (Two)
1 (One)
29668
2080
27588
22.225X0.889, 22.225X0.7112, 17900
SS: ASTM A 249 TP 304 (Welded) 4.15 MWC (However the actual value can vary +/-10% of the design value)
33350 40020 0.2
0.15
Not to exceed 0.30
Minimum 10% of number of condenser tubes
Carbon Steel to IS – 2062 Gr. B 2340x20

Four (04) Nos. for two Unit viz. One independent set for each half of condenser Clarified Water as per Analysis Attached along with project information in section B.

2300 NB

Approx 1.5 to 2.0

5.0 kg/cm² (g) & vacuum 0.1 kg/cm² (abs)

60

Single Pass

2 (Two)

1 (One)

29668

2080

27588

22.225X0.889,

22.225X0.7112,

17900

SS: ASTM A 249 TP 304 (Welded)

4.15 MWC

(However the actual value can vary +/-10% of the design value)

33350

40020

0.2


0.15

Not to exceed 0.30


Minimum 10% of number of condenser tubes


Carbon Steel to IS – 2062 Gr. B

2340x20

<div>  </div>		TITLE : STANDARD TECHNICAL SPECIFICATION DATA SHEET-A CONDENSER ON - LOAD TUBE CLEANING SYSTEM (Sponge Rubber Ball Type)		SPEC. NO. PE-TS-387/388-165-N001 VOLUME : II B SECTION-D REV. NO. 0 DATE: 04.02.2013 2X660 MW RAGHUNATHPUR TPP PH-II STG	
SL NO	PROJECT				
		a) Material			Carbon Steel to IS - 2062 Gr. B
		b) O.D. X Thickness			2340x20
3.3		Manhole			Manhole : Yes, 600 NB size Drain : 150NB drain stub inside the body of COLTCS
4.0		MATERIALS OF CONSTRUCTION			
4.1		BALL SEPARATOR			
		a) Body / housing			Carbon Steel to IS -2062 Gr. B. with epoxy painted inside (with minimum housing thickness same as connecting pipe thickness) Provision for future installation of cathodic protection with sacrificial anodes shall be provided.
		b) Screen / Strainer			SS-316
		c) Strainer shaft			SS-316
		e) Internal Hardware including nuts, bolts , etc.			SS-316
		f) Site Glass provision			Yes
4.2		BALL RECIRCULATING PUMP			Non Clog type
		a) Casing			2.5% Ni. CI to IS 210 FG 260
		b) Impeller			SS-316
		c) Shaft			SS-316
4.3		BALL COLLECTOR			
		a) Body / housing			Carbon steel-IS 2062 Gr. B with epoxy painted inside
		b) Screen / Strainer			SS-316
		c) Site Glass Provision			Yes
4.4		Differential pressure measuring system			SS-316
4.5		Injection nozzle			
4.6		Valves			
4.6.1		Check Valves (all sizes)			
		a) Body & Bonnet			For size 50 NB and below-Piston type For sizes 65 NB and above-Swing check type or dual plate type.
		b) Seating surface & rings			CI, IS 210, Gr.FG 260 / BS 1452 Gr. 14, Flanged Ends 13% Chromium Steel
		c) Disc for Check Valve			
		d) Hinge Pin for Check Valve			CI, IS 210 Gr. FG 260/ BS 1452 Gr. 14 AISI-316
		e) Backseat for check valve			13% Chromium Steel

SPEC. NO. PE-TS- 387/388-165-N001		VOLUME : II B		SECTION-D		REV. NO. 0		DATE: 04.02.2013		2X660 MW RAGHUNATHPUR TPP PH-II STG	
TITLE : STANDARD TECHNICAL SPECIFICATION										DATA SHEET-A	
CONDENSER ON - LOAD TUBE CLEANING											
SYSTEM (Sponge Rubber Ball Type)											
PROJECT											
4.6.2	Globe Valves 50 Nb & Below										Gun metal as per IS 318 Gr. 2, screwed ends
4.6.3	> BF/Gate Valves (65 Nb & above)										2% NiCl as per IS 210, FG 260, epoxy coated SS – 410 / BS 970 431 S-291
	> Body & Disc										Nitrile rubber
	> Shaft										18 – 8 SS
	> Seal										Self lubricating
	> Sealing, Retaining segment & internals										IS 2062, Gr. B
	> Bearings										
	> Companion Flange										
	C) Ball valves										SA 351 CF8M
	i) Body										SA 351 CF8M
	ii) Ball										SS 316
	iii) Stem										By Bidder
4.7	Interconnecting Piping										a) Upto 150NB - Carbon steel ERW, IS:1239 (Heavy Grade)
	Material										b) Greater than 150NB – CS to IS 2062 Gr. B, rolled & butt welded, conforming to IS 3589
5	COUNTER FLANGES for Ball Separator										Carbon Steel to IS 2062 Gr. B or eq for thickness, drilling etc refer Annexure II in section CI (In Purchaser's scope)
	a) Flanges										A 193 & A 194 (In Bidder's scope)
	b) Fasteners										Min 4 mm thick rubber
	c) Gaskets										In Bidder's scope
6	OTHER COUNTER FLANGES (for interconnecting piping)										Carbon Steel to IS 2062 Gr. B
6.1	MATERIALS										A 193 & A 194
	a) Flanges										Min 4 mm thick rubber
	b) Fasteners										
	c) Gaskets										

		TITLE : STANDARD TECHNICAL SPECIFICATION DATA SHEET-A CONDENSER ON - LOAD TUBE CLEANING SYSTEM (Sponge Rubber Ball Type)		SPEC. NO. PE-TS-387/388-165-N001	
SL NO		PROJECT		VOLUME : II B	
REV. NO.		SECTION-D		DATE: 04.02.2013	
REV. NO. 0		2X660 MW RAGHUNATHPUR TPP PH-II STG			
7.0	Material of Other components not specified above				Suitable for intended duty and shall be subject to Purchasers approval during detailed engg. In the event of order.
8.0	PAINTING				
8.1	INTERNAL SURFACE				SA - 2.5 of Swedish Specn. SIS-05-59-00-1967
	a) Surface preparation				Two coat of Epoxy Resin based Zinc Phosphate primer
	b) Primer				Adequate no. of coats of coal tar epoxy paint to achieve total dry film thickness of 200 to 250 microns
	c) Final paint				
8.2	EXTERNAL SURFACE				SA-2.5 of Swedish Specn. SIS-05-5900-1967
	a) Surface preparation				Two coat of Epoxy resin based zinc phosphate primer
	b) Primer				Epoxy based TiO2 pigmented coat
	a) Intermediate				Synthetic enamel paint to achieve total DFT of 175 to 200 microns. Colour- code shall be as per IS 9404 (Appendix - A)
	d) Final paint				YES
9.0	Adequate provision for future installation of cathodic protection (Sacrificial type anodic protection by Purchaser)				If required as per bidder's design – the same to be incorporated by bidder in its constructional feature.
10.0	Flow straightener for streamlining the CW flow in ball collecting strainer				
11.0	Performance Guarantee & Bid Evaluation				
11.1	Performance Parameters to be Guaranteed				As per Guarantee schedule of bidder
	❖ Pressure drop in ball separator in clean condition				Min. 90 % recovery
	❖ Percentage recovery of balls				Min. 3 weeks
	❖ Life of sponge Rubber Balls				As per clause no 8.00.00 of Section C1
11.2	Bid evaluation Criteria & Liquidated damages				@ Rs.11.0 Lacs per 0.05 MWC pr. drop across each balls collecting strainer
11.3	Bid evaluation rate				Twice the bid evaluation rate
11.4	Liquidated damages				
12.0	The tube cleaning system shall be designed for following operation modes				
	a) Automatic start up initiated by push button				YES

		TITLE : STANDARD TECHNICAL SPECIFICATION DATA SHEET-A		SPEC. NO. PE-TS- 387/388-165-N001
		CONDENSER ON- LOAD TUBE CLEANING SYSTEM (Sponge Rubber Ball Type)		VOLUME : II B
				SECTION-D
SL.NO		PROJECT		REV. NO. 0 DATE: 04.02.2013
	13.0	Mandatory Spares to be supplied under this specification.	2X660 MW RAGHUNATHPUR TPP PH-II STG	
	14.0	Documents enclosed for bidder's reference ❖ Water Analysis ❖ GA of CW piping in TG hall	1. Sponge rubber balls for condenser on-load tube cleaning system (a. 20% -Abrasive Balls- 10000 Nos). (b. 80%- Normal Balls – 40000 No). 2. Ball Recirculating Pump (Set Consisting of Shaft, Rotor , Seals, Gland Package shafts sleeves for Complete replacement in one Pump)--- 1 No. Indicated in project information in Section B. Attached in Annexure-III	
* GA Drawing of BFV			Attached as Annexure-IV in section C1	
* Typical Flow diagram for COLTCS			Attached as Annexure-V in section C1	
* Counter Flange Details			Attached as Annexure-II in section C1	



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO. PE-TS-390-165-N001

VOLUME : IIB

SECTION : D

REV. NO. 0

DATE : 17.07.13

SHEET 1 of 1

SECTION D2

STANDARD TECHNICAL SPECIFICATION FOR ELECTRICAL SYSTEMS



TITLE :
GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.
PE-SS-999-506-E101
VOLUME NO. : **II-B**
SECTION : **D**
REV NO. : **00** DATE : 29/08/2005
SHEET : **I** OF **I**

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00



TITLE :
GENERAL TECHNICAL REQUIREMENTS
FOR
LV MOTORS

SPECIFICATION NO.
PE-SS-999-506-E101
VOLUME NO. : II-B
SECTION : D
REV NO. : 00 DATE : 29/08/2005
SHEET : 1 OF 4

1.0 INTENT OF SPECIFICATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer's work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

2.0 CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement for rotating electrical machines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechanical vibration of rotating electrical machines

In case of imported motors, motors as per IEC-34 shall also be acceptable.

3.0 DESIGN REQUIREMENTS

3.1 Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2 Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

3.3 Starting Requirements

3.3.1 Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.

3.3.2 Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.



TITLE :
GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.
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The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.

3.3.3 The following frequency of starts shall apply

- i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.
- ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)
- iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for minimum 20,000 starts during the life time of the motor

3.4 Running Requirements

3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.

3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.

3.5 Stress During bus Transfer

3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.

3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.

3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.

3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.


4.0 CONSTRUCTIONAL FEATURES

4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy

4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.

Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled

4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 29/08/2005 SHEET : 3 OF 4
4.4.	Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.	
4.5	Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.	
4.6	In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation. In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.	
4.7	Terminals and Terminal Boxes	
4.7.1	Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.	
	Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".	
4.7.2	unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.	
4.7.3	Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or U W & V respectively.	
4.7.4	Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.	
4.7.5	Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.	
4.7.6	Degree of protection for terminal boxes shall be IP 55 as per IS 4691.	
4.7.7	Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.	
4.7.8.	Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.	
4.7.9	Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.	
4.8	Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.	
4.9	General	



TITLE :
GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

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- 4.9.1 Motors provided for similar drives shall be interchangeable.
- 4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.
- 4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.
- 4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.
- 4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.
- 4.9.6 Name plate with all particulars as per IS: 325 shall be provided
- 4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.


5.0 INSPECTION AND TESTING

- 5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.
- 5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.
- 5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.
- 5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.

6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT


- a) OGA drawing showing the position of terminal boxes, earthing connections etc.
- b) Arrangement drawing of terminal boxes.
- c) Characteristic curves:
(To be given for motor above 55 kW unless otherwise specified in Data Sheet).
- i) Current vs. time at rated voltage and minimum starting voltage.
- ii) Speed vs. time at rated voltage and minimum starting voltage.
- iii) Torque vs. speed at rated voltage and minimum voltage.
For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.
- iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.


CLAUSE NO.	TECHNICAL REQUIREMENTS			
	MOTORS			
1.00.00	GENERAL REQUIREMENTS			
1.01.00	For the purpose of design of equipment/systems, an ambient temperature of 50 deg. centigrade and relative humidity of 95 %(at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.			
1.02.00	All equipments shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.			
1.03.00	Contractor shall provide fully compatible electrical system, equipments, accessories and services.			
1.04.00	All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.			
1.05.00	The auxiliary AC voltage supply arrangement shall have and 415V systems. It shall be designed to limit voltage variations as given below under worst operating condition :			
	(a)	11kV, 3.3 kV	+/- 6%	
	(b)	415/240V	+/- 10%	
1.06.00	The voltage level for motors shall be as follows:-			
	a)	Upto 0.2KW	: 240V, Single Phase AC/ 415V Three phase AC	
	b)	Above 0.2KW and upto 200KW	: 415V, Three Phase AC	
	c)	Above 200KW and upto 1500 KW	: 3.3 kV, Three Phase AC	
	d)	Above 1500 KW	: 11 kV, Three Phase AC	
1.07.00	Fault level shall be limited to 40kA RMS for 1 second for 11kV, 3.3 kV system and 45 kA RMS 1 second for 415V system. 415V system shall be solidly grounded and 220 VDC system shall be isolated type.			
1.08.00	Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor motors.			
1.09.00	The responsibility of coordination with electrical agencies and obtaining all necessary clearances shall be of the contractor.			
1.10.00	Degree of Protection			
	Degree of protection for various enclosures as per IS: 4691, IEC60034-05 shall be as follows:-			
	i)	Indoor motors	- IP 54	
	ii)	Outdoor motors	- IP 55	
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2		PART-B SUB SECTION-III: E1 (MOTORS)
				PAGE 1 OF 8


CLAUSE NO.	TECHNICAL REQUIREMENTS			
	iii) CW motors (in case of Screen protected Drip proof) - IP 23 iv) Cable box - indoor area - IP 54 v) Cable box - outdoor area - IP 55			
2.00.00	CODES AND STANDARDS 1) Three phase induction motors : IS:325, IEC:60034 2) Single phase AC motors : IS:996, IEC:60034 3) Crane duty motors : IS:3177, IEC:60034 4) DC motors/generators : IS:4722 5) Energy Efficient motors : IS 12615			
3.00.00	TYPE			
3.01.00	AC Motors: (a) Squirrel cage induction motor suitable for direct-on-line starting. (b) Continuous duty LT motors upto 160 KW Output rating (at 50 deg.C ambient temperature) ,shall be Energy Efficient motors ,Efficiency class-Eff1, conforming to IS 12615. (c) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.			
3.02.00	DC Motors Shunt wound.			
4.00.00	RATING (a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor. (b) Whenever the basis for motor ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.			
5.00.00	TEMPERATURE RISE Air cooled motors 70 deg. C by resistance method for both thermal class 130(B)& 155(F) insulation. Water cooled 80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2	PART-B SUB SECTION-III: E1 (MOTORS)	PAGE 2 OF 8


CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी</div> <div>NTPC</div>	
	41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class Y wet wound Boiler circulation pump motor.		
6.00.00	OPERATIONAL REQUIREMENTS		
6.01.00	Starting Time		
6.01.01	For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.		
6.01.02	For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.		
6.01.03	For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.		
6.01.04	Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.		
6.02.00	Torque Requirements		
6.02.01	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.		
6.02.02	Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.		
6.03.00	Starting voltage requirement		
	(a) 85% upto 1500KW		
	(d) 80% from 1501 KW to 4000KW		
	(e) 75% > 4000KW		
7.00.00	DESIGN AND CONSTRUCTIONAL FEATURES		
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors, space heater terminals inside the main terminal box may be acceptable.		
7.02.00	All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). CW motors can be screen protected drip proof (SPDP) type. Motors located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below		
	(a) Fuel oil area : Group - IIB		
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2	PART-B SUB SECTION-III: E1 (MOTORS)
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CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>		
7.03.00	<p>Winding and Insulation</p> <p>(a)Type : Non-hygroscopic, oil resistant, flame resistant</p> <p>(b)Starting duty : Two hot starts in succession, with motor initially at normal running temperature</p> <p>(c) 11kV, 3.3 kV AC motors : Thermal Class 155(F) insulation with winding temperature rise limited to thermal class 130(B). The winding insulation process shall be total Vacuum Pressure Impregnated i.e.resin poor method. The lightning impulse & interturn insulation surge withstand level shall be as per IEC-60034 Part-15.</p> <p>(d)415V AC & 220V DC motors : Thermal Class130(B) or better</p>			
7.04.00	Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.			
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.			
7.06.00	Noise level for all the motors shall be limited to 85dB (A). Bearing housing vibration shall be limited within the limits prescribed in IEC 60034-14/IS:12075 . Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.			
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided-with dial type thermometer with adjustable alarm contact and duplex platinum resistance type temperature detectors preferably 2 numbers.			
7.08.00	Motor body shall have two earthing points on opposite sides.			
7.09.00	HT motors can be offered with either elastimould termination or dust tight phase separated double walled (metallic as well as insulated barrier) cable terminal boxes. In case elastimould terminations are offered, then protective cover and trifurcating sleeves shall also be provided. In case cable terminal box is offered, then Employer shall provide termination kit. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel for three core cables) or 4 mm (non magnetic material for single core cables) shall be provided in case of cable terminal boxes.			
7.10.00	The spacing between gland plate & centre of terminal stud shall be as per Table-I.			
7.11.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.			
7.12.00	The motors shall be suitable for bus transfer schemes provided on the11kV, 3.3 kV /415V systems without any injurious effect on its life.			
7.13.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2	PART-B SUB SECTION-III: E1 (MOTORS)	PAGE 4 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS		
7.14.00	11kV and 3.3 kV motors Cable Terminal Box shall be suitable for fault level of 750MVA for 0.12 sec and 250 MVA for 0.12 sec respectively.Elastimould termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.		
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box, cable glands & lugs suitable for the same.		
7.16.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance).		
	(a) Upto 110KW:	11.0	
	(b) Above 110KW & upto 1500KW:	10.0	
	(c) Above 1500KW & upto 4000KW:	9.0	
	(d) Above 4000KW:	6 to 6.5	
8.00.00	TYPE TEST		
8.01.00	HT MOTORS		
8.01.01	The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.		
8.01.02	The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.		
8.01.03	In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the Employer for waiver of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The Employer reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.		
8.01.04	Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.		
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2	PART-B SUB SECTION-III: E1 (MOTORS) PAGE 5 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS			
8.01.05	<p>LIST OF TESTS TO BE CONDUCTED</p> <p>The following type tests shall be conducted on each type and rating of HT motor</p> <ul style="list-style-type: none"> (a) No load saturation and loss curves upto approximately 115% of rated voltage (b) Measurement of noise at no load. (c) Momentary overload test (subject to test bed constraint). (d) Full load test (subject to test bed constraint). (e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose. (f) Lightning Impulse withstand test on the sample coil shall be as per clause 5.1.3.2, IEC-60034, Part-15. (g) Surge withstand voltage test on interturn insulation as per IEC 60034-15 			
8.01.06	<p>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</p> <p>The following type test reports shall be submitted for each type and rating of HT motor</p> <ul style="list-style-type: none"> (a) Degree of protection test for the enclosure followed by IR, HV and no load run test. (b) Fault level withstand test for each type of cable terminal box of HT motors. 			
8.02.00	<p>LT Motors</p>			
8.02.01	<p>LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Employer's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.</p>			
8.02.02	<p>However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.</p>			
8.02.03	<p>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</p> <p>The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only</p>			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2		PART-B SUB SECTION-III: E1 (MOTORS)
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
	<ol style="list-style-type: none"> 1. Measurement of resistance of windings of stator and wound rotor. 2. No load test at rated voltage to determine input current power and speed 3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors) 4. Locked rotor readings of voltage, current and power input at a suitable reduced voltage. 5. Full load test to determine efficiency power factor and slip . 6. Temperature rise test . 7. Momentary overload test . 8. Insulation resistance test . 9. High voltage test . 10. Test for vibration severity of motor. 11. Test for noise levels of motor . 12. Test for degree of protection and 13. Overspeed test. 			
8.03.00	All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.			
8.04.00	The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2		PART-B SUB SECTION-III: E1 (MOTORS)
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CLAUSE NO.	TECHNICAL REQUIREMENTS																														
	<p>TABLE - I</p> <p>DIMENSIONS OF TERMINAL BOXES</p> <p>FOR LV MOTORS:</p> <table><thead><tr><th>Motor MCR in KW</th><th>Minimum distance between centre of stud and gland plate in mm</th></tr></thead><tbody><tr><td>UP to 3 KW</td><td>As per manufacturer's practice.</td></tr><tr><td>Above 3 KW - upto 7 KW</td><td>85</td></tr><tr><td>Above 7 KW - upto 13 KW</td><td>115</td></tr><tr><td>Above 13 KW - upto 24 KW</td><td>167</td></tr><tr><td>Above 24 KW - upto 37 KW</td><td>196</td></tr><tr><td>Above 37 KW - upto 55 KW</td><td>249</td></tr><tr><td>Above 55 KW - upto 90 KW</td><td>277</td></tr><tr><td>Above 90 KW - upto 125 KW</td><td>331</td></tr><tr><td>Above 125 KW-upto 200 KW</td><td>203</td></tr></tbody></table> <p>FOR HT MOTORS:</p> <p>The distance between gland plate and the terminal studs shall not be less than 500 mm.</p> <p>PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:</p> <p>NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:</p> <table><thead><tr><th>Motor MCR in KW</th><th>Clearance</th></tr></thead><tbody><tr><td>UP to 110 KW</td><td>10mm</td></tr><tr><td>Above 110 KW and upto 150 KW</td><td>12.5mm</td></tr><tr><td>Above 150 KW</td><td>19mm</td></tr></tbody></table>			Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm	UP to 3 KW	As per manufacturer's practice.	Above 3 KW - upto 7 KW	85	Above 7 KW - upto 13 KW	115	Above 13 KW - upto 24 KW	167	Above 24 KW - upto 37 KW	196	Above 37 KW - upto 55 KW	249	Above 55 KW - upto 90 KW	277	Above 90 KW - upto 125 KW	331	Above 125 KW-upto 200 KW	203	Motor MCR in KW	Clearance	UP to 110 KW	10mm	Above 110 KW and upto 150 KW	12.5mm	Above 150 KW	19mm
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CLAUSE NO.	LT SWITCHGEAR (Starters Panel)
1.00.00	<p>CODES AND STANDARDS</p> <p>IEC 947, IS 13947</p>
2.00.00	<p>TYPE</p> <p>Circuit Breakers Shall be air break, three pole, spring charged, horizontal drawout type, suitable for electrical operation.</p> <p>Switchgear Fully drawout type single front</p> <p>MCC Fully drawout type single front/Double front.</p> <p>ACDB/DCDB Fixed type single front</p>
3.00.00	<p>SYSTEM PARAMETERS</p> <p>415VAC $\pm 10\%$ (SOLIDLY GROUNDED)</p> <p>50 Hz $\pm 3\%$ - 5%</p> <p>45KA RMS / 1 SEC (FAULT LEVEL)</p> <p>220V DC NOMINAL (190V DC-240V DC) ISOLATED TYPE</p>
4.00.00	<p>TEMPERATURE RISE</p> <p>The temperature rise of the horizontal and vertical busbars and main bus link including all power drawout contacts when carrying 90% of the rated current along the full run shall in no case exceed 55 deg. C with silver plated joints and 40 deg. C with all other types of joints over an ambient of 50 deg C.</p>
5.00.00	<p>OPERATIONAL REQUIREMENTS</p>
5.01.00	<p>Breakers</p>
5.01.01	<p>Breakers shall have anti-pumping feature.</p>
5.01.02	<p>The incomer and bus coupler breakers for switchgear shall be electrically operated with over current releases or relays.</p>
5.01.03	<p>Breakers shall have inherent fault making and breaking capacities. They shall have shunt trip coils. In case releases are offered, the same shall have contact for energisation of lockout relay. All breakers shall have built in interlocks for equipment and personnel safety.</p>
5.01.04	<p>Paralleling of two supplies shall be avoided by interlocking except for switchgear where auto-changerover is provided. Breaker contact multiplication, if required, shall be through latch relay.</p>

CLAUSE NO.	LT SWITCHGEAR
01.05	Mechanical tripping shall be through red 'Trip' push button outside the panels for breakers, and through control switches for other circuits.
01.06	Provision of mechanical closing of breaker only in 'Test' and 'Withdrawn' position shall be made. Alternatively, mechanical closing facility should be normally inaccessible, accessibility rendered only after deliberate removal of shrouds. It shall be possible to close the door with breaker in test position.
01.07	Clear status indication for each circuit shall be provided through lamps, switch positions or other mechanical means.
01.08	Supervision relay shall be provided for trip coil monitoring.
02.00	Switches, Contactors and Fuses
02.01	Incomers for MCCs and DBs rated upto 630A could be load break isolators.
02.02	Motor starter contactors shall be of air break, electromagnetic type suitable for DOL starting of motor, and shall be of utilisation category AC-3 for ordinary and AC-4 for reversing starters. DC contactor shall be of DC-3 utilisation category.
02.03	Fuses shall be HRC type with operation indicator. Isolating switches shall be of AC 23A category when used in motor circuit, and AC 22A category for other applications. Fuse switch combination shall be provided wherever possible.
02.04	Isolating switches and MCCBs shall have door interlocks and padlocking facility.
	Panels
	All switchgears, MCCs, DBs, panels, modules, local starters and push buttons shall have prominent engraved identification plates.
02	Local push button stations shall have metal enclosure of die cast aluminium or rolled sheet steel of 1.6mm thickness & shall have DOP of IP-55. Push buttons shall be of latch type with mushroom knobs.
03	Where breaker/starter module front serves as compartment cover, suitable blanking covers, one for each size of modules per switchboard shall be supplied for use when carriage is withdrawn.
04	All non-current carrying metal work of boards/panels shall be effectively bonded to earth bus of galvanised steel, extending throughout the switchboard/MCC/DB. Positive earthing shall be maintained for all positions of chassis and breaker frame.
05	Suitable trolley arrangement shall be provided for breaker/starter modules. Two trolleys per switchgear room shall be provided so that top most breaker module of all types, sizes and rating can be withdrawn on trolley and lowered for maintenance purpose.
	The incoming connection to transformer of more than 1000KVA and inter-connecting sections between switchboards shall preferably be of busducts. The busduct enclosure

CLAUSE NO.	LT SWITCHGEAR
	<p>shall be made of minimum 3mm thick aluminium alloy. The section of the busduct should have adequate strength to withstand internal and external forces resulting from the various operating conditions. Aluminium sheet hood shall be provided for outdoor busduct enclosure joints to provide additional protection against water ingress. The busduct top shall be sloped to prevent retention of water. The busduct shall have DOP of IP55.</p>
5.03.07	<p>It should be possible to carryout maintenance on a feeder with adjacent feeders alive.</p>
5.04.09	<p>Control, Protection & Metering Requirements</p>
5.04.01	<p>Control circuits shall operate at suitable voltage of 110V AC or 220V DC. Necessary control supply transformers having primary and secondary fuses shall be provided for each MCC, 2 x 100% per section. However the breakers shall operate on 220V DC. The auxiliary bus bars for control supply shall be segregated from main bus bars. The control supplies shall be monitored.</p>
5.04.02	<p>Contractor shall fully co-ordinate overload and short circuit tripping of breaker with up-stream and down stream breakers/fuses/MCCBs motor starters. Various equipments shall meet requirement of Type-II class of coordination as per IEC.</p>
5.04.03	<p>All relays and timers shall operate on available DC supply and not have any inbuilt batteries. They shall be provided with hand-reset operation indicator (flags) or LEDs with pushbuttons for resetting.</p>
5.04.04	<p>All equipments shall have necessary protections. However, following minimum protections shall be provided:</p>
	<ol style="list-style-type: none"> 1) Contactor controlled motor feeders (Motors up to 160 kW) <ol style="list-style-type: none"> a) Instantaneous short circuit protection on all phases through HRC cartridge type fuses rated for 80 kA rms (prospective breaking capacity at 415V). b) Thermal overload protection. c) Single phasing protection for motors protected by fuses. 2) Breaker controlled motors feeders (motors rated above 160kW) <ol style="list-style-type: none"> a) Instantaneous short circuit protection on all phases b) Overload protection on two phases c) Over load alarm on third phase d) Earth fault protection e) Under voltage protection


CLAUSE NO.	LT SWITCHGEAR
	<ul style="list-style-type: none"> f) hand reset lockout relay with a blue lamp for monitoring. 3) Incomers/bus coupler/outgoing breaker feeders other than motor feeders <ul style="list-style-type: none"> a) Definite time delay short circuit protection b) Hand reset lockout relay with a blue lamp 4) Incomer From DG Set. <ul style="list-style-type: none"> a) Differential Protection (87) - Three Pole b) Reverse Power Protection. c) Overload Alarm on one phase d) Earth Fault Detection Relay (64) e) Voltage controlled overcurrent relay e) Generator under/over voltage Protection f) Hand Reset/Lockout Relay with a blue lamp. g) 3 Phase Energy Meter having accuracy of 1.0 class.
5.04.05	<p>Meters / instruments</p> <p>All meters/ instrument shall be flush mounted on front panel, at least 96 sq.mm. size with 90 degree linear scales and accuracy class of 2.0.</p>
5.04.06	<p>All motors of 30kW and above shall have an Ammeter. Bus-section shall have bus VT, voltmeter with selector switch, and other relay and timers required for protection. Adequate control and selector switches, push buttons and indicating lamps shall be provided. Thermostatically controlled space heaters with switches shall be provided to prevent condensation.</p>
5.04.07	<p>In case of remote controlled breaker panels, following shall be ensured.</p> <p>Each feeder shall have local/remote selector switch. Closing from local shall be possible only in test position whereas closing from remote shall be possible in either service or test position. Tripping from local shall be possible only when local/remote selector switch is in local position. Tripping from remote shall be either breaker in service position or selector switch being in remote position.</p>
05.00	<p>Control from Remote</p> <p>Necessary hardware shall be provided in the switchgear panel like coupling relays(24V DC, with max burden 2.5VA), auxiliary relays, current & voltage transducers(4-20 mA, dual output) etc. to effect interlocks, exchange information / status and exercise control from remote.</p>

CLAUSE NO.	LT SWITCHGEAR
6.00.00	DESIGN AND CONSTRUCTIONAL FEATURES
6.01.00	<p data-bbox="321 464 1256 516">All 415V switch gear motor control centers (MCCs), AC & DC distribution boards (DBs), etc shall have following features :</p> <ol style="list-style-type: none"> <li data-bbox="321 541 1203 569">1) Shall be of metal enclosed, indoor, floor mounted and free standing type. <li data-bbox="321 596 1256 674">2) All frames and load bearing members shall be fabricated using mild steel structural sections or pressed and shaped cold rolled sheet steel of thickness not less than 2mm. <li data-bbox="321 701 1256 835">3) Frame shall be enclosed in cold rolled sheet steel of thickness not less than 1.6mm. Doors and covers shall also be of cold rolled sheet steel of thickness not less than 1.6 mm. Stiffeners shall be provided wherever necessary. Removable gland plates of thickness 3mm (hot/cold rolled sheet steel) or 4 mm (non-magnetic material) shall be provided for all panels. <li data-bbox="321 863 1256 915">4) All switchboards/panels shall be of dust and vermin proof. All cutouts shall have synthetic rubber gaskets. <li data-bbox="321 942 1256 1020">5) For motors above 160kW, remote controlled electrical circuit breakers, and for smaller motors, switch-fuse contactor feeders shall be provided. The other outgoing feeders would be switch-fuse units or moulded case circuit breakers. <li data-bbox="321 1047 1256 1703">6) All switchboards, MCCs and DBs shall have following distinct vertical sections, <ol style="list-style-type: none"> <li data-bbox="407 1129 1256 1182">a) Completely enclosed bus bar compartment for horizontal and vertical bus bars. <li data-bbox="407 1209 1256 1262">b) Completely enclosed switchgear compartments (one for each circuit housing circuit breakers, motor starter or switch-fuse feeder). <li data-bbox="407 1289 1256 1398">c) Compartment for cable tray or cable box for power and control cables In case of cable box, they shall be segregated with complete shrouding for individual feeders at the rear for direct termination of cables. <li data-bbox="407 1425 1256 1478">d) For cable connection to circuit breaker, a separately enclosed cable compartment shall also be acceptable. <li data-bbox="407 1505 1256 1558">e) Compartment for relays and other control devices associated with a circuit breaker, wherever necessary. <li data-bbox="407 1585 1256 1638">f) The switchboards/MCC/DBs of 1600A & above rating shall be of DOP IP42 & of IP52 for less than 1600A rating <li data-bbox="407 1665 1256 1703">g) All 415V switchgears, MCC's, AC & DC distribution boards etc. shall be painted by powder coating process. Paint shade shall be as follows.

CLAUSE NO.


LT SWITCHGEAR

- | | | |
|------|--------------------|----------|
| (i) | Front & Back | RAL 9002 |
| (ii) | Extreme end covers | RAL 5012 |
- 7) Busbars shall be of high conductivity aluminium alloy or copper.
 - 8) Minimum air clearance in air between phases and phase-earth shall be 25 mm for busbars and cable terminations. For all other components, the Clearances shall be at least 10mm. Wherever above is not possible except for horizontal and vertical busbars, insulation shall be provided by anti tracking sleeving or barriers. However for horizontal and vertical busbars, clearances specified above shall be maintained even when busbars are insulated/sleeved. In case of DC DBs/ fuse boards, the busbar system shall be insulated or physically segregated with barriers to prevent interpole short circuit.
 - 9) Busbar insulators shall be of track-resistant high strength non-hygro-scoptic, non-combustible type and suitable to withstand stresses due to over-voltages and short circuit current. Insulators and barrier of inflammable material such as Hylam shall not be accepted.
 - 10) All types of relays and timer shall be subject to Employer's approval. They shall be flush mounted with connections from inside, and shall have transparent & dust tight cover, removable from front, drawout construction for easy replacement and testing facility. The auxiliary relays and timer may be provided in fixed cases.
 - 11) Maxi terminal /cage clamp type terminal blocks shall be provided for signals to be interfaced with DDCMIS/PLC.
 - 12) The switchgears/MCC shall be designed to offer adequate level of safety to operating/maintenance personnel. Means shall be provided to prevent access to the live part to avoid accidents during service as well as maintenance period. Bidder shall bring out the safety means provided to achieve above. A detailed instruction plate suitable for wall mounting shall be provided for each switchgear/MCC room describing various safe operating procedure/safety precautions for safe operation and maintenance of switchgear/MCC.
 - 13) All current and voltage transformers as required for metering & protection specified shall be completely encapsulated, cast resin insulated type. Incomers from transformers shall have CTs for transformer REF protection. All current and voltage transformers as required for metering and protection specified shall be completely encapsulated, cast resin insulated type. Incomers from transformers shall have CTs for transformer restricted earth fault protection. The accuracy shall be as follows:
- | | CTs | PTs |
|------------|------|-----|
| Protection | 5P20 | 3P |
| Metering | 1.0 | 1.0 |
| REF | P5 | |

	TITLE	SPECIFICATION NO.
	MOTOR DATA SHEET - C	VOLUME II B
		SECTION D
		REV NO. 00 DATE 29/08/2005
		SHEET 1 OF 2

S. No.	Description	Data to be filled by successful bidder
A.	General	
1	Manufacturer & country of origin	
2	Motor type	
3	Type of starting	
4	Name of the equipment driven by motor & Quantity	
5	Maximum Power requirement of driven equipment	
6	Rated speed of Driven Equipment	
7	Design ambient temperature	
B.	Design and Performance Data	
1	Frame size & type designation	
2	Type of duty	
3	Rated Voltage	
4	Permissible variation for	
5	a) Voltage	
6	b) Frequency	
7	c) Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)	
9	Synchronous speed & Rated slip	
10	Minimum permissible starting voltage	
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	
13	b) At min starting voltage	
14	Locked rotor current as percentage of FLC (including IS tolerance)	
15	Torque	
	a) Starting	
	b) Maximum	
16	Permissible temp rise at rated output over ambient temp & method	
17	Noise level at 1.0 m (dB)	
18	Amplitude of vibration	
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	
	c) At 75% load	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE	SPECIFICATION NO.
	<p align="center">MOTOR</p> <p align="center">DATA SHEET - C</p>	VOLUME II B
		SECTION D
		REV NO. 00 DATE 29/08/2005
		SHEET 2 OF 2

S. No.	Description	Data to be filled by successful bidder
	c) At starting	
C.	Constructional Features	
1	Method of connection of motor driven equipment	
2	Applicable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Main terminal box	
	a) Type	
	b) Power Cable details (Conductor, size, armour/unarmour)	
	c) Cable Gland & lugs details (Size, type & material)	
	d) Permissible Fault level (kArms & duration in sec)	
7	Space heater details (Voltage & watts)	
8	Flame proof motor details (if applicable)	
	a) Enclosure	
	b) suitability for hazardous area	
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
D.	Characteristic curves/ drawings (To be enclosed for motors of rating $\geq 55KW$)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

CLAUSE NO.

QUALITY ASSURANCE



INDUCTION MOTOR & SYNCHRONOUS MACHINE

TESTS/CHECKS TEMS/COMPONENTS	Visual	Dimensional	Make/Type/Rating/TC/General Physical Inspection	Mech/Chem. Properties	NDT /DP/MP/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment
Plates for stator frame, end shield, spider etc.	Y	Y	Y	Y					Y
Shaft	Y	Y	Y	Y	Y	Y			Y
Magnetic Material	Y	Y	Y	Y	Y		Y		
Rotor Copper/Aluminium	Y	Y	Y	Y		Y	Y		Y
Stator copper	Y	Y	Y	Y			Y		Y
SC Ring	Y	Y	Y	Y	Y	Y	Y	Y	Y
Insulating Material	Y		Y	Y			Y		
Tubes for Cooler	Y	Y	Y	Y	Y				Y
Sleeve Bearing	Y	Y	Y	Y	Y				Y
Stator/Rotor, Exciter Coils	Y	Y	Y				Y	Y	
Castings, stator frame, terminal box and bearing housing etc.	Y	Y	Y	Y	Y			Y	
Fabrication & machining of stator, rotor, terminal box	Y	Y			Y				Y
Wound stator	Y	Y					Y	Y	
Wound Exciter	Y	Y					Y	Y	
Rotor complete	Y	Y					Y		
Exciter, Stator, Rotor, Terminal Box assembly	Y	Y					Y		
Accessories, RTD, BTD, CT, Brushes, Diodes, Space heater, antifriction bearing, cable glands, lugs, gaskets etc.	Y	Y	Y						
Motor (IS 325 / 4722/ 9283)	Y	Y	Y						

MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9575/ 9571/ 0370/
0360/ 9586-102-2

PART-B
SUB-SECTION-VII:QE1
MOTOR

PAGE 1 OF 2

CLAUSE NO.

QUALITY ASSURANCE



INDUCTION MOTOR & SYNCHRONOUS MACHINE

TESTS/CHECKS ITEMS/COMPONENTS	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	All routine & acceptance tests as per IS-325/IS-4722 /IS- 9283/IS 2148/IEC 60079-1	Vibration	Over speed	Tan delta, shaft voltage & polarization index test
Plates for stator frame, end shield, spider etc.									
Shaft									
Magnetic Material	Y		Y						
Rotor Copper/Aluminium									
Stator copper			Y						
SC Ring									
Insulating Material			Y						
Tubes for Cooler		Y							
Sleeve Bearing		Y							
Stator/Rotor, Exciter Coils									
Castings, stator frame, terminal box and bearing housing etc.									
Fabrication & machining of stator, rotor, terminal box									
Wound stator									
Wound Exciter									
Rotor complete				Y	Y				
Exciter, Stator, Rotor, Terminal Box assembly									
Accessories, RTD, BTD, CT, Brushes, Diodes, Space heater, antifriction bearing, cable glands, lugs, gaskets etc.									
Motor (IS 325 / 4722 / 9283/2148/IEC 60079-1)						Y	Y	Y	Y1
Note : 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalisation. However, No QP for LT motor upto 50KW. 2. Makes of all major bought out items will be subject to NTPC approval. Y1 = for HT Motor / Machines only.									


MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9575/ 9571/ 0370/
0360/ 9586-102-2

PART-B
SUB-SECTION-VII:QE1
MOTOR

PAGE 2 OF 2

CUSTOMER :		PROJECT :		SPECIFICATION :								
BIDDER/ VENDOR :		TITLE :		NUMBER :								
SYSTEM :		QUALITY PLAN :		SPECIFICATION :								
CAT. :		NUMBER PED-508-00-Q-006/0		TITLE :								
SHEET 1 OF 2		ITEM AC ELECT. MOTORS BELOW 75KW (LV)		VOLUME III								
CHARACTERISTICS CHECK		REFERENCE DOCUMENT		REMARKS								
EXTENT OF CHECK		ACCEPTANCE NORM		FORMAT OF RECORD								
TYPE/ METHOD OF CHECK		NORM		AGENCY								
CAT. :		7		P W V								
3		6		9								
4		5		10								
2		3		11								
1.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUF'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	3	-	-	
2.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	3	-	-	
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG / MFG. SPEC.	MFG. DRG / MFG. SPEC.	-DO-	3	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG SPEC / RELEVANT IS	MFG SPEC. RELEVANT IS	-DO-	3	-	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC / DATA SHEET	SAME AS COL.7	TEST REPORT	3	2,1	2,1	NOTE -1
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-	
BHEL		PARTICULARS		BIDDER/VENDOR								
NAME		SIGNATURE		DATE								
BIDDER'S/VENDORS COMPANY SEAL												

		QUALITY PLAN		CUSTOMER :		PROJECT TITLE		SPECIFICATION :	
		SHEET 2 OF 2		BIDDER/ VENDOR SYSTEM		QUALITY PLAN		NUMBER :	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	VOLUME III
1	2	3	4	5	6	7	8	9	10
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	3 1
<p>NOTES:</p> <p>1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON</p> <p>2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.</p> <p>3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.</p>									
BHEL		PARTICULARS		BIDDER/VENDOR					
		NAME							
		SIGNATURE							
		DATE							
BIDDER'S/VENDORS COMPANY SEAL									



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO. PE-TS-390-165-N001

VOLUME : IIB

SECTION : D

REV. NO. 0

DATE : 17.07.13

SHEET 1 of 1

**SECTION D3
STANDARD TECHNICAL SPECIFICATION
FOR
C&I SYSTEMS**



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 1 OF 3

Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

GENERAL*	* PROJECT	2x660 MW MOUDA STPP, 1X500 MW VINDHYACHAL STPP	
	OFFER REFERENCE		
	* TAG NO. SERVICE		
	* DUTY	<input type="checkbox"/> ON / OFF	<input type="checkbox"/> INCHING
	* LINE SIZE (inlet/outlet): MATERIAL		
	* VALVE TYPE	<input type="checkbox"/> GLOBE <input type="checkbox"/> GATE <input type="checkbox"/> REG. GLOBE <input type="checkbox"/> BUTTERFLY	
	* OPENING / CLOSING TIME		
	* WORKING PRESSURE		
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%	
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY	
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY	
ACTUATOR RATED TORQUE	BIDDER TO SPECIFY		
CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF, IP:55	
	MECHANICAL POSITION INDICATOR	TO BE PROVIDED FOR 0-100% TRAVEL	
	BEARINGS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.	
	GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION	METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.	
	SIZING	OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 90% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING(REGULATING) SERVICE 150 STARTS/HR MINIMUM	
HANDWHEEL	* REQUIRED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
	* ORIENTATION	<input type="checkbox"/> TOP MOUNTED <input type="checkbox"/> SIDE MOUNTED	
	TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.		
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY	
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY	
	MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT.	
	ACTUATOR APPLICABLE WIRING DIAGRAM	<input checked="" type="checkbox"/> ENCLOSED (BIDDER TO CONFIRM) A: <input type="checkbox"/> DRG. NO. 3-V-MISC-24227 R00 B: <input type="checkbox"/> DRG. NO. 3-V-MISC-24550 R00 C: <input checked="" type="checkbox"/> DRG. NO. 3-V-MISC-24283 R00 D: <input type="checkbox"/> DRG. NO. 4-V-MISC-90271 R11	
	COLOUR SHADE	<input checked="" type="checkbox"/> BLUE (RAL 5012) ENAMEL <input type="checkbox"/>	
	SHAFT RPM	BIDDER TO SPECIFY	
	OLR SET VALUE	BIDDER TO SPECIFY	
	STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY	
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY	
	Ⓜ PWR SUPP TO MTR / STARTER	415 VAC±10%, 3PH, 50Hz±5%, 3 wire, 10 % (ABSOLUTE) COMBINED VOLTAGE & FREQUENCY VARIATIONS	
	Ⓜ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER <input type="checkbox"/> 230 V AC <input checked="" type="checkbox"/> 110 V AC	
	Ⓜ ENCLOSURE CLASS OF MOTOR	<input type="checkbox"/> IP 65 <input checked="" type="checkbox"/> IP 67 FOR OUTDOOR <input type="checkbox"/> FLAME PROOF <input checked="" type="checkbox"/> IP 55 FOR INDOOR, TOTALLY ENCL, SELF VENTILATED.	
	Ⓜ INSULATION CLASS	<input type="checkbox"/> CLASS-B <input checked="" type="checkbox"/> CLASS-F WITH TEMPERATURE RISE LIMITED TO CLASS-B	



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:


SHEET 2 OF 3

Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

	@ WINDING TEMP PROTECTION	<input checked="" type="checkbox"/> THERMOSTAT (3 Nos., 1 IN EACH PHASE) <input type="checkbox"/>	
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED	
INTEGRAL STARTER	INTEGRAL STARTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	TYPE OF SWITCHING DEVICE	<input checked="" type="checkbox"/> CONTACTORS <input type="checkbox"/> THYRISTORS	
	TYPE	<input checked="" type="checkbox"/> CONVENTIONAL <input type="checkbox"/> SMART (NON-INTRUSIVE)	
	IF SMART		
	a) SERIAL LINK INTERFACE	<input type="checkbox"/> INTEGRAL <input type="checkbox"/> FIELD MOUNTED	
	b) SERIAL LINK PROTOCOL	<input type="checkbox"/> FOUNDATION FIELD-BUS <input type="checkbox"/> PROFI-BUS <input type="checkbox"/> TCP/IP <input type="checkbox"/>	
	c) SERIAL LINK MEDIA	<input type="checkbox"/> TWISTED PAIR Cu-CBL <input type="checkbox"/> CO-AXIAL Cu-CBL <input type="checkbox"/> OFC	
	d) HAND HELD PROGRAMMER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	e) MASTER STATION	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	f) MASTER STN INTERFACE WITH DCS	<input type="checkbox"/> MODBUS <input type="checkbox"/> TCP/IP	
	g) DETAILS OF SPECIAL CABLE	<input type="checkbox"/> ENCLOSED <input type="checkbox"/> NOT REQUIRED	
	STEP DOWN CONT. TRANSFORMER	<input checked="" type="checkbox"/> REQUIRED	
	OPEN / CLOSE PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	STOP PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	INDICATING LAMPS	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	LOCAL REMOTE S/S	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	STATUS CONTACTS FOR MONITORING	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (OIL RELAY OPERATED, THERMOSTAT OPERATED, CONT./POWER SUPPLY FAILED, S/S IN LOCAL, TORQUE SWITCH OPTD. MID WAY)	
INTERPOSING RELAY (Applicable for integral Starter)	INTERPOSING RELAYS	REQUIRED	
	INTERPOSING RELAY (QUANTITY)	<input checked="" type="checkbox"/> 2 NOs. <input type="checkbox"/> 3 NOs.	
	DRIVING VOLTAGE	<input type="checkbox"/> 20.5 - 24V DC <input checked="" type="checkbox"/> 24 V DC	
	DRIVING CURRENT	<input type="checkbox"/> 125mA MAX <input type="checkbox"/> _____ mA MAX	
	LOAD RESISTANCE	<input type="checkbox"/> > 192 ohms - < 25 k ohms <input type="checkbox"/> > _____ ohms - < _____ ohms	
	COIL BURDEN	2.5 VA	
TORQUE SWITCH (Not Applicable for Smart Actuator)	MECHANICAL LATCHING DEVICE	REQUIRED(REFER NOTE-5)	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	OPEN / CLOSE	<input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos. / <input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos	
	CONTACT TYPE	2 NO + 2 NC	
	RATING	5A 240V AC AND 0.5A 220V DC	
	ENCLOSURE	IP 55	
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE	
	ACCURACY	+3% OF SET VALUE	
LIMIT SWITCH (Not Applicable for Smart Actuator)	MFR & MODEL NO.	BIDDER TO SPECIFY	
	OPEN : INT : CLOSE	<input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2 Nos. (ADJ.) <input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2Nos.	
	CONTACT TYPE	2 NO + 2 NC	
	RATING (AC / DC)	5A ,240V AC AND 0.5A,220V DC	
	ENCLOSURE CLASS	IP 55	

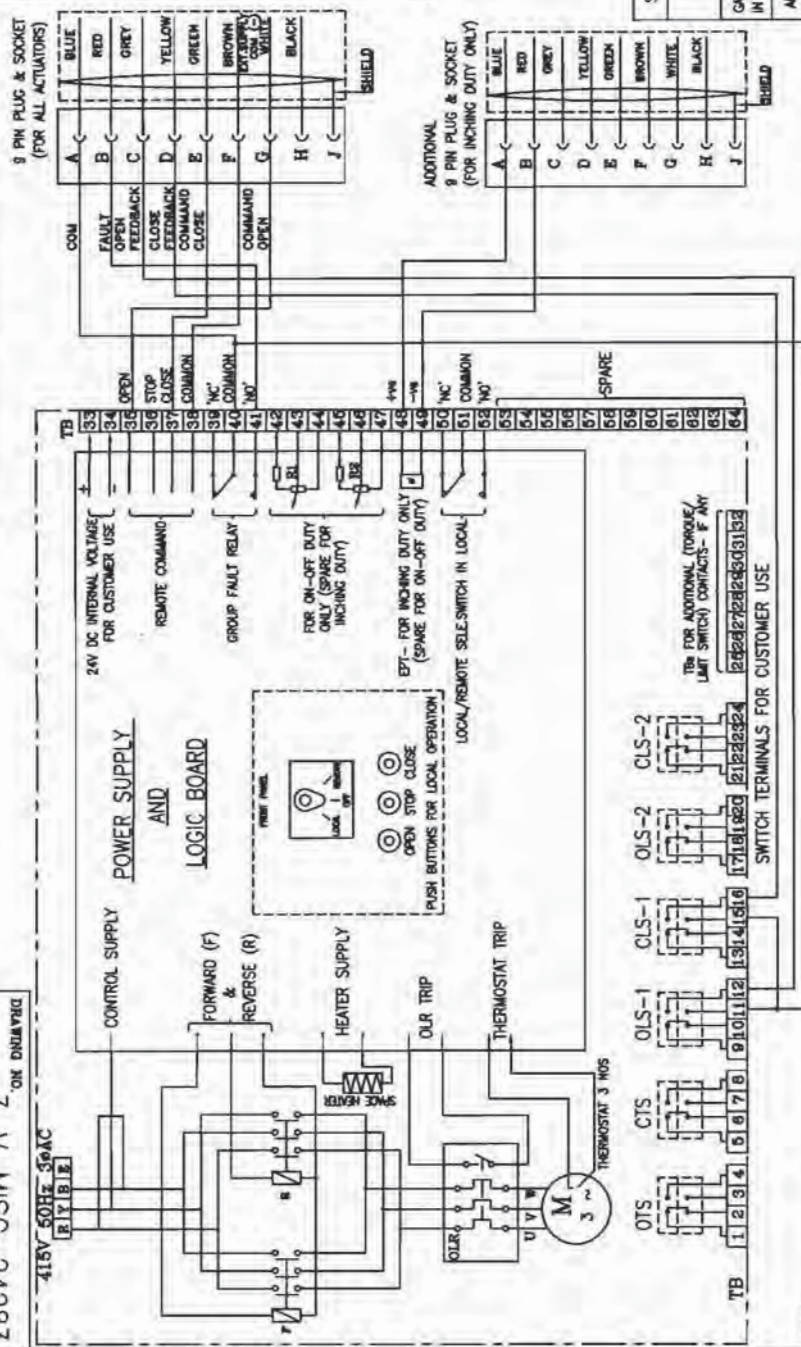
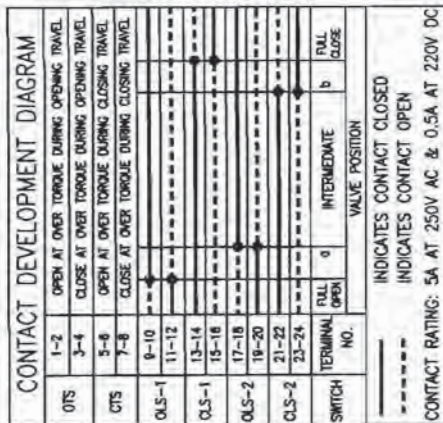
	SPECIFICATION FOR MOTORISED VALVE ACTUATOR	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE:
		SHEET	3 OF 3
Data Sheet A & B			
DATA SHEET-A (TO BE FILLED BY PURCHASER)		DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	

POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty)	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	TYPE	<input type="checkbox"/> ELECTRONIC (2 WIRE) R/I CONVERTER <input checked="" type="checkbox"/> ELECTRONIC (2 WIRE) CONTACTLESS	
	SUPPLY	<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/>	
	OUTPUT	<input checked="" type="checkbox"/> 4-20mA	
	ACCURACY	$\pm 1\%$ FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY		
	@ RATING		
TERMINAL BOX	MOTOR TERMINAL BOX	REQUIRED	
	ACTUATOR TERMINAL BOX	REQUIRED	
	ENCL CLASS MTR T.B. / ACTUATOR T.B.	<input type="checkbox"/> IP 65 <input checked="" type="checkbox"/> IP-67..... <input type="checkbox"/> IP65 <input checked="" type="checkbox"/> IP-67.....	
	@ EARTHING TERMINAL	REQUIRED	
	PLUG & SOCKET(9 PIN) (ADDITIONAL 1 NO. FOR PoT)	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> 1 NO. <input checked="" type="checkbox"/> 1 NO. ADDITIONAL FOR PoT	
CABLE GLANDS	@ POWER CABLE GLAND	SIZE: _____	
	@ SPACE HEATER CABLE GLAND	SIZE: _____	
	OTHER CONTROL CABLE GLANDS-1	<input type="checkbox"/> 1No. for BFV of CW PUMP(Cable size 2Px1.5mm2)	
	OTHER CONTROL CABLE GLANDS-2	QUANTITY & SIZE : _____	
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY _____ Kg.	

NOTES

- SCOPE: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY.
- CODES & STANDARDS: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH: IS-9334, IS-2147, IS-2148, IS-325, IS-2958, IS-4891 AND IS-4722.
- TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG. C.
- CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED.
- THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION. THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE.
- THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.

NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL NAME SIGNATURE DATE
NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @ = TO BE FILLED BY ES				



SETTING PROCEDURE OF POSITION LIMIT AND TORQUE SWITCH					
VALVES	OPEN		CLOSE		
	MAIN	BACK UP	MAIN	BACK UP	
GATE VALVE OF 100 mm AND ABOVE IN 1500 CL AND ABOVE RATINGS	OLS	OTS *	OLS	OTS	
ALL OTHER GATE & GLOBE VALVES	OLS	OTS *	OTS	OTS	!

! - OLS NOT TO BE CONNECTED IN TRIP CIRCUIT
 * - BYPASS OTS FOR INITIAL 5% OF TRAVEL(FOR GATE VALVES ONLY)

NOTE:-

- | REV | DATE | ALTERED | CHD & APPD |
|-----|------|--|------------|
| 1. | | ALL TORQUE AND LIMIT SWITCHES (OTS,CTS,OLS1&2, OLS1&2) ARE WITH 2N0+2NC CONTACTS '1NG+1NC' IS TERMINATED IN TBS 1-24, REMAINING CONTACTS ARE FOR INTERNAL USE. | |
| | | ANY SPARE CONTACTS WHICH ARE NOT USED INTERNALLY ARE TO BE TERMINATED IN TBS 25-32 | |
| 2. | | CTS - TORQUE SWITCHES FOR CW ROTATION (CLOSE) | |
| 3. | | OTS - TORQUE SWITCHES FOR CCW ROTATION (OPEN) | |
| 4. | | OLS-1, OLS-2 - LIMITSWITCHES FOR POSITION OPEN | |
| 5. | | OLS-1, OLS-2 - LIMITSWITCHES FOR POSITION CLOSE | |
| 6. | | EPT - ELECTRONIC POSITION TRANSMITTER | |
| | | (CONTACTLESS TYPE, FOR INCHING DUTY) | |
| 7. | | R1-R2-POTENTIOMETER 2 x 100 OHMS (FOR ON-OFF DUTY) | |
| 8. | | FOR COMMANDS & EPT EITHER INTERNALLY GENERATED 24 VDC OR EXTERNAL SUPPLY OF 24VDC CAN BE USED | |
| 9. | | M - MOTOR 3/8 415V 50 Hz AC SUPPLY | |
| 10. | | TORQUE SWITCH BYPASS WITH LIMITSWITCH BOTH ON OPEN & CLOSE DIRECTION TO BE DONE INTERNALLY. | |


CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.


TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

ELECTRICAL VALVE ACTUATORS (AC) WITH INTEGRAL STARTERS
FOR NTPC PROJECTS
(DRAWN FOR INTERMEDIATE POSITION OF VALVES)

	BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT, TIRUCHIRAPPALLI-600014.		DRW N.P.ESWAR CBO D.DINAKARAN APD KARUNACHALAM		SDA N.P. VAB 17.03.05 17.03.05
	395-121 REPT VL CODE	- SCALE NTS	WEIGHT (KG). -	REFERENCE INFORMATIONS NO. OF SHEET -	
TITLE WIRING DIAGRAM (TERMINAL PLAN) FOR ACTUATOR WITH INTEGRAL STARTER WITH PLUG & SOCKET FOR NTPC PROJECTS			DRAWING NO. 3-V-MISC-24283		REV 0

Size A3

	DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE:
			SHEET 1 OF 2	
Data Sheet No.: PE-DC-999-145-1026-A				
TECHNICAL REQUIREMENTS FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE (TO BE FILLED BY PURCHASER) TO BE FILLED-UP / CONFIRMED BY BIDDER				
GENERAL	MANUFACTURER			
	MODEL NUMBER			
TECHNICAL	SENSING ELEMENT	<input type="checkbox"/> BOURDON <input type="checkbox"/> DIAPHRAGM (BOURDON FOR HIGH PRESS AND DIAPHRAGM FOR LOW PRESS APPLICATION)		
	MATERIAL	SENSING ELEMENT – AISI 316 SS MOVEMENT – AISI 304 SS CASING – <input checked="" type="checkbox"/> DIE CAST AL <input type="checkbox"/> SS		
	ENCLOSURE	CLASS: <input checked="" type="checkbox"/> IP-55 <input type="checkbox"/> IP-65 <input type="checkbox"/> EXPL PROOF PAINT: <input checked="" type="checkbox"/> ENAMEL <input type="checkbox"/> EPOXY		
	DIAL	SIZE: 150 MM COLOR: WHITE NUMERALS: BLACK SCALE: LINEAR, 270° ARC GRADUATED IN METRIC UNITS		
	CASE	COLOUR : BLACK		
	SPAN/ ZERO ADJUSTMENT	INT. MICRO SCREW		
	RANGE SELECTION	SHOULD COVER 125% OF OPERATING PARAMETER		
	OVER RANGE PROTECTION	1.5 TIMES OF FSD		
	BLOW OUT DISC	REQUIRED		
	SWITCHING FACILITY (IF APPLICABLE)	NOT REQUIRED		
	TYPE	<input type="checkbox"/> MICRO SWITCH <input type="checkbox"/> OTHER		
	NO. / TYPE OF CONTACTS	2 NOS. SPDT		
	CONTACT RATING	5A 230V AC, 0.25A 220V DC		
SETTING RANGE	FIELD ADJUSTABLE OVER FULL RANGE			
REPEATABILITY	± 1% OF FSR			
POWER SUPPLY	<input type="checkbox"/> 230V AC <input type="checkbox"/> 110V AC			
PERFORMANCE	ACCURACY	± 1% OR BETTER OF FULL SCALE DEFLECTION		
CONNECTION	PROCESS	<input type="checkbox"/> M20 x 1.5 (M) <input checked="" type="checkbox"/> ½" NPT (M) <input type="checkbox"/> ½" NPT (F) <input type="checkbox"/> OTHER		
	LOCATION	BOTTOM		
ACCESSORIES	NAME PLATE / METAL TAG	SS		
	OTHER	SIPHON FOR STEAM, SNUBBER FOR PUMP DISCHARGE, CHEMICAL SEAL DIAPHRAGM FOR CORROSSIVE, OIL SERVICES and SLURRY APPLICATION TO BE PROVIDED		
OTHER REQUIREMENT	INSTRUMENT LIST	INSTRUMENT LIST COMPRISING OF TAG NO., SERVICE, DESIGN/OPERATING PRESSURE & TEMPERATURE TO BE ATTACHED		
QUALITY REQUIREMENT	CHECK LIST FOR PG/DPG	REFER CHECK LIST NO PE-CL-999-145-1 026-0		

		CHECK LIST FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE (Mechanical Auxiliary Packages)		SPECIFICATION NO.: VOLUME SECTION REV. NO. DATE: SHEET 2 OF 2			
						Data Sheet No.: PE-CL-999-145-1026-0	
SL NO	TESTS/CHECKS	QUANTM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGENCY			REMARKS
				P	W	V	
1.0	CHECK FOR		APPROVED TECHINCAL REQUIREMENT/ DATA SHEET				MFR TO CARRY OUT ROUTINE TEST ON 100%. WHEN MATL CORELATION ARE NOT AVAILABLE MFR'S COMPLIANCE TO BE PROVIDED
	1.1 DIAL SIZE	100%		M	C	C	
	1.2 MODEL NO/TAG NO	100%		M	C	C	
	1.3 RANGE/SCALE	100%		M	C	C	
	1.4 END CONNECTION	100%		M	C	C	
	1.5 SWITCH CONTACT RATING & NOS	100%		M	C	C	
2.0	CALIBRATION						
	2.1 ACCURACY	100%		M	C	B	
	2.2 REPEATABILITY (FOR SWITCH)	100%		M	C	B	
	2.3 SET POINT ADJUSTMENT FOR SWITCH	100%		M	C	C	
3.0	OVER PRESSURE & LEAK TEST	100%		M	C	C	
4.0	OPERATION OF PR. RELEIF DEVICE	ONE PER TYPE		M	C	C	
5.0	REVIEW OF T.C. FOR MATERIAL OF-						
	5.1 SENSOR	FOR LOT		-	-	B	
	5.2 MOVEMENT			-	-	B	
	5.3 PROCESS CONNECTION			-	-	B	
	5.4 HOUSING		-	-	B		
6.0	REVIEW OF T.C. FOR DEGREE OF PROTECTION	TYPE TEST	-	-	B		
7.0	REVIEW OF T.C. FOR CONTACT RATING OF SWITCH	ONE PER TYPE	-	-	B		
8.0	ACCESSORIES AS APPLICABLE	100%	M	C	C		
LEGEND: M: MANUFACTURER/ SUB CONTRACTOR, C: CONTRACTOR/ NOMINATED INSP AGENCY, B: BHEL. P: PERFORM, W: WITNESS, V: VERIFICATION.							
NOTE: CONTRACTOR TO PROVIDE COMPLIANCE CERTIFICATE FOR TESTS/CHECKS VERIFIED BY CONTRACTOR AND SUBMIT THE SAME ALONGWITH TEST CERTIFICATES TO BE VERIFIED BY BHEL.							



DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 1 OF 3


Data Sheet No.: PES-145-01-DS1-A

TAG No. Qty.....

Data Sheet A & B

DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER
(TO BE FILLED BY PURCHASER)DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

GENERAL	MANUFACTURER		
	MODEL NUMBER		
TECHNICAL	TYPE	TRANSMITTER OF MICROPROCESSOR BASED 2 WIRE TYPE, HART PROTOCOL COMPATIBLE	
	TRANSMITTER MEASUREMENT	<input type="checkbox"/> PRESSURE <input checked="" type="checkbox"/> DIFF. PRESSURE	
	OUTPUT RANGE	SIGNAL 4-20MA DC (ANALOG) along WITH SUPERIMPOSED DIGITAL SIGNAL (BASED ON HART PROTOCOL)	
	TURN DOWN RATIO	10:1 FOR VACUUM /VERY LOW PRESSURE APPLICATION 30:1 FOR OTHER APPLICATION	
	ACCURACY	± 0.1% OF CALIBRATED SPAN(MINIMUM)	
	STABILITY	± 0.1% OF CALIBRATED SPAN FOR 8 MONTHS FOR RANGE UPTO AND INCLUDING 70 Kg/cm ² ± 0.25% OF CALIBRATED SPAN FOR 8 MONTHS FOR RANGE MORE THAN 70 Kg/cm ²	
	LOAD IMPEDANCE	500 OHM (MIN)	
	RESPONSE TIME (TIME TAKEN FROM CHANGE IN PHYSICAL PARAMETER INPUT CHANGE TO TRANSMITTER, OUTPUT REACHING 63.2 % OF IT'S TOTAL CHANGE INCLUDING THAT TIME)	100 ms OR BETTER	
	HOUSING	IP 55(with corrosion resistance epoxy coating)	
	OVER PRESSURE	150 % OF MAX OPERATING PRESSURE	
	CONNECTION (ELECTRICAL)	PLUG & SOCKET TYPE	
	PROCESS CONNECTION	1", 150# RF	
	ZERO DRIFT & SPAN DRIFT	+/- 0.015 PER DEG C AT AT MAX SPAN +/- 0.11 PER DEG C AT AT MAX SPAN	
	SPAN & ZERO	CONTINUOUS TEMPER PROOF,REMOTE AS WELL AS ADJUSTABLY MANUAL FROM INSTRUMENT WITH ZERO SUPPRESSION & ELEVATION FACILITY	
	DAIGNOSTICS	SELF INDICATING FEATURE	
POWER SUPPLY	24 V DC ± 10%		

	DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE:
			SHEET 2	OF 3
TAG No. Qty.....		Data Sheet No.: PES-145-01-DS1- A		
Data Sheet A & B				
DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
	ADJUSTMENT/CALIBRATION/MAINTENANCE	HAND HELD CALIBRATOR/HART		
	ACCESSORIES	DIAPHRAGM SEAL,PULSATIONS DAMPENERS,SYPHON ETC AS REQUIRED BY SERVICE & OPERATING CONDITION, 2 VALVE MANIFOLD FOR ABSOLUTE PRESSURE TRANSMITTER (3-VALVE MANIFOLD FOR GAUGE /VACUUM PRESSURE TRANSMITTER JAND 5 VALVE MANYFOLD FOR DP /LEVEL/FLOW TRANSMITTER		



**CHECK LIST FOR
PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER
(Mechanical Auxiliary Packages)**

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 3 OF 3

Data Sheet No.. PE-CL-999-145-1026-0

SL NO	TESTS/CHECKS	QUANTM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGENCY			REMARKS
				M	C	B	
1.0	CHECKS FOR VISUAL, MODEL TAG NO.	SEE NOTE-1 BELOW	APPROVED TECHINCAL REQUIREMENT/ DATA SHEET	P	W	V	MFR TO CARRY OUT ROUTINE TEST ON 100%. WHEN MATERIAL CORELATION ARE NOT AVAILABLE MFR'S COMPLIANCE TO BE PROVIDED
2.0	PROCESS CONNECTION	-do-		P	W	V	
3.0	ACCURACY	-do-		P	W	V	
4.0	REPEATEABILITY	-do-		P	W	V	
5.0	HYSTERISIS	-do-		P	W	V	
6.0	EFFECT OF TEMP VARIATION ON ACCURACY	-do-		P	W	V	
7.0	SPAN /ZERO ADJUSTMENT	ONE/TYPE		P	W	V	
8.0	EFFECT OF SUPPLY VOLTAGE VARIATION	ONE/TYPE		P	W	V	
9.0	HIGH PRESSURE TEST	SEE NOTE-1 BELOW		P	W	V	
10.0	BURN IN TEST	ONE/TYPE		P	W	V	
11.0	DEGREE OF PROTECTION	ONE/TYPE		P	W	V	

LEGEND:

M: MANUFACTURER/ SUB CONTRACTOR, C: CONTRACTOR/ NOMINATED INSP AGENCY, B: BHEL. P: PERFORM, W: WITNESS, V: VERIFICATION.

NOTE:

- QUANTUM OF CHECK SHALL BE AS BELOW
100 % - BY MANUFACTURER
RANDOM FOR EACH TYPE - BY BHEL & CUSTOMER
- MANUFACTURER TO MAINTAIN CALIBRATED INSTRUMENT HAVING BETTER ACCURACY THAN THE ITEM UNDER TEST. INSPECTING ENGINEER SHALL CHECK THE SAME.
- IN CASE OF IMPORTED ITEMS CONTRACTORS SHALL REVIEW TC's AND NOT INSPECT.

CONTRACTOR TO PROVIDE COMPLIANCE CERTIFICATE FOR TESTS/CHECKS VERIFIED BY CONTRACTOR AND SUBMIT THE SAME ALONGWITH TEST CERTIFICATES TO BE VERIFIED BY BHEL.



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO. PE-TS- 387/388-165-N001

VOLUME : IIB

SECTION : D

REV. NO. 0

DATE : 04.02.2013

SHEET 1 of 1

LIST OF SUBVENDORS

<div style="border: 1px solid black; padding: 5px; text-align: center;"> NTPC </div>		PROJECT :						LIST OF ITEMS REQUIRING QP			REF. NO :
		PACKAGE : TG PACKAGE						APPROVAL & ACCEPTABLE			REVISION NO : 00
		CONTRACTOR : BHEL - PEM, HYD, EDN, BHOPAL, Trichy						VENDOR AS APPROVED BY			DATE : 11/11/2010
		CONTRACT NO : 9575-110 and 9586-110									
No.	Major Equipment	QP Inspection Category	QP No. 9575-110/ 9586-110- QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
9	Electronic transmitters (pressure, DP & flow)	III				EMERSON (Rosemount)	USA/Daman	A			
		III				FUJI ELECTRIC YOKOGAWA	JAPAN JAPAN	A A			Testing and Calibration at M/s YIL, Bangalore is also acceptable.
		III				ABB	FARIDABAD	A			Model - 2600 T
		III				ABB	GERMANY	A			Model - 2800 T

<div style="border: 1px solid black; padding: 5px; text-align: center;">NTPC</div>		PROJECT :				LIST OF ITEMS : PURING QP			REF. NO :		
		PACKAGE : TG PACKAGE				APPROVAL & ACCEPTABLE			REVISION NO : 00		
		CONTRACTOR : BHEL - PEM, HYD, EDN, BHOPAL, Trichy				VENDOR AS APPROVED BY			DATE : 11/11/2010		
		CONTRACT NO : 9575-110 and 9586-110									
No.	Major Equipment	QP Inspection Category	QP No. 9575-110/ 9586-110- QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
13	Pressure, DP Gauge	III				BALIGA BUDENBERG ASHCROFT	CHENNAI UK USA/Germany	DR A A			

AT



PROJECT :		LIST OF ITEMS R. AJIRING QP				REF. NO :					
NTPC		PACKAGE : TG PACKAGE				REVISION NO : 00					
		CONTRACTOR : BHEL - PEM, HYD, EDN, BHOPAL, Trichy				DATE : 11/11/2010					
		CONTRACT NO : 9575-110 and 9586-110									
No.	Major Equipment	QP Inspection Category	QP No. 9575-110/9586-110-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Remark
		I				ECIL	Hyderabad	DR*			Record updation - See footnotes
		I				Prammen	Pudukottai	A			
		I				Chemin	Pondicherry	A			
29	Instrument Cables	I				Paramount	Khushkhera	A			PVC,FRLS type,RQP
		I				Polycab	Daman	A			PVC,FRLS type,RQP
		I				Delton	Faridabad	A			PVC,FRLS type,RQP
		I				KEI	Bhiwadi	A			PVC,FRLS type
		I				Elkey Teelinks	Faridabad	A			PVC,FRLS type
		I				CORDS	Bhiwadi	A			PVC,FRLS type,RQP
		I				RELIANCE	Bangalore	DR*			PVC,FRLS type,RQP
											Record updation - See footnotes
		I				Nicco	Kolkata	A			PVC,FRLS type
		II				TEW & C	USA	A			
		II				Habia cables	Sweden	A			
		II				Kerpen cables	Germany	A			
		II				Lapp cables	Germany	A			
		II				Thermo electra Bv	Netherland	A			
		I				Universal Cable	Satna	A			PVC,FRLS type
30	Electrical actuator	II				Auma	Germany	A			
		II				Limitorque	USA	A			
		II				Rotorq	UK	A			
		I				Limitorque	Faridabad	A			
		II / I				Rotorq	Chennai/ Bangalore	A			For Bangalore - CAT - I
		II				Nippon gear	Japan	A			
		II				Auma	Bangalore	A			
31	Flow nozzle assembly	II				Microprecision	Faridabad	A			Except P-81 Material
		II				SEKO	Austria	A			
		II				TECHNOMATIC	Italy	A			
		II				ABB/ H&B	UK	A			



NTPC

PROJECT :

LIST OF ITEMS FOR PURCHASING QP

REF. NO :

PACKAGE : TG PACKAGE

APPROVAL & ACCEPTABLE

REVISION NO : 00

CONTRACTOR : BHEL - PEM, HYD, EDN, BHOPAL, Trlchy

VENDOR AS APPROVED BY

DATE : 11/11/2010

CONTRACT NO : 9575-110 and 9586-110

No.	Major Equipment	QP Inspection Category	QP No. 9575-110/9586-110-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		II				IL	Palghat	A			
		II				Daniel	USA	A			
		II				Starmech	Puna	A			
		*				MINCO	GOA	DR			Except P-91 Material * - Inspection category to be decided during vendor evaluation.
		*				Engg. Specialities	Kolkata	DR			
32	HIGH Temp. cable (PTFE/FEP)	III				Habla cables	Sweden	A			
		III				Lapp cables	Germany	A			
		III				Karpen cables	Germany	A			
		III				TEW & C	USA	A			
		III				Thermo-Electra Bv	Netherland	A			
		II				HFCL	Goa	A			
		II				R&M	Switzerland	A			
		II				Aksh Fibra	Bhiwadi	A			
		II				Finolex	Pune/Goa	A			
		II				Birla Ericson	Rewa	A			
33	Fiber optic cable										



ENDORSEMENT
151

NTPC		PROJECTS CONTRACTOR		CONTRACT NO:- 9575-110-2		LIST OF ITEMS REQUIRED FOR QUALITY PLAN AND SUB-CONTRACTOR'S APPROVAL				Ref. No. Revision No.	
SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
2	MISC PUMPS - HORIZONTAL CENTRIFUGAL	I				WPIL	GAZIABAD	A			CAPACITY REF NTPC LTR DTD 03.03.08
		I				JYOTI PUMPS	VADODRA	A			CAP UPTO 2350 M3/HR
		I				SULZER PUMPS INDIA	MUMBAI	A			CAP UPTO 1900 M3/HR
		I				BEST & CROMPTON (BE ACON WEAR)	CHANNAI	A			
		I				VOLTAS	MUMBAI	A			
		I				SAM	COIMBATO RE	A			CAPACITY UPTO 1350 M3/HR
		I				KBL	PUNE	A			



Suodh Mand
SV DAM / VD / PEM

NTPC		PROJECTS CONTRACTOR		CONTRACT NO:- 9575-110-2		LIST OF ITEMS REQUIRED FOR QUALITY PLAN AND SUB-CONTRACTOR'S APPROVAL					Ref. No. Revision No.	
SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS /APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK	DATE :
2	MISC PUMPS -HORIZONTAL CENTRIFUGAL	1				BDK MARKETING	HUBLI	DR				
		1				FLOWMORE	GAZIABAD	A			CAPACITY UPTO 2000 M3/HR	
		1				KSB	PUNE	A				
		1				MATHER & PLATT	PUNE	A				

Suven M-2-P

NTPC

CONTRACTOR

CONTRACT NO:- 9575-110-2

FOR THE
AND SUB-CONTRACTORS APPROVAL

Revision No.

DATE:

SR NO	ITEM	QP /INS-PN CAT	QP NUMBER	QP SUBMISSION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APPL L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
13	CCS VALVES OTHER THAN BHEL TRICHY	I				BDK	HUBLI	A			REFER NTPC LETTER DATED 24/02/00 :01/CQA/3520-001/C-04
		I				AUDCO(L&T)	CHENNAI	A			
		I				KSB	COIMBATO RE	A			UPTO 250 NB -600CL : & 400NB -300 CL.; 600NB -150 CL
		I				FOURESS ENGG.	AURANGAB AD	A			
		I				KBL	PUNE	A			GATE /GLOBE UPTO 300 NB - 600 CL; 600 NB-150 CL; CH
		I				PETROL VALVE	ITALY	A			REFER NTPC LETTER DATED 24/02/00 :01/CQA/3520-001/C-04
14	GM VALVES (UPTO 100 NB)	II									VENDOR APPROVAL BY NTPC NOT ENVISAGED.
	CI VALVES (GATE UPTO 500 NB, GLOBE UPTO 250 NB, NRV UPTO 650 NB)	I				BANKIM	KOLKATTA	A			UPTO 350 NB -PN1.0
		I				KBL	KONDHAPU RI	A			ONLY GATE UPTO 600 NB -PN1.0
		I				H SARKAR	KOLKATTA	A			UPTO 350 NB -PN1.0
		I				LEADER ENGG. WORKS	JULLUNDH ER	A			GATE UPTO 600 NB ; GLOBE /CHECK UPTO 300 NB



Encl. 1

NTPC		PROJECTS CONTRACTOR		LIST OF ITEMS REQUIRED FOR QUALITY PLAN AND SUB-CONTRACTORS APPROVAL							Ref. No. Revision No.		
CONTRACT NO:- 9575-110-2				Q.P. /INS- PN CAT	Q.P NUMB ER	Q.P SUB MISS ION SCH	Q.P APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
SR NO	ITEM												
15	BALL VALVES (NON FIRE SAFE TYPE)		I					FLOWCHEM	AHMEDABAD	A			UPTO 350 NBX150#
			I					AUDCO(L&T)	CHANNAI / KANCHIPU RAM	A			
			I					BDK	HUBLI	A			UPTO 400 NBX150#
			I					PEC	NASIK	A			UPTO 400 NBX150#
			I					VAAS AUTOMATION	CHENNAI	DR			
			I					AKAY INDUSTRIES	HUBLI	A			UPTO 50 NB.
			I					LEADER	JALANDHAR	A			UPTO 50 NB.
			I					MICROFINISH VALVES	HUBLI	A			UPTO 400NB. #300



Signature

Signature

NTPC

PROJECTS

CONTRACTOR

CONTRACT NO:- 9575-110-2

LIST OF ITEMS REQUIRED FOR QUALITY PLAN
AND SUB-CONTRACTORS APPROVAL

Ref. No.

Revision No.

SR NO	ITEM	QP INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APPL L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
18	CRH-7.8.9, DEAEERATOR PEGGING VALVES	I				PETROL VALVES	ITALY	A			
18	ANGLE VALVES	I				IL	PALGHAT	A			UP TO 2 INCH SIZE
		I				VELAN INC	CANADA	A			UP TO 2 INCH SIZE
		I				SAMPELL AG	GERMANY	A			
		I				REINEKE	GERMANY	A			
20	BUTTERFLY VALVES IN CI / CCS / CSS CONST(UPTO PN 10 & SUBJECT TO LIFE CYCLE TEST).	I				KBL	KONDHAPURI	A			CI/CCS UPTO 1400 MM SIZE
		I				FOURESS ENGG.	BANGALORE	A			
		I				AUDCO	CHANNAI	A			
		I				BDK PROCESS CONTROL	HUBLI	A			CI/CCS UPTO 1050 MM SIZE
		I				INTERVALVE	PUNE	A			UPTO 500 NB
		I				TYCO	HALOL	A			UPTO 500NB PN16 & UPTO 900NB PN10, /2200NB PN 08



Sushr Nre P

NTPC		PROJECTS CONTRACTOR		CONTRACT NO:- 8575-110-2		LIST OF ITEMS REQUIRED AND SUB-CONTRACTORS APPROVAL				IG QUALITY PLAN		Ref. No. Revision No.	
SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK		
20	BUTTERFLY VALVES IN CI / CCS / CSS CONST (UPTO PN 10 & SUBJECT TO LIFE CYCLE TEST)	I				IL	PALGHAT	A					
		I				STAFFORD CONTROLS	PUNE	DR					
21	AIR RELEASE VALVES	III										BHEL APPROVED SOURCES	



- 1 MOTORS LV E1027 BHARAT BIJLEE LTD. PB NO 7011,MILAP NIKETAN 4th FLR 8-A
BAHADUR SHAH ZAFAR MARG,N.DELHI-110002 3354613,3319694
- 2 MOTORS LV C02 CROMPTON GREAVES VANDHANA BUILDING 11, TOLSTOY MARG
NEW DELHI-110001 3730445,3721534
- 3 MOTORS LV A24 ASEA BROWN BOVERI IST FLOOR,QUTUB HOTEL SHAHID JEET
SINGH MARG NEW DELHI-110016 6856205,206,208
- 4 MOTORS LV K01 KIRLOSKAR ELECTRIC CO LTD. P.O. BOX 5555 MALLESWARAM WEST
BANGALORE 560055 3322111,3322771
- 5 MOTORS LV A35 NGEF BANK OF BARODA BDG PBNO.633,16,SANSAD MARG NEW
DELHI-110001 3320893,3328983
- 7 MOTORS LV S01 SIEMENS 4A, RING ROAD I.P. ESTATE NEW DELHI 110002
3318144,3317152
- 8 MOTORS LV M01 MARATHON 708, EROS APARTMENT 56, NEHRU PLACE NEW DELHI-
110019 1146519440
- 9 MOTORS LV A35 GE-POWER 150 AIRPORT ROAD BANGALORE-560017
5263671,5268413
- 10 MOTORS LV E1115 RAJINDRA ELECT INDUSTRIES 14 SHAH IND.ESTATE VEERA DESAI
RD,ANDHERI(W) MUMBAI-400053 6367943,6367944
- 11 MOTORS LV L04 LAXMI HYDRAULICS PVT. LTD 129/130, INDUSTRIAL ESTATE PATIL
NAGAR, HOTGI ROAD SOLAPUR-413003, MAHARASHTRA