2x660 MW RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II

TECHNICAL SPECIFICATIONS FOR WATER TREATMENT PACKAGES

SPECIFICATION NO.: PE-TS-528-404-W001

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA

CONTENT

SECTION	DESCRIPTION	PAGE
	PROJECT INFORMATION	1
SECTION – I	SPECIFIC TECHNICAL REQUIREMENTS	11
SECTION – IA	SPECIFIC TECHNICAL REQUIREMENTS - MECHANICAL	12
	• ANNEXURE I: QUALITY PLAN	68
	• ANNEXURE II: SUB VENDORS LIST	94
	• ANNEXURE III: FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES	210
	• ANNEXURE IV: DRAWING/DOCUMENTS REQUIRMENT & DISTRIBUTION SCHEDULE	215
	• ANNEXURE V: SURFACE PREPARATION & PAINTING	224
	• ANNEXURE VI: MANDATORY SPARES & COMMISSIONING SPARES	233
	• ANNEXURE VII: FORMAT FOR OPERATION AND MAINTENANCE MANUAL	242
	• ANNEXURE VIII: PACKING PROCEDURE	245
	• ANNEXURE IX: SITE STORAGE AND PRESERVATION	277
	• ANNEXURE X: WATER ANALYSIS AND INFLUENT QUALITY	293
	• ANNEXURE XI: OPERATION AND MAINTENANCE	296
	• ANNEXURE XII: PRE-COMMISSIONING & COMMISSIONING	302
	• ANNEXURE XIII: DRAWINGS	321
	• ANNEXURE XIV: PERCENTAGE BREAK UP OF PRICE FOR WATER TREATMENT PACKAGES	338
	• DATA SHEET - A FOR CHEMICAL DOSING SYSTEM (TG & SG)	340
	• DATA SHEET - A FOR CONDENSATE POLISHING UNIT (CPU OR CPP) (TG)	343
	• DATA SHEET - A FOR OXYGEN DOSING SYSTEM (SG)	353
	• DATA SHEET - A FOR EFFLUENT TRANSFER SYSTEM (SG)	355
	• DATA SHEET - A FOR SEWAGE TREATMENT PLANT (STP) (SG)	361
SECTION – IB	SPECIFIC TECHNICAL REQUIREMENTS – ELECTRICAL	375
	ELECTRICAL SCOPE SHEET BETWEEN BHEL AND VENDOR (TG)	377
	ELECTRICAL SCOPE SHEET BETWEEN BHEL AND VENDOR (SG)	380
	DATA SHEET OF MOTOR AND ELECTRICAL ITEMS (TG)	383
	DATA SHEET OF MOTOR AND ELECTRICAL ITEMS (SG)	397
	LOAD DATA FORMAT	404
SECTION – IC	SPECIFIC TECHNICAL REQUIREMENTS – CONTROL & INSTRUMENTATION	406
	CONTROL SYSTEM FOR WATER TREATMENT PACKAGES	414
	DATA SHEET FOR INSTRUMENT AND ANALYZER	416
	DATA SHEET FOR CONTROL VALVE	444
	DATA SHEET FOR ELECTRICAL ACTUATOR	450
	DATA SHEET FOR LOCAL CONTROL PANEL (LCP)	454
	PROCESS CONNECTION AND HOOK UP DIAGRAM	464
SECTION – II	GENERAL TECHNICAL REQUIREMENTS	498
SECTION – IIA	GENERAL TECHNICAL REQUIREMENTS – MECHANICAL • GENERAL TECHNICAL REQUIREMENT OF LOW-PRESSURE PIPING • GENERAL TECHNICAL REQUIREMENT PUMPS	499 500 526
SECTION – IIB	GENERAL TECHNICAL REQUIREMENTS – ELECTRICAL • DATA SHEET B OF MOTOR (TO BE FILLED BY BIDDER) • CABLE SCHEDULE FORMAT	537 538 542
SECTION – IIC	GENERAL TECHNICAL REQUIREMENTS – CONTROL & INSTRUMENTATION • PACKING REQUIREMENT FOR C&I	546 547

	• DOCUMENTATION REQUIREMENT FOR C&I	549
SECTION-III	LIST OF DOCUMENTS TO BE SUBMITTED ALONG WITH BID	552
	COMPLIANCE CUM CONFIRMATION SCHEDULE	553
	PRE-BID CLARIFICATIONS SCHEDULE	554
	SCHEDULE OF DECLARATION	555

PROJECT INFORMATION

(COMMON FOR TG & SG)

1.00.00 BACKGROUND

Details of proposed Stage / Units

Project name: RAGHUNATHPUR Thermal Power Project Phase-II

No. of Existing Units: Phase-I, 2 x 600 MW

No. of Proposed Units: Phase-II, 2x660 MW

Project setting up by: Damodar Valley Corporation

2.00.00 CAPACITY

Phase-I	:	1200 MW (2 x 600 MW) - Under Operation
Phase-II	:	1320 MW (2 x 660 MW) - Present proposal

3.00.00 MODE OF OPERATION

Base Load (However, continuous operation under two-shift and cyclic modes during certain periods of the year is also envisaged.)

4.00.00 LOCATION AND APPROACH

SITE DATA		
Location	:	Raghunathpur sub-division of Purulia District, West Bengal.
Latitude and Longitude	:	$23^{o}37'$ 20" N, $86^{o}39'$ 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
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.
Siesmic Data	:	Siesmic Zone-II category
NATURE OF LAND		
Land	:	Within 20 m contour variation. This plot isabove highest flood level of the area.
Soil	:	Fallow,moorum covered plot with alluvial soilunderneath

		followed by rocky sub-strata.
Land Use	:	Fallow, unused.
Crops	:	Rainfed single-crop cultivation only on 10-15% of the area.
Irrigation	:	None.

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

5.00.00 LAND

Total area of land available for Phase-I and Phase-II: 2085 Acres
No additional land is proposed to be acquired for the project.

6.00.00 METEOROLOGICAL DATA

Data of RAGHUNATHPUR is enclosed as **Annexure-II**.

7.00.00 WATER

Water requirement of Raghunathpur TPS is being met from Panchet Dam,about 12 Km from Site, constructed across the Damodar River at Panchetin Dhanbad district of Jharkhand State.

As per MOEF&CC vide notification dated 07.12.2015 and its amendmentdated 28.06.2018, the water requirement for Ph-II is limited to 40 Cusecs.The project shall be provided with Water Cooled Condenser (WCC) andaccordingly, consumptive make up water requirement would be about 40Cusecs.

A total water allocation of 112.28 Cusecs is available with DVC forRaghunathpur Project. The water requirement for Ph-I (2x600 MW) isabout 48.41 Cusecs (with ash water recovery). Surplus water available is63.87 Cusec. The water requirement for Ph-II will be met from theavailable committed quantity of 112.28 Cusecs. No additional watercommitment is required for the expansion project.

8.00.00 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.

9.00.00 COAL

9.01.00 Coal Availability and Linkage

Coal requirement for the project is estimated at 6.60 MTPA corresponding to 85% PLF considering GCV of 3200 Kcal/Kg. M/s Central Coalfields Limited (CCL) on 03.01.2011 issued a Letter of Assurance (LOA) for 4.69 MTPA of E-Grade Coal for Ph-II. DVC has requested extension of validity of LOA for a further period of 4 yearswith effect from 31.03.2022 towards fuel security of RTPS Ph-II. Further,SLC-LT, in its meeting held on 08.08.2022, has recommended the grant ofcoal linkage under Para B (i) of SHAKTI Policy to Raghunathpur TPS Ph-IIfrom Coal India Limited.

9.02.00 Coal Quality Parameters and Fuel Oil Characteristics

The primary fuel for the main steam generator shall be coal. The coal qualityparameters indicated in **Annexure-IV-2**are to be considered for steam generator design.

10.00.00 FUEL OIL

The fuel oils to be used for start-up, coal flame stabilization and low load operation of the steam generator shall be Light Diesel Oils having the characteristics given at**Annexure-IV-1**.

11.00.00 STEAM GENERATOR TECHNOLOGY

The steam generators shall be based on super critical technology, once through type, water tube, direct pulverized coal fired, top supported, balanced draft furnace, single reheat, radiant, dry bottom type, suitable for outdoor installation. The gas path arrangement shall be single pass (Tower type) or two pass type.

The Salient data for design and sizing of equipment at BMCR Condition at **Annexure-VII-3**.

Salient data for design and sizing of equipment at Pure Sliding Pressure Condition at **Annexure-VII-4**.

12.00.00 FLUE GAS DESULPHURIZATION SYSTEM (FGD):

The project is envisaged with Flue Gas Desulfurization (FGD) system in compliance to the notification dated 07.12.2015 by Ministry of Environment, Forest & Climate Change. The Tentative Limestone characteristic to be used for design of FGD system shall be as per the characteristic given at **Annexure-IV-5**.

13.00.0 POWER EVACUATION SYSTEM

Power Generated from each 660 MW units would be stepped up to the evacuation voltagelevel through suitably rated Generator Transformer.The power evacuation isproposed through two numbers of 400/220/132KV DVC Sub-stations envisaged for evacuation of Ph-II power of the project

14.00.00 PLANT WATER SCHEME

The Plant water scheme is described below:

14.01.00 Condenser Cooling (CW) Water System

It is proposed to adopt a recirculating type cooling water system with Induced Draft type cooling towers for the project. For the re-circulating type CW system it is proposed to supply clarified water as make up. Circulating water from CW pumps to TG area and from TG area to cooling tower will be carried through pipes/ducts. Cooled water from Cooling Tower will be led to CW pump house through the cold water channel by gravity.

Plant water scheme is included in **Part-E** of the technical specification.

14.02.00 Equipment Cooling Water (ECW) System (Unit Auxiliaries)

All plant auxiliaries shall be cooled by De-mineralized water (DM) in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit.

It is proposed to provide independent primary cooling water circuit for TG & its auxiliaries and Steam Generator & auxiliaries (including FGD) on Unit basis.

14.03.00 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. The water from SACW pumps shall be led to the main CT for cooling.

14.04.00 Ash Water System

Necessary LP & HP water pumps, flushing water pumps & seal water pumps for slurry disposal pump gland sealing are provided.

14.05.0 Other Miscellaneous Water Systems

CW system blow down water shall be used in Ash Handling System, FGD process water and CHP dust suppression, service water etc. (Refer Plant Water Scheme). Further, the plant service water requirement, sealing of Vacuum pumps (if applicable) of Ash Handling plant, make-up to fire water system, APH wash & FGD system (gypsum cake wash) make up shall be met from PT plant of CW system (PT-CW). The waste service water collected from various areas and coal-laden water from coal handling plant shall be treated as per requirement and reused.

The quality of Raw water, Cooling Water Analysis, Design Clarified Water Analysis, & DM water is given in this sub-section at Annexure-III-A, B & C.

15.00.00 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 Part-B of this section.

16.00.00 CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT

All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given as given in Part-B of this section

17.00.00 Vulnerability Atlas of India(VAI), prepared by Building Materials, Training and Promotion Council (BMTPC) under Ministry of Housing and Urban Affairs, is a comprehensive document which provides existing hazard scenario for the entire country and presents the digitized State/UT-wise hazard, maps with respect to earthquakes, winds and floods for district-wise identification of vulnerable areas. It also includes additional digitized maps for thunderstorms, cyclones and landslides. The main purpose of this Atlas is its use for disaster preparedness and mitigation at policy planning and project formulation and construction stage. The VAI provides necessary information for risk analysis and hazard assessment and is available at website www.bmtpc.org.

As per Government's directive, it is mandatory for the bidders to refer VAI for multi-hazard risk assessment and include the relevant hazard proneness specific to project location while planning, designing and execution of the project in terms of following details:

i) Seismic zone (II to V) for earthquakes
ii) Wind velocity
iii) Area liable to floods and Probable max. surge height
iv) Thunderstorms history
v) Number of cyclone storms/sever cyclone storms and max sustained wind specific to coastal region
vi) Landslides incidences with Annual rainfall normal
vii) District wise Probable Max. Precipitation

Accordingly, bidder should refer VAI while planning, designing and execution of the project.

However, for design of structures/facilities and equipment, the criteria for earthquake resistant design of structures and equipment, the criteria for Wind Resistant Design of Structures and Equipment and design parameters for drainage facilities, stipulated in the Technical Specification shall be followed.

For other information like area liable to floods, probable max. surge height, landslide, thunderstorm, cyclone etc. agencies are required to refer the VAI.

ANNEXURE-III-A

RAW WATER ANALYSIS

RAW WATER ANALYSIS DATA , RTPS ,DVC		
Parameters	Min	Max
pH	7.71	8.77
COND. (µS/cm)	215	511
TURBIDITY (NTU)	2.24	24.7
Total Hardness (ppm as CaCO3)	69	142
Ca-Hardness (ppm as CaCO3)	42	86
Mg-Hardness (ppm as CaCO3)	27	68
M.O. Alkalinity (ppm as CaCO3)	69	115
Silica (ppm as SiO2)	08	14
Chloride (ppm as Cl)	13	30

ANNEXURE-III B

COOLING WATER ANALYSIS

CONSTITUTUENTS	As	CONTENTS
Calcium	CaCO3	95.0 ppm
Magnesium	CaCO3	58.0 ppm
Sodium & Potassium	CaCO3	68.0 ppm
TOTAL CATIONS	CaCO3	221.0 ppm
(except iron in solution)		
Bicarbonate	CaCO3	115.0 ppm
Carbonate	CaCO3	-- ppm
Sulphate	CaCO3	80.0 ppm
Chloride	CaCO3	26.0 ppm
Nitrate	CaCO3	-- ppm
Phosphate	CaCO3	-- ppm
TOTAL ANIONS	CaCO3	221.0 ppm
Silica	SiO2	13.5 ppm
pH value at 25^0C		8.1
Total Suspended Solids		1000 ppm (maximum)
Turbidity		1000 NTU (maximum)
DESIGN CLARIFIED WATER ANALYSIS		
CONSTITUTUENTS	**As**	**CONTENTS**
Calcium	CaCO3	116.5 ppm
Magnesium	CaCO3	58.0 ppm

Sodium & Potassium	CaCO3	68.0 ppm
TOTAL CATIONS	CaCO3	242.0 ppm
(except iron in solution)		
Bicarbonate	CaCO3	93.5 ppm
Carbonate	CaCO3	-- ppm
Sulphate	CaCO3	116.0 ppm
Chloride	CaCO3	33.0 ppm
Nitrate	CaCO3	-- ppm
Phosphate	CaCO3	-- ppm
TOTAL ANIONS	CaCO3	242.5 ppm
Silica	SiO2	13.5 ppm
pH value at 25^0C		7.5 - 8.0
Turbidity		15 NTU (maximum)
Residual Chlorine	Cl_2	0.5 ppm

** Clarified Water shall be used as Service Water and Potable Water.

Note :

1) The above figures have been arrived with due consideration of injection of 80 ppm alum, 20 ppm lime and 5 ppm chlorine in raw water.

2) For arriving circulating water analysis, the above referred design clarified water analysis shall be multiplied by COC 4.0.

ANNEXURE-III C

ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER

Sl.No.	Characteristics	Value
1.	Silica (Max.)	0.02 ppm as Sio2
2.	Iron as Fe	Nil
3.	Total hardness	Nil
4.	pH value	6.8 to 7.2
5.	Conductivity	Not more than 0.1 micro mhos / cm excluding the effects of free CO2

SECTION-I

SPECIFIC TECHNICAL REQUIRMENT

SECTION- I A: SPECIFIC TECHNICAL REQUIRMENT-MECHANICAL
SECTION- I B: SPECIFIC TECHNICAL REQUIRMENT-ELECTRICAL
SECTION- IC: SPECIFIC TECHNICAL REQUIRMENT-CONTROL & INSTRUMENTATION

SECTION- I A

SPECIFIC TECHNICAL REQUIRMENT-MECHANICAL

1. INTENT OF SPECIFICATION

1.1 Water Treatment packages includes **Chemical (NaOH) Dosing System (CDS-TG), Condensate Polishing Plant (CPU-TG), Chemical (Hydrazine, Ammonia and NaOH) Dosing System (CDS-SG),Oxygen Dosing System (ODS-SG), Effluent Transfer System (ETS-SG) & Sewage Treatment Plant (STP-SG).**

1.2 This specification is intended to cover SUPPLY PART, SERVICES PART & MANDATORY SPARES comprising of design, engineering, manufacture, fabrication, assembly, inspection & testing at vendor's & sub-vendor's works, painting, forwarding, supply and delivery at site including start up and commissioning spares, mandatory spares, properly packed for transportation, supply of chemicals as specified, unloading / handling and storage at site, in site transportation, assembly, **erection and commissioning**, trail run, preparation and submission of "As Built" drawings, preparation of drawings in 3D, site testing, carrying out performance guarantee tests at site and handover of complete **Type-A Packages (TG Packages) i.e. Chemical (NaOH) Dosing System (CDS-TG) & Condensate Polishing Plant (CPU-TG) and Type-B Packages (SG Packages) i.e Chemical (Hydrazine, Ammonia and NaOH) Dosing System (CDS-SG), Oxygen Dosing System (ODS-SG), Effluent Transfer System (ETS-SG) & Sewage Treatment Plant (STP-SG)** as per the details and scope defined as per BHEL NIT & tender technical specification, amendment & agreements till placement of order for **Raghunathpur Thermal Power Project Phase-II (2X660 MW).**

1.3 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve them of the responsibility of providing such facilities to complete the supply, erection and commissioning of Water Treatment Packages within quoted price.

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

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

1.6 Items though not specifically mentioned but needed to make the system complete as stipulated under these specifications are also to be furnished unless otherwise specifically excluded.

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

1.8 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Section-III of the specification as **"**PRE BID CLARIFICATION SCHEDULE". In absence of any such clarifications, in case of any contradictory requirement, the

more stringent requirement as per interpretation of BHEL/ Customer shall prevail and shall be complied by the bidder without any commercial and delivery implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by BHEL/ Customer as and when brought to their notice either by the bidder or by BHEL/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

1.9 This bid is to be treated as no technical deviation bid, hence any clarification required by bidder, must be asked before bid submission. Thereafter, no deviation/ clarifications shall be entertained.

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

1.11 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder/ vendor and Customer/ Purchaser/ Employer will mean BHEL and Customer as interpreted by BHEL in the relevant context. Please refer GCC/SCC for better clarity.

1.12 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and dispatch release issued by BHEL/Customer.

1.13 BHEL's/Customer's representative shall be given full access to the shop in which the equipment's are being manufactured or tested and all test records shall be made available to him.

1.14 "Contractor"/ "Vendor" referred in this specification shall be read as "bidder".

1.15 Bidder to comply complete specification given under specific (Section I) and general technical requirements (Section II). However, in case of any contradiction, Specific technical requirement shall prevail over general technical requirements.

2. CHEMICAL (NaOH) DOSING SYSTEM (CDS) (SKID BASED) (TYPE-A TG PACKAGES)

2.1 SCOPE OF SUPPLY

Chemical Dosing System, complete with all accessories for the total scope as specified hereinafter for the following systems: -

a) NaOH DOSING SYSTEM - 2 Nos. Skids.

2.2 DESIGN CRITERIA

The following drawings/ data sheets are enclosed for the reference:

a) P&ID for NaOH dosing system (PE-DG-528-154-W001).
b) DATA SHEET – A for all above systems.

The LP dosing consists of NaOH dosing skids for ECW system. The details of each dosing system are given below:

2.3 NaOH DOSING SYSTEM FOR ECW SYSTEM: (TOTAL NO. OF SKID = 2 NOS)

(Refer Drawing. No. PE-DG-528-154-W001, SHEET 03 OF 03)

One skid of NaOH Dosing System consists of the following:

a) One number NaOH Mixing cum storage tank.
b) Two (2 X 100%) NaOH Dosing Pumps.
c) Associated Piping, valves, fitting as indicated in the P&ID of NaOH dosing system and data sheet-A enclosed and as required to make the system complete.
d) Commissioning spares as per list
e) Mandatory spares as per list

CONTROL PHILOSPOHY FOR NaOH DOSING SYSTEM

The control of all dosing systems shall be realized in DDCMIS including ON/OFF command of the individual pumps and stirrers. All controls, fault indicators/alarms, interlocks, logics shall be implemented in DDCMIS. Separate local panel shall be provided for each of the above said system.

The starter of all the motors shall be clubbed with main plant MCC. Power to all pumps, agitators etc. shall be fed from MCC. DDCMIS commands shall extend to MCC.

A local panel comprising of ‘START’ push button, 'STOP' push button along with ‘ON/OFF/TRIP’ indication, local/ remote indication, stroke position indicator, raise/ lower push button for stroke position and local annunciation shall be provided for local operation. The 'START' push button and ‘STOP’ push button shall be routed to DDCMIS.

The ON/OFF operation of all motorized stirrers and pumps shall also be provided in DDCMIS with local ON, OFF facility.

The auto stroke controllers (I/E converter) of each pump shall be mounted on the local panel of respective dosing skid. The stroke position & adjustment will be done from DDCMIS and the stroke controller (I/E converter) shall be suitable for accepting 4-20 mA DC signals. The pumps shall be provided with 24 V DC, 2- wire LVDT Type Position feedback transmitter to generate 4-20 mA DC signals to indicate stroke position in DDCMIS & Local panel.

The Local/ Remote selection switch (soft) shall be provided in DDCMIS and its indication shall be provided in LCP. LCP shall be located on the dosing skid.

INDICATION

1. Following interlocks shall be provided at low-low Level in the mixing cum storage tank:
   i) Running Dosing pump shall be tripped.
   ii) Stirrer motor of the respective tank shall be tripped.

2. Following conditions to be ensured before starting a stirrer:

   i) Level in the tank adequate.
   ii) MCC not disturbed

3. Following conditions to be ensured before starting a pump:

   i) Level in the tank adequate.
   ii) MCC not disturbed.
   iii) Duplex strainer- not choked

4. Following shall be provided on LCP:

   i) ON/ OFF/ Fault- Lamp Indications for all drives (pumps & agitator)
   ii) Operation 'Local selected' / operation 'Remote selected'- Lamp Indication, common for all drives.
   iii) Pump- Start/ Stop & Agitator-Start/ Stop –Push Buttons
   iv) Auto stoke controller
   v) Stoke position indicator (may be a part of controller)
   vi) Local LED based annunciation driven by DDCMIS.

5. Following fault indications with alarm annunciations shall be provided on LCP:

   i) Low level in the mixing cum storage tank.
   ii) Low-low level in the mixing cum storage tank
   iii) High level in the mixing cum storage tank
   iv) High-high level in mixing cum storage tank
   v) High pressure at pump discharge header
   vi) Low pressure at pump discharge header
   vii) Strainer choked
   viii) Dosing pump-1--tripped
   ix) Dosing pump-2--tripped
   x) Stirrer motor—tripped

SIGNAL EXCHANGE

6. Following signals shall be wired from DDCMIS to LCP. These shall be 24V DC powered signals. (PF contacts are not used to avoid the higher voltage LCP power supply reaching DDCMIS while contact interrogation).

   i) Operation local selected.
   ii) Operation remote selected.
   iii) Pump- 1/2 & stirrer (ON/OFF/FAULT).
   iv) Process conditions (as per clause 5 above).
   v) Pump- 1/2 stroke length demand signal (4-20 mA).

7. Following signals shall be wired from LCP to DDCMIS. Binary signals shall be P.F. contacts.

   i) All field signals.
   ii) START & STOP–PB commands for all drives (pumps & agitator).
   iii) Pump- 1/2 stroke length feedback signal (4-20 mA).

8. Signal Exchange between DDCMIS & MCC:
   i) START & STOP command from DDCMIS to MCC.
   ii) ON, OFF, MCC Disturbed feedback from MCC to DDCMIS.

9. Signal Exchange between LCP & MCC shall be

   i) EMERGENCY STOP-PB for all drives (pumps & agitators) shall also be wired directly to MCC.

   All the field instruments i.e. level transmitter, differential pressure transmitter, pressure transmitter etc. & stroke actuator shall be terminated at local panel by the vendor, for taking further to DDCMIS by BHEL.

   Further, Control & instrumentation shall be as per P&ID of NaOH Dosing System, Data Sheet-A.

2.4 TERMINAL POINTS (also refer P&I Diagrams enclosed)

a) All piping beyond battery limit of skid as indicated in P&ID's enclosed with the technical specification is excluded from bidder's scope.
b) Electrical scope shall be as per Std. Electrical Scope Matrix attached in Section IB of the technical specification.
c) All drains shall be brought at one point on the skid by the bidder via a drain header and further connection to the nearest plant drain shall be done by BHEL/ Customer.
d) Counter flanges for all the piping terminal points (as per P&IDs) and for the terminal point of drain header shall be in bidder's scope.

2.5 SPECIAL TOOLS AND TACKLES

a) One set of all special tools shall be furnished and shipped with each piece of equipment for dismantling, maintenance, adjustment, and calibration of the equipment. The tools shall be shipped in separate heavily constructed wooden boxes provided with hinged covers and padlock hasps.
b) The Contractor shall supply under this contract all maintenance tools for each piece of equipment/ system and it shall be boxed separately and the boxes shall be appropriately marked for shipment and identification of contents.
c) A weather-proof itemized list of the contents shall also be attached to the outside of each container.
d) The maintenance tools shall include all special handling rigs, bars, slings, cable and all specialized equipment for control system maintenance such as extender boards, scopes, and all software and hardware. Further, Bidder shall also include a full set of regular maintenance tools and tackles required. Bidder shall also include all maintenance tools and tackles in their scope. Total price of all the maintenance tools and tackles shall be included in the quoted lump sum price.

2.6 The material of construction specified in Data Sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty which shall be subjects to Customer/ BHEL approval during detailed engineering.

2.7 All instrument-wetted parts will be suitable for requested application.

2.8 All high points on any, tanks, pumps, piping or instrumentation will be vented and provided with valve. All low points on any, tanks, pumps, piping or instruments will be drained and provided with

valve.

2.9 5 mm (min.) thick IS 2062 Checker plate shall be provided by bidder covering the skid frame and for elevated platform for the preparation/ measuring tank, wherever applicable. The tanks support, pumps and pipe support and LCP/ LCP support shall be welded to the checker plate.

2.10 Stuffing box shall be provided for mounting the agitator to avoid air ingress.

2.11 Vent/ overflow pipe from tank shall at least reach the bottom half of the breather/ water seal/ CO2 absorber.

2.12 SS pad shall be provided for welding MS structural supports to SS tanks.

2.13 Step ladder and chemical charging platform shall be provided for easy access to top of tank.

2.14 All the terminal points shall be easily accessible and towards one side of skid.

2.15 All valves shall be easily accessible for the operator.

2.16 All tanks/ pumps shall have name plate clearly indicating the equipment name.

2.17 Pipe fittings of the system shall be done using elbows and tees. Pipe bending is not acceptable.

2.18 All equipment shall have SS name plate.

2.19 All LCP shall be mounted in their respective dosing skids only.

2.20 Energy efficient level IE4 LT Motors shall be provided by the bidder.

2.21 All the terminal points where flange joints are involved, bidder shall terminate it along with matching counter flange, nuts, bolts, gaskets etc.

2.22 KKS codes for all drives and instruments for the project have to be followed.

2.23 All the instruments/ equipment/ electrical items shall be provided & designed with maximum star rating as available in line with energy conservation policies notified by BEE, GOI at the time of supply.

3. CONDENSATE POLISHING UNIT (CPU OR CPP) (TYPE-A TG PACKAGES)

REFERENCE DOCUMENTS:

A. **DATASHEET-A OF CONDENSATE POLISHER PLANT.**
B. **P & ID OF CONDENSATE POLISHER PLANT (PE-DG-390-155-W001).**
C. **SUGGESTIVE EQUIPMENT LAYOUT OF CPU REGENERATION AREA (PE-V0-390-155-W003).**

The condensate polishing unit package (service vessel area & regeneration area) shall be part of TG package and for electrical scope it shall be considered as TG BOP package.

There shall be three numbers Condensate polishing service vessels (3X33.33% capacity) for each 660 MW unit. There are two 660 MW TG units. There shall be one complete set of external regeneration systems common for both the TG units Condensate Polishers.

The proposed condensate polishing units shall treat the entire condensate of the turbine generator of each unit of power station. The proposed schematic arrangement of the condensate polishing unit and its regeneration facility shall be as per the enclosed P&I Diagram. Arrangement of piping, valves and instruments shown in the P&ID are bare minimum. The bidder shall include the complete system including regeneration facility as elaborated in this specification meeting the contractual requirements.

Condensate polisher unit (service vessels) shall be located in the TG hall of corresponding units. Condensate polisher service vessels will be provided on the discharge side of the high-pressure condensate extraction pumps.

The regeneration systems shall be external and common to the CPU of all the TG units. For regeneration, resin from the exhausted exchanger vessel will be transferred hydraulically/hydro-pneumatically to this facility. The exhausted resin charge will be cleaned, separated, regenerated, mixed and rinsed before being stored for the next use.

The regeneration process offered by the bidder shall be of proven design and shall essentially be the same process by virtue of which the bidder is qualified and shall give resin-separation compatible with the desired effluent quality. Documentary evidence shall be submitted by the bidder to the customer to 'establish this requirement during detailed engineering stage if required.

The common influent and effluent headers of each CPU. will be connected to an automatic bypass line (s) to be provided by Contractor. On high pressure signal across the service vessel. the automatic control valve(s) in the bypass line(s} shall open, bypassing the service vessel(s).

In the event of a tube failure in the condenser. circulating water will enter the condensate system and will contaminate it. Typical composition of the circulating water is exhibited elsewhere in the technical specification and the condensate polishing plant shall be designed for such tube leakage condition as mentioned.

The equipments covered under this subsection. other. than in. service vessel areas shall be located outdoor (in open) and no superstructures are envisaged to be provided for these equipments/pump houses. However, the equipments may have localized shade provisions and pumps maintenance area shall be provided with roof cover. All the instruments associated with condensate polishing plant shall be provided with proper enclosures by Bidder. All vessels, pumps & blowers and their drives and other electrical and C&I equipments/accessories of regeneration system shall be suitable for outdoor duty and enclosures class of all the equipments shall be suitably selected by the bidder.

3.1 SCOPE OF SUPPLY

Broad scope of supply (mechanical) for this package is detailed below & mentioned in P&ID and as indicated in relevant portion of this specification and same shall be in the scope of the bidder. Please refer Electrical and C&I specifications also for respective scope of Electrical and C&I items and same shall be in the scope of the bidder.

A. SERVICE VESSEL FACILITY

Condensate Polisher plant of service vessel area in each TG units **(Refer drg. No. PE-DG-390-100-M003 for location)** shall consist of following:

1) There shall be three numbers service vessels (3X33.33%) for each 660 MW TG unit, each polishing 33.33% of the condensate flow. Each Condensate polisher vessels shall be complete with condensate inlet and outlet connections, connections for resin transfer to and from the vessels, bed support-cum-under drain system, inlet water distributors, air distribution arrangement for resin mixing, all fittings and appurtenances etc. as required.

2) External resin traps at the outlet of each of the polisher vessel, designed for in-place manual back washing.

3) Condensate inlet and outlet headers for each installation with pipe connections to each condensate polisher vessels.

4) Resin transfer headers and pipe lines connecting the external regeneration facilities to the condensate polisher vessels of each installation.

5) Rinse water outlet headers from condensate polisher vessels of each installation upto the condenser hot well.

6) Gland sealing water piping for the valves in the rinse water line.

7) Emergency bypass between the condensate influent and effluent headers with its automatic valve, isolation valves on both sides and controls as mentioned in P&ID shall also be provided. This emergency bypass system will open automatically in case of pressure differential exceeding 3.5 bar.

8) Two (2) nos. (2X100%) capacity (1Working+1Standby) oil free type, air blowers to supply necessary air for mixing the resins in the service vessels for each 660 MW TG unit CPU. Each blower shall be complete with motor, V-belt drive with belt guard, inlet filter/silencer, flexible couplings discharge snubber, all mounted on a single base. Relief valve(s) shall be provided as required.

9) All necessary drains, vents and sampling points, with valves as specified and as required.

10) Complete Instrumentation and Control for automatic operation.

11) Nine (9) complete charges of resins. One charge will be defined as cation, anion & inert resin (if applicable) requirement for one service vessel.

12) Complete instrumentation and controls for this system, including the differential pressure transmitters, panel mounted indicating type controller with provision for remote manual operation, actuator for the control valve with positioner etc. All tubing, wiring, air sets, and other fittings, required to complete the system.

13) All necessary valves, piping, instrumentation & fittings for the installations with actuators necessary for their remote operation. These shall include suitable fool proof arrangement to prevent accidental over pressurization of the resin transfer pipeline and regeneration facilities connected to it, which are designed for pressure much lower than that of the Condensate polishing plant service vessel

area.

14) Operating platforms, ladders, supports and other structural works for each Condensate Polisher vessels to facilitate accessibility for operation and other equipment etc. shall be provided.

15) All analysers (Sodium, silica, conductivity, cation conductivity, pH etc) shall be provided in air-conditioned panel/ cabinet. Air conditioning equipment required for all analysers panel shall be in bidder's scope

16) Multistream for Silica and Sodium Analysers shall be provided as per P&ID and Multistream analysers shall have at least one stream as spare. Hence, minimum 5 stream Silica and Sodium Analysers for each TG unit shall be provided by bidder.

17) A common drain header for the condensate polisher service vessels of each unit up to the hot well.

18) Operating pressure for service vessels shall be normal operating pressure of condensate extraction pump. Service vessel design pressure shall be equal to shut off pressure of condensate extractions pump plus 5% margin.

19) Design temperature of the service vessel shall take care of all operating regimes including HP-LP bypass operation.

20) Emergency bypass system: (Please refer P&ID also)

Each condensate polisher service unit shall be provided with an automatic bypass system for the condensate polisher on the condensate inlet and outlet headers of the unit with a set of control valve with its isolation valves on the upstream and downstream sides of the control valve.

In the event of excessive pressure differential between the condensate inlet and outlet headers, this control valve will open automatically to bypass requisite quantity of condensate to prevent this pressure differential from exceeding a pre-set limit when all vessels/ two vessels/one vessel/no vessel is in operation.

Either 2x50% capacity valves or 1x100% control valve to achieve proper control under all operating conditions shall to be provided as per customer’s approval of engineering documents.

Complete instrumentation and controls required to complete the system, shall also be in bidder’s scope.

The isolation valves shall be provided with geared operators for manual operation. The entire system shall be designed for an internal pressure of at least the design pressure of service vessels and for a maximum condensate flow of not less than total design flow of all the working service vessels.

The control system shall be so designed that the control valve is able to bypass 33% of rated flow when any of the service vessel is out of service,67% of flow when two vessels are taken out of service and 100% of flow when all the service vessels are out of service.

Service vessel bypass control system as indicated in the P&ID shall be in bidder’s scope.

B. REGENERATION SYSTEM

Regeneration area shall be considered as low-pressure area. One (1) common external regeneration system for regeneration of the ion exchange resins from the condensate polishers for all the turbo generator units shall be provided. One (1) common facility for regeneration of the ion-exchange resins from the condensate polishers of all the turbo-generator units shall be provided utilizing three (3) tank concepts and consisting of following:

1) One No. Resin Separation & Cation Regeneration Vessel.

2) One No. Anion resin regeneration vessel.

3) Two (2) Numbers Mixed resin storage vessels.

4) The regeneration vessels arrangement shall be as per the supplier recommendation/ process utilising three (3) tank concept as defined above. However, there shall be two numbers identical mixed resin storage vessels. If the process envisages the chemical regeneration arrangement in mixed resin storage vessel, then additional mixed resin storage should also have chemical regeneration arrangement.

5) All internals, fittings and appurtenances for these vessels.

6) Common waste effluent header with one (1) number resin trap, total one (1) number for station designed for in place manual backwashing.

7) Resin injection hopper One (1) number, complete with a water ejector system for resin make-up. Resin injection hopper shall be sized to handle up to 150 litres of as received new resins.

8) Two (2) nos. (2X100%) (1Working+1Standby) oil free type air blowers with electric motor drives, for supplying all the process air required for cleaning of the resins and their regeneration processes. Each blower shall be complete with motor, V-belt drive with belt guard, inlet filter/silencer, flexible couplings discharge snubber, all mounted on a single base. Relief valve(s) shall be provided as required.

9) Two (2) nos. (2X100%) (1Working+1Standby) DM water pumps with electric motor drives for water supply for chemical preparation, dilution water supply during dosing & regeneration etc. These DM water pumps will take suction from DM water storage tanks provided for CPU.

10) Two (2) nos. (2X100%) (1Working+1Standby) DM water pumps with electric motor drives for water supply and transfer of resin from service vessel to regeneration vessels and vice – versa. These DM water pumps will take suction from DM water storage tanks provided for CPU.

Waste water generated during Resin Transfer operation: The DM water used for resin transfer operations from the Regeneration building to the Condensate Polisher vessels and from the Condensate Polisher vessels to the Regeneration building shall be collected in DM waste water collection tank (MSRL construction) of adequate capacity in Condensate Polishing Plant regeneration area and the same shall be pumped to CW channel for recycle/re-use by means of two (2) numbers (1W+1S) (2x100%) of waste water recycle pumps. The material of construction of pumps shall be SS-316 (casing, impeller and shaft). The piping distance from waste water recycle pumps to CW channel shall be considered 450 m and 12 m static head for pump selection. Further bidder to consider 60 m piping (MOC: SS 316) from the discharge of pump header in their scope. The necessary piping, auto valves, manual valves, instrumentation required for the same shall be in bidder's scope.

11) One (1) number alkali preparation tank complete with electrically driven stirrer, dissolving basket, carbon dioxide absorber, overflow seal, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and with all other required accessories.

12) Two (2) nos. (2x100%) (1Working+1Standby) alkali solution transfer-cum-recirculation pumps of suitable capacity and head to meet the system requirements. These pumps shall be provided along with electric motor drive, strainer with necessary valves & instrumentation & accessories.

13) One (1) number alkali day tank complete with electrically driven stirrer, dissolving basket, carbon dioxide absorber, overflow seal, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and with all other required accessories.

14) Two (2) nos. (2x100%) (1Working+1Standby) Alkali dosing pumps for dosing NaOH (48% conc.) along with electric motor drive, strainer, pulsation dampener & safety relief valve at the outlet line of

each pump with all other required accessories etc.

15) One (1) no. Activated carbon filter for alkali complete with internals, integral pipe works, valves, instruments, ladders, platforms, lifting lugs, carbon trap etc. and with all other accessories as required.

16) One (1) no. hot water tank complete with heaters (2X50%), internals, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and with all other accessories as required.

17) Two (2) numbers acid measuring tank, complete with fume absorber, overflow seal, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and with all other required accessories.

18) Two (2) nos. (2x100%) (1Working+1Standby) Acid dosing pumps for dosing hydrochloric acid (30% conc.) along with electric motor drive, strainer, pulsation dampener & safety relief valve at the outlet line of each pump and with all other required accessories etc.

19) Diluent water supply separately, for acid and alkali, each provided with an automatic on off valve, a throttling valve for setting of flow, a local flow indicator, and a mixing tee where the chemicals get injected into the water stream.

20) One (1) number lime tank of effective capacity of minimum 2 m3 (MOC: SS-316) complete with electrically driven stirrer, dissolving basket, carbon dioxide absorber, overflow seal, drains, manhole, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and with all other required accessories. The tank shall be protected externally with chlorinated rubber paint.

21) Dosing of acid, alkali shall also be provided to neutralise effluents before disposal along with all piping, valves etc. and the same shall be in bidder's scope.

22) There shall be Bulk Acid storage tanks (two numbers) complete with fume absorber, overflow seal, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and with all other required accessories.

23) There shall be Bulk Alkali storage tanks (two numbers) complete with, carbon dioxide absorber, overflow seal, integral pipe works, valves, instruments, ladders, platforms, lifting lugs etc. and with all other required accessories.

24) Two (2) nos. (2x100%) (1Working+1Standby) acid unloading pumps for unloading hydrochloric acid (30-33% conc.) along with electric motor drive, strainer for each pump and with all other required accessories etc.

25) Two (2) nos. (2x100%) (1Working+1Standby) Alkali unloading pumps for unloading NaOH (48% conc.) along with electric motor drive, Strainer for each pump with all other required accessories etc.

26) All integral pipe works, valves, internals, fittings, hangers, supports and appurtenances etc for these vessels.

27) All analysers (pH, conductivity, concentration etc) shall be provided in air-conditioned panel/ cabinet. Air conditioning equipment required for all analysers panel shall be in bidder's scope.

28) There shall be two numbers DM water storage tanks. These Two (2) numbers of DM Tanks shall be of vertical cylindrical type in Mild steel construction internally painted with epoxy. The design features of the tanks & accessories shall be as per IS: 803. However, minimum thickness of shell plate, bottom plate and roof plate shall be 8 mm, 10 mm and 6 mm receptively.

The tanks shall be provided with CO2 absorber and over flow seal pot. Effective capacity of each tank shall be equivalent to 1.5 times the DM water required for three (3) regenerations operation of of one (1) complete TG unit including resin transfer operations from Condensate Polishing Plant to regeneration plant and regeneration plant to Condensate Polishing Plant and for preparation of

chemicals for three (3) regenerations operation. However, the capacity of each DM water storage tank shall be 900 m3 minimum. Water inlet pipe shall led up to the bottom of DM tanks (preferably through perforated pipe) to avoid turbulence/agitation.

29) Total two (2) numbers mixing tee for Acid and alkali dosing facility.

30) Neutralising pit of RCC construction with acid/alkali resistant tiles shall be provided to receive drains from the regeneration in two (2) sections and each section shall have a holding capacity of 1.5 times the waste effluent from each regeneration of each vessel. For disposal of neutralized effluent pumping, pumps shall be provided. Proven agitation system like air agitation/ venturi mixing shall be provided, in addition to recirculation from pumps.

31) Total three (3) numbers (1W+1S+1Maint. standby) the waste recirculation/disposal pumps for Neutralising pit.

32) In case offered CPU system required hydro-pneumatic resin transfer then service air required for resin transfer operation in service vessel area & regeneration area shall be arranged by bidder and bidder to consider necessary air compressors (2X100%) & air receiver in their scope along with necessary drive motor, piping with necessary valves & instrumentation & accessories.

33) Design pressure of the condensate Polisher Service Vessels is indicated elsewhere. For all other Pressure vessels, the design pressure shall be at least 8 kg/cm² (g) minimum.

34) All the atmospheric tanks shall be at least 6 mm thickness.

35) Safety equipment as indicated elsewhere in the specification.

36) All necessary drains, vents and sampling points with valves as specified and as required.

37) All necessary piping, valves & fittings, complete instrumentation, controls etc. necessary for automatic operation.

38) All equipment for dosing of acid and alkali solutions shall be rated to provide a maximum dosing rate at least 20% in excess of that required from process calculation except Acid and alkali measuring Tank for which excess margin is defined under Datasheet.

39) Adequate number of safety shower units and Eye-fountains to protect against any chemical hazard or at least 2 nos. shall be provided by bidder. The same shall be in bidder's scope of Supply.

40) Platform/ operating platform, Ladder, supporting structure for service vessel area and regeneration area vessels and tanks and necessary cross over for piping shall be in bidder's scope.

41) Four (4) sets of safety equipment [(Personal Protection Equipment (PPE)] comprising PVC protection suits with hoods, rubber boots, face visors and thick PVC gauntlets shall also be provided.

42) Suggestive equipment layout of CPU regeneration area has been enclosed here with this specification ,bidder is requested to follow the same.

C. PIPING

All the piping as listed below shall be in bidder's scope. The below indicated pipes shall be designed, supplied, erected, laid and tested by the bidder. Elbows, tees, flanges, counter flanges, Hangers and supports, embedment plates with lugs etc required for the below given piping shall also be provided by the bidder.

1) Service vessel inlet header shall be seamless carbon steel ASTM A-106 Gr B (OD 406.4 X 12.7 mm thick).

2) Service vessel outlet header shall be seamless carbon steel ASTM A-106 Gr B (OD 406.4 X 12.7 mm thick).

3) Rinse water outlet piping to Condenser Hot well shall be seamless carbon steel ASTM A 106 Gr -B (OD 168.3 x 7.11 mm). The distance between CPU service vessel to condenser Hot well shall be considered as 110 meters approx. for each unit and this piping shall also be in bidder's scope.

4) Resin transfer piping shall be minimum 80 NB and of SS 304 (seamless) Schedule 10 (minimum). One-way piping distance for resin Transfer Piping between farthest service vessel and regeneration area shall be 375 meters approx. Complete resin transfer piping shall be in bidder's scope. Other details have been attached elsewhere in the tender technical specification. Further all the resin transfer piping inside each service vessel area and common regeneration area shall be in bidder's scope.

5) Piping handling DM water shall be Stainless steel SS 316 Schedule 10 (minimum). One-way piping distance for DM water piping between farthest service vessel and regeneration area shall be 375 meters approx. Complete DM water piping shall be in bidder's scope. Other details have been attached elsewhere in the tender technical specification. Further all the DM water piping inside each service vessel area and common regeneration area shall be in bidder's scope.

6) Piping related to DM water Storage tanks of CPU (2nos.) from terminal point of customer@100 NB size to inlet, outlet and recirculation to tanks and related to DM water pumps (for regeneration) and DM water pumps (for resin transfer) inlet and outlet connections shall be in bidder's scope. The piping length of 150 meters shall be considered by bidder in their scope. Complete DM water piping from terminal point up to DM water Storage tanks of CPU (2nos.) along with motorised isolation valves in each line shall be in bidder's scope. Other details have been attached elsewhere in the tender technical specification.

7) The material of piping handling DM waste water generated during regeneration and resin transfer shall be of stainless-steel type 316 Sch.10 (Minimum). The piping distance from CPU regeneration area to CW channel is 450 meters approx. bidder to consider 60 m piping (MOC: SS 316) from the discharge of pump header in their scope. Other details have been attached elsewhere in the tender technical specification.

8) Pipeline handling Alkali shall be of stainless-steel type 316 Sch.10 (minimum).

9) Piping for Acid service (HCl) shall be carbon steel Poly propylene lined.

10) Piping for air service shall be shall be of hot dip galvanized (heavy grade) steel.

11) All piping within each of the above skids/equipment shall also be in bidder's scope.

12) There shall be a Neutralisation Pit (N pit) for CPU regeneration and the Neutralisation pit Civil work shall be under Customer (DVC) scope. The regeneration waste from CPU regeneration area shall be led to this N-pit via drain.

13) Service water piping in CPU service vessel area (used for cooling of condensate sample), Service water piping in each CPU regeneration area, instrument air piping for each CPU service vessel area & regeneration area and service air piping for each CPU service vessel area & regeneration area, potable water piping for each CPU regeneration area etc. shall also be in bidder's scope.

14) Similarly, all piping between external regeneration facility and the skids for chemical dosing and acid/alkali preparation, demineralized water piping to the chemical dosing, acid /alkali piping from external bulk storage tanks to respective preparation skids, the alkali preparation skids from the external regeneration facility, alkali solution from its preparation facility to the alkali dosing skid, dilute chemical solution piping for acid and alkali from the dosing skids to the external regeneration facility, piping to the preparation/dosing facilities, instrument air piping and water supply line of the diluent water tank from the regeneration facility shall also be designed, supplied, erected and tested

by the bidder. These shall include all drains, vents and sampling points with valves as specified and as required. The entire installation shall be complete with all pipe supports. hangers, etc.

1) Bidder shall design, supply and erect the piping between the service vessel units and the common external regeneration facility, for transferring the exhausted and regenerated resins as required.

2) All piping shall be laid above ground and generally laid in pipe trestles including crossing of road/pipe/cable trenches if any. Piping of between chemical tanks area and regeneration area etc. may be laid on pedestals if layout permits.

3) The resin transfer pipeline arrangement shall avoid any sharp bends which cause segregation of the mixed resins, and pockets where the resins can get trapped. Suitable observation ports shall be provided in all critical areas to enable the operator to monitor completeness of the resin transfer operations. All necessary arrangements for venting and draining of the pipeline shall be provided.

4) The resin transfer pipeline shall be sized for a flow velocity of between 2.3 and 3.0 meters/sec. For other services, design criteria shall be generally in line with design philosophy described elsewhere in technical specification.

5) Remotely operated valves suitably interlocked with the plant operation, shall ensure that the resins get transferred to and from only the particular service vessel which has been selected by the operator.

6) All lined vessel connections and connections in unlined vessels (25 NB and larger) shall be flanged to ANSI 125 lb class minimum except the polisher service vessels which shall be ANSI 300 lb class minimum, Flat face flanges shall be used throughout. Nozzle material shall be ASTM-106 Gr. B. Sch.80 pipe for all vessels. All flanged connections shall be supplied complete with matching counter flanges, nuts, bolts and full-face gaskets. All the pipeline in service vessels area where pressure may attain same as service vessel shall be designed for 300 lb class minimum.

7) Complete supporting system for the pipeline shall be designed, fabricated and supplied by the Bidder. Inside the building, the overhead portion of the pipeline may be supported from the building structures. In outdoors, the pipeline may run on steel posts. Crossing of the roads shall be on a pipe bridge with a clear height of at least 6.1 meters over the road surface. All the steel structures of the pipe bridge and the supporting posts along with all necessary hanger, clamps, connecting steel, fixing bolts, nuts, etc. shall be supplied and erected by the bidder.

8) Effluent from N-Pit shall be transferred to ash slurry pump house. Piping from Neutralisation Pit (N pit) of CPU regeneration area to ash Slurry Sump house shall be of 150 NB, MSRL construction and piping distance to ash Slurry pump house shall be 100 meters approx. Complete N-Pit waste transfer piping up to ash slurry pump house along with motorised isolation valves in each line shall be in bidder's scope. Other details have been attached elsewhere in the tender technical specification.

9) Routing of all pipe line shall be developed by the bidder and shall be finalized in coordination with the BHEL/Customer, based on the space available and the final layout.

10) Bidder to submit BBU during detailed engineering after approval of Basic documents. Incomplete BBU shall not be reviewed by BHEL.

11) Bidder to consider suitable arrangement i.e. Compressor, associated piping & instruments, isolation valves etc for the Service & Instrument air, in case the pressure provided at terminal point is not sufficient for intended application.

D. VALVES

All the valves in service vessel area and regeneration area as indicated in P&ID (bare minimum) and to meet the system requirement as mentioned elsewhere in the specification shall be in the bidder's scope of supply.

1) All valves shall be designed as per applicable AWWA/BID/BS or equivalent international standard /codes.

2) The isolation valves on the resin transfer line shall be of eccentric plug type/ball valve (full bore type) of stainless-steel construction (SS 316).

3) Emergency bypass control valve shall be of double flanged butterfly type. Isolation valves of wafer (lugged) type butterfly valves (resilient material seated, to ensure bubble-tight shut off) shall be provided on the upstream and downstream sides of the control valve. Other Butterfly valves in Service Vessel Area shall be 300lb class (minimum) and end connection shall be lugged wafer (min.).

4) All butterfly valves MOC used in service vessel area in condensate inlet line shall be (Body: WCB Disc:CF8M/SS316) and condensate outlet line will be (Body & Disc both: CF8M/SS316) minimum. Further the material of construction of Valves handling condensate in service vessel area shall be as per described elsewhere in the tender technical specification under "·Power Cycle & low-pressure piping system" of this Technical Specification.

5) Isolation Valves handling Acid, Alkali, Ammonia etc shall be diaphragm type in MSRL (Mild Steel Rubber lined) construction.

6) Isolation Valves handling DM water shall be Butterfly or gate or globe type and shall be of SS construction.

7) Non-return valves for DM Water & alkali shall be SS construction and for acid non-return valve shall be lined type or as per manufacturer's standard practice.

8) All valves in service vessels area where pressure may attain same as service vessel shall be designed for 300 lb class minimum. Bidder to select the class/ pressure rating of the valves of service vessel area to meet the system design requirement. In case it has been found that the class/ pressure rating as required is higher than 300lb class then the same shall be considered by bidder in their scope.

3.2 TERMINAL POINTS

A. CONDENSATE POLISHING PLANT - SERVICE VESSEL AREA

- Service vessel inlet – (OD 457.2 X 12.7 mm thick, ASTM A-106 Gr- B seamless) - Single piping connection near to service area.
- Service vessel outlet – (OD 457.2 X 12.7 mm thick, ASTM A-106 Gr-B seamless) - Single piping connection near to service area.
- Rinse water outlet- Rinse water outlet piping (OD 168.3 x 7.11 mm, ASTM A-106 Gr-B seamless) till condenser hot well nozzle for each unit is in the scope of bidder.
- 25 NB connection of Instrument air supply at 5 to 7 kg/cm2 (g) – At 5-meter distance from service vessel area.
- 25 NB connection of Service air supply at 5 to 7 kg/cm2 (g) – At 5-meter distance from service vessel area.
- Gland sealing water supply & analyser rack cooling water supply piping - Service water connection (40 NB) at 5-meter distance from service vessel area.

B. EXTERNAL REGENERATION AREA

- 25 NB Instrument air supply at 5 to 7 kg/cm2 (g) – at pipe rack terminal point C row grid 25-26
- 25 NB Service air supply at 5 to 7 kg/cm2 (g) - at pipe rack terminal point C row grid 25-26
- Service water (40 NB) - at pipe rack terminal point C row grid 25-26.

- Potable water (25 NB) - at pipe rack terminal point C row grid 25-26.
- DM water (100NB) for DM Tank filling – at pipe rack terminal point C row grid 25-26.
- DM resin transfer waste water recycle piping - at pipe rack terminal point C row grid 25-26.

3.3 DESIGN REQUIREMENTS FOR CPU

3.3.1 SALIENT DESIGN DATA

The design flow (through working vessels) for each condensate polishing plant shall be the corresponding condensate flow of TG unit at VWO (Valve wide open) condition at 3% cycle make-up.

A) NORMAL RUN (CONDENSATE POLISHER UNIT (SERVICE VESSEL))

The following dissolved solids concentration and conditions shall be used as a basis of design for the condensate polishing system. The ionic concentrations indicated below are as such.

PARAMETERS	INFLUENT	EFFLUENT
Ammonia, ppb	100	---
Total dissolved solids, ppb	100	20
Silica, ppb	30	5 (refer Note 1)
Iron, ppb	50	5
Sodium, ppb	10	2
Chloride, ppb	10	2
pH	8.0-8.5	--
Effluent conductivity after removal of ammonia and amines (micro mhos/cm) at 25 deg. C.	--	0.1 or less
Crud, ppb (mostly black oxide of Iron)	25	<5

Note 1: Silica value shall be 7 ppb in case the temperature of the condensate is 50degC & above.

Under the above operating and design flow through the polisher units, the un-ammoniated resins shall not reach “ammonia break-point” in less than 30 days (720 hrs) of continuous operation while maintaining the above effluent quality. Whenever specific conductivity starts increasing from 0.1 micro mhos/cm in the effluent, it is deemed that “ammonia break point” is reached. The effluent values indicated above shall be the maximum values.

In addition to the dissolved solids, the influent condensate shall also contain some quantities of suspended solids (crud) derived from the corrosion of water and steam carrying pipelines, turbine condenser, and steam side of the feed Water heater. Normally this concentration will not exceed about 25 ppb and the polisher beds shall provide sufficient filtering action to restrict the effluent crud content to less than 5 ppb & same shall be guaranteed.

B) START-UP CONDITION

START-UP CONDITION FOR CONDENSATE POLISHER UNIT (SERVICE VESSEL)

During start up conditions, quality of the influent may deteriorate to –

TDS, ppb	2000 maximum
Silica, ppb	150 maximum
Crud, ppb (mostly black oxide of Iron)	1000 maximum

For design purposes, average crud loading shall be considered as 500 ppb. Under such conditions, total crud content of the effluent shall not exceed 150 ppb.
Useful service run between two successive regenerations at design flow rate with above conditions should not be less than 50 hours.

C) CONDENSER LEAK CONDITION:

Under condenser tube-leakage condition, the plant shall be designed for 2000 ppb TDS in addition to the normal influent contaminants specified at cl. 1.3.1 (A) above.

PARAMETERS INFLUENT	PARAMETERS INFLUENT	PARAMETERS EFFLUENT
Total dissolved solids, ppb	2000 plus normal influent contaminants	Sodium ≤ 20ppb Silica ≤ 20ppb

The anion and cation load in influent design TDS shall be based on circulating water analysis.

Useful service run between two successive regenerations at design flow rate with above conditions should not be less than 50 hours.

3.3.3 The bed cross section shall be such that the velocity of condensate through it, shall not exceed 2 meters/min at the design flow rate. Internal diameter of the service vessels (excluding the rubber lining) of cylindrical type shall be selected meeting the above-mentioned velocity criteria. For vessels of spherical shape, where the bed cross section varies, the diameter (excluding the rubber lining) of the vessel shall be selected considering velocity not exceeding 1.75 meters/minute. The effective depth of the mixed resin bed in the condensate polisher service vessels shall not be less than 1100 mm.

3.3.2 At the design flow rate, the pressure drop across the polisher service vessels with clean resin bed shall not exceed 2.1 Kg/sq. cm. This pressure drop shall include losses due to entrance and exit nozzles, distributors, under drains, resins and the effluent resin traps. Maximum pressure drop under dirty conditions will be restricted to 3.5 kglsq.cm including the pressure drop across effluent resin traps.

3.3.3 Cation resins shall be regenerated by technical grade hydrochloric acid to IS:265 (concentration 30-33% by volume) and anion resins by sodium hydroxide, rayon grade to IS:252 available as 48% lye or as flakes. In no case, the regeneration levels cannot be lower than the values indicated below:

a) Cation resin: 125 kg of 100% HCl per cubic meter of resin

b) Anion resin: 160 kg of 100% NaOH per cubic meter of resin.

3.3.4 Rinse water outlet header of each condensate polishing unit shall be provided with a pressure reducing station with isolating valves, suitably designed to enable the water entry to the condenser hot well which is operating under vacuum. The pressure reducing station shall consist of either a pressure reducing valve from design pressure of service vessel to condenser vacuum or a combination of orifice plates to reduce pressure from design pressure of service vessel to 2 kg/cm2 and a pressure reducing valve from 2 kg/cm2 to condenser vacuum.

3.3.5 While calculating pump head, 10% margin (minimum) shall be considered of the value of friction losses. Pipe friction loss shall be calculated as per William-Hazen formula and “C” value to be adopted shall be as described elsewhere in this specification. Pump recirculation with a regulating valve shall be provided for all the pumping system.

3.3.6 All the design parameters listed above in this chapter under clause 2.3 i.e. the effluent quality, the

design flow, design service length, Chemical consumption for regeneration and Pressure drop across the resin bed in clean and dirty condition at rated design flow shall be guaranteed by the Bidder.

3.3.7 SYSTEM REQUIREMENT

- The regeneration process offered by the bidder, shall be of proven design and shall essentially be the same process by virtue of which the bidder is qualified and shall give resin-separation compatible with the desired effluent quality. Documentary evidence shall be submitted by the bidder to the Customer/BHEL to establish this requirement during detailed engineering stage as desired by BHEL/ Customer.

- The bidder shall include inert resin in the system if they feel that it helps in better resin separation.

- In case, after separation of resins, there are undesired contaminant resins, the bidder shall provide a system either to eliminate this cross contamination of resins or to nullify the detrimental effect of entrapped resins to the effluent quality.

3.3.8 Exchange Resins

a. The resins shall be in the form of spherical beads. Base of the ion-exchange resins shall be a copolymer of styrene and divinyl benzene forming a macroporous or macrorecticular structure. Other details are as follows:

Cation	:	Strong acid, with sulfonic acid functional group .
Anion	:	Strong base, with quaternary ammonium (type I) functional group.
Inert	:	Nonionic, compatible with the above resin types.

Cation resins shall be supplied in hydrogen form and Anion resins shall be supplied in hydroxide form.

b. Physical Properties:

i. Particle size: The resins shall be in the form of spherical beads. All resins, when wet screened with U.S. standard sieves, shall pass through a No.14 sieve not more than 2 percent shall be retained on a no. 16 sieve, and not more than 2 percent shall pass through a no. 40 sieve. The particle sizes and densities shall be carefully controlled to facilitate clear separation between the resins during regeneration process.

ii. Bead Strength: The average force required to fracture individual beads of cation resins in hydrogen form, anion resins in hydroxide form, and the inert resins, shall exceed 350 grams. Not more than 5 percent of the beads tested in each batch shall get fractured by forces less than 200 grams.

c. Chemical Properties:

i. Total wet volume ion-exchange capacities in equivalents/ litre shall not be less than the following:

Cation in hydrogen form: 1.7
Anion in hydroxide form: 1.0

ii. The resins shall contain a minimum of metallic and organic impurities consistent with good processing. The processing procedure will include rinsing the resins with demineralized

water before packing, so that further rinsing will not be required before use. Foreign objects in the resins shall constitute a basis for its rejection.

iii. Cation-Anion resin ratio shall be 1.5 parts cation to 1.0-part anion by volume. In case the process requires any non-ionic resin the same shall represent at least 10 percent of the bed volume, but not less than 15 cm of the bed depth in the resin separation tank of the external regeneration facility.

iv. Manufacturer: It is not the intent to pre-select any specific brand name for this application. Resins will be accepted by the Customer/BHEL strictly on their merits The resins shall be of reputed manufacturer with adequate past record of successful service for not less than 3 years in similar application.

v. Bidder shall submit all necessary data and information in this regard along with his proposal. Some of these possible resin terms are as follows:

1) Duolite C - 26 TR & A - 161 TR Rohm and Hass 252 C & TRA-900C.

2) Dowex MSC-1, MSA-1 C grades.

3) Inert resin - Duolite sec, Rohm & Hass 359 or Dow-buffer beads.

Above listing is by no means exhaustive, and shall not be construed to be a recommendation for their selection for this plant. Bidder shall fully satisfy himself as to the suitability of the resin system selected by him before offering it in his proposal.

d. The resin shall be suitable for the condensate temperature that may be achieved in all operating regimes of TG cycle. However, the anion resin shall be suitable for a minimum temperature of 60 Deg.C.

3.3.9 VESSELS FREE BOARD:

The pressure vessels in the common external regeneration facility shall be provided with adequate free boards over the top of the settled resins, to minimize resin loss during their use. Minimum free boards to be are as follows:

(i) Mixed resin Storage vessel : 50%

(ii) Resin separation vessel : 75%

(iii) Cation regeneration vessel : 75%

(iv) Anion regeneration vessel and activated carbon filter : 75%

However, if a vessel is used for more than one service, then the vessel design shall be based on the service which gives maximum freeboard.

3.3.10 PRESSURE VESSELS, ATMOSPHERIC TANKS & MISCELLANEOUS ITEMS

1) Design of all vertical cylindrical atmospheric storage tanks containing water, acid, alkali and other chemicals shall conform to IS: 803.

2) Design of all horizontal cylindrical atmospheric storage tank containing water, acid, alkali, and other chemicals shall conform to BS: 2594.

3) Unless otherwise mentioned design temperature of all pressure vessels and storage tanks shall be 10 deg.C higher than the maximum temperature that any part of the vessel/tank is

likely to attain during operation.

4) All vessels/tanks without inside rubber lining shall have a corrosion allowance of minimum 2 mm and mill allowance (minimum 0.3 mm) for shell and dished ends. Thinning allowance of 2 mm (minimum) shall be considered for dished end of torospherical type.

5) All the atmospheric tanks shall have sufficient free board above the ‘‘Level High /Normal Level’’ as the case may be. The overflow level shall be kept at least 20 cm or 10% of vessel height whichever is maximum above the ‘‘Level High /Normal Level’’ for all the tank. Further, a minimum 100 mm free board shall be provided above the top of overflow level to the top of tank.

6) All pressure vessels shall be designed and constructed in strict accordance with the ASME code Section VIII or acceptable equivalent international standard. Suitable mill tolerances shall be considered for determining the thickness of the shells and dished ends. A minimum thinning allowance of 2 mm shall be considered for the dished ends of torospherical type.

7) Pressure vessel ends shall be of dished design and constructed by forging, pressing or spinning process. Spherical vessels for CPU service vessels are acceptable. Conical or flat ends shall not be accepted. All the atmospheric vessels shall be at least 6 mm thickness.

8) All pressure vessels shall be fabricated from carbon steel plates to SA-515 / 516 Gr. 70 and lined internally. The lining shall be of rubber having a hardness of 65 plus/minus 5 shore -A meeting the requirements of IS:4682, Part-I. The lining shall be applied in three layers, resulting in a total thickness of not less than 4.5 mm anywhere on the internal surfaces of the vessels. The lining shall extend over the full face of all flanged connections and shall have a minimum thickness of 3 mm in all such external areas.

9) Vessel internals shall meet the following requirements:

Inlet water and regenerant distributor: - Hub and internals diffuser splash plate or header and perforated laterals. Material of construction shall be SS-316 except for acid service which will be of Hastealloy-B.

Under drains: Same as above with screened laterals with internal perforated pipes and rubber lined flat bottom. For resin separation/ regeneration/ mixed resin vessels, it may have fully screened bottom (NEVA - clog type with pora septanurese screen, fully supported by subway grid or equal).

All internal fasteners shall be of SS-316 and heavy-duty locknuts shall be used throughout.

10) Design temperature of service vessel and their internals/appurtenances shall take care of all operating regimes including HP-LP bypass operation and minimum 70 Deg.C.

11) **Resin Traps:** Outlet of each condensate polisher vessel, activated carbon filter and waste effluent header of the common regeneration shall be provided with a resin trap. Pressure drop at design flow through a clean resin trap shall not exceed 0.35 kg/sq.cm.

Resin trap shall be of rubber lined steel construction and internals (cord & screen) shall be of JOHNSON SCREENS IRELAND or equivalent (SS-316) construction. Resin traps of process effluent line shall have screen opening not exceeding 120 percent of associated process vessel under drain screen opening. Other resin traps shall have screen opening of 60 mesh. In place manual back flushing shall be provided for all resin traps.

12) **Carbon Trap (for ACF):** Outlet of each Activated Carbon filler on Carbon trap (media trap) shall be provided by bidder as per manufacturer standard.

13) **Hot Water Tank (for alkali):**

For heating of alkali diluent water, 2x50% electrical heating coil in a tank of mild steel rubber lined construction shall be provided. The capacity of tank shall be minimum 20% higher than the maximum water demand. This tank shall be provided with burn out protection, pressure relief valve, level transmitters/switches, temperature indicator etc. The heater shall be controlled by the temperature transmitter/ switches provided on the tank. The heaters shall be sized for heating the water from a temperature of 15°C to 50°C at the outlet. The water shall be heated to the required temperature within 5 hours.

14) **Activated Carbon Filter (For Alkali)**

Rated flow of the filter shall not be less than the design capacity of the alkali transfer-cum recirculation pump, and the maximum velocity through the filter for this flow shall not exceed 12 meters/hour. Depth of the filter material shall not be less than 1 meter.

The filtering medium shall be granulated activated carbon, meeting following minimum requirements.

Total Surface area : Not less than 850 sq.m/gm.

Bulk density : Not Jess than 400 kg/cu.m.

Iodine number : 850 minimum

Uniformity coefficient : 1.9 or less

Abrasion number : 70 minimum

Ash : 8% maximum

Mean particle diameter shall be about 1.5-1.7 mm with following size distribution.

On 20 mesh : less than 3%

Through 40 mesh : less than 10%

Through 50 mesh :Less than 1%

The filter shall be provided with all necessary valves and connections for manual backwashing and rinsing with demineralized water, Rate set valves shall be provided with adjustable limit stops for setting backwash and rinse rates.

3.3.11 Operating platforms, permanent ladders (not rugs), supports and other structural works for each vessel, tanks, valves etc. to facilitate accessibility for operation and maintenance for all the condensate polisher mixed beds, regeneration vessels, alkali and acid measuring tanks & preparation tanks and other equipment's etc. is also in bidder's scope.

3.3.12 The Condensate Polisher Service vessels, blowers etc. will be located indoor near corresponding units. Regeneration system equipment shall be kept under shed and one-meter height parapet wall shall be provided around this shed. Effluent re-circulation/disposal pumps, Bulk chemical storage tanks, unloading transfer pumps and DM water storage tanks for regeneration system etc. shall be kept in open area.

3.3.12 MCC of CPU shall be in customer scope shall be located outside CPU regeneration area.

3.3.13 Space available for CPU service Vessels area & CPU Regeneration area (Vide ref. Dwg. No. PE-DG- 390-100-M003 & Customer Plot Plan Dwg. No. 2115-209-001-PVM-F-003) are attached in this specification. Bidder to accommodate their equipment within the space provided. The location of DM resin transfer waste water tank shall be in CPU regeneration area.

3.3.14 For Skid Mounted dosing equipment. all the equipment, piping etc. shall be assembled on two (2) structural steel skids one (1) for acid and one (1) for alkali dosing equipment. The bidder shall supply all anchor bolts, foundation plates, sleeves, nuts, inserts etc. to be embedded in concrete for these equipment skids. The length of the foundation bolts shall be liberally sized to reach below the reinforcement level. Each equipment skid shall be provided with suitable lifting lugs, eye bolts etc. to facilitate erection and maintenance.

3.3.15 In order to facilitate erection at site chemical dosing preparation equipment shall be mounted on structural steel skids and assembled (including piping) at the manufacturer's shop, to the maximum extent possible, prior to shipping. The number of mechanical connections shall be minimised by the use of pipe headers wherever possible. Alkali solution preparation, alkali dosing and acid dosing system are a recommended listing of the main equipment skids to be furnished under this package. The bidder may also supply and install this equipment (Alkali solution preparation skid (1no.), Alkali dosing skid (1 no.) & Acid dosing skid(1no.)) independently instead of assembling the skids.

3.4 CONTROL & OPERATION

a) It is not the intent to specify here the complete details of the control system. Basic type of controls required has been specified below. The bidder shall submit the complete detail of the system offered by him like the extent of automation offered, operation of the complete system, logic/flow diagrams, type and details of the presentation of information, the type of mimic, hardware details etc. along with detailed circuit descriptions

b) The control & operation of various systems described below is indicative only and the actual control & operation philosophy shall be finalized with during detailed engineering based on which the control logic is to be built in DDCMIS.

c) Complete system operation shall be through mimics on OWS/LVS. The sequence startup mode (Automatic, semi-automatic and operator guided mode) shall be provided.

d) It shall be possible to operate in Auto/Semi-Auto /Manual mode. In 'Auto' mode, once the sequence has been initiated, it shall proceed from step to step automatically. In 'Semi-Auto' mode each step shall be performed only after initiation by the operator. In 'Manual' mode complete operation shall be by the operator by operation of the Control switches on the panel.

e) 'Close-Auto-Open' control facility shall be provided from OWS/control panel for solenoid valves. In 'Auto' position, the valves shall receive close / open command from the Control system.

f) 'Stop-Auto-Start' Control facility shall be provided from OWS / control panel for the various drives. In 'Auto' position, the drives shall receive stop/start command from the Control system.

g) On control system failure, it shall be possible to operate the valves by means of manual operator of solenoid valves too.

h) The control system shall link the various steps such as closing/opening of different valves, starting/stopping of various pumps etc. which form a sequence. The logic system shall adhere to the correct sequence of operation and predetermined time intervals. The system shall have interlocks so that, criteria necessary for each step are complete prior to proceeding to the next step.

i) It shall be possible to switch mode of operation from one to the other at any moment and the operation shall proceed on the newly selected mode from that time.

j) For steps, which require frequent time adjustment, it shall be possible to change the time setting from the front of the panel. For all other steps it shall be possible to adjust the time setting from

inside the panel.

k) For all sequences, the current step number, set time of the step, elapsed time of the step and the total elapsed time of the sequence shall be indicated in the OWS/control panel.

l) A mimic shall be provided for the CPP scheme and Regeneration system scheme shall be provided. Status of various vessels, drives, valves etc. shall be indicated by on the mimic.

m) The system shall incorporate the necessary safety features. During automatic sequential operation, if any pre-requisite criterion is not fulfilled or missing for a pre-determined time interval, the steps should not proceed further, and Alarm shall be provided. Missing criteria, sequence, which is under hold up etc., shall be displayed.

n) The safety system for any sequence/step shall check the opening of the required valves and closure of the remaining valves of the plant to avoid mal-operation.

o) Wherever standby equipment is provided, it shall be possible to select each of the drive on 'standby' duty.

p) The detailed logic for the sequence and for each of the drive shall be subject to the BHEL/Customer's approval.

q) Start, progress and stop of each of the sequence shall be annunciated.

r) The status of vessels of Condensate Polishing Plants shall be available in all the CPP panels of all TG units and as well as in the regeneration plant control panel. Similarly, the status of regeneration plant status shall be available in the panels of Condensate Polishing Plants of all TG units.

s) Details of control system specification and configuration details shall be elaborated elsewhere in the tender technical specification.

3.4.1 Control & Operation of the Condensate Polishing Unit

a) The regeneration system control system shall be linked with Balance of Plant control system for data transfer through a two-way link for both information and control.

b) It shall be possible to select each of the CPU vessel for any of the following operations or mode:

(1) Standby (Applicable for where spare service vessel (s) are provided)

(2) Service

(3) Isolation from service.

(4) Exhausted Resin Transfer from CPU vessel to Regeneration plant.

(5) Regenerated Resin Transfer from Regeneration plant to CPU vessel

(6) Rinse mode.

Each mode or operation is described as below:

Standby Mode:

(1) Among the vessels, any one of the vessels may be selected in this mode.

(2) Under this mode, the vessel, which was regenerated in previous cycle and filled with regenerated resin, shall be kept ready for next Service cycle.

(3) The selection of any vessel for Standby mode shall be initiated by operator and there shall be indication about the details such as "Condition of the resin; Whether it is filled with regenerated resin or exhausted resin, whether the standby vessel has undergone rinse cycle or not, date and time of receipt of regenerated resin and completion of rinse cycle etc.

Service mode:

(1) Service flow rate for each polishing vessel shall be monitored. During periods of low condensate flow the operator may select to remove one of the vessels from service by a manually initiated automatic sequence.

(2) High differential pressure across the influent and effluent headers will cause an alarm and bypass system shall be initiated as described elsewhere in this section.

(3) By observing the individual vessel flow indicators, or conductivity at vessel outlet the operator can determine which vessel is contributing most to the pressure drop and is in need of resin cleaning.

(4) Cation conductivity indicators shall monitor the polishing system influent and effluent streams as well as the discharge of each service vessel. A high influent conductivity alarm will alert the plant operator that a problem condition such as air or condenser cooling water leakage has occurred. This conductivity analyzer shall also provide contacts for an alarm at the power station main control room. A high effluent header or service vessel conductivity alarm will alert the operator to the need for regeneration of a polishing vessel.

(5) When the vessel under Service mode is ready for regeneration, the operator shall change the same into "Isolation mode" in the panel. Subsequently the "Standby vessel" shall be selected for "Service mode" from the OWS/control panel. The selection shall follow, required sequences such as pressurization of the vessel, checking of the effluent quality and putting the vessel in service on satisfactory effluent quality.

Isolation from Service:

Normally "Service Vessel" once exhausted shall be isolated from service till the "Resin Transfer" operation is initiated. In addition, provision to be kept for isolation of one or all the vessels from service if required by operator from the panel.

Resin Transfer from CPU vessel to Regeneration plant:

(1) When a vessel in a service mode needs regeneration as stated above, the resin transfer from the particular vessel to the regeneration plant shall be initiated from the panel of the condensate polishing plant.

(2) The transfer of resin from the service vessel shall include operations such as isolation of the service vessel, hydraulic transfer of the resin to the external regeneration system (resin separation vessel) and the complete drain down of the service vessel.

(3) The sequence of "Resin Transfer" operation shall be initiated from the Control system in panel of CPP and shall be controlled in the regeneration Panel.

(4) The completion of the operation shall be exhibited in the panel.

Resin Transfer from Regeneration Plant to CPU Vessel:

(1) When the regeneration is completed in the regeneration plant, the resin shall be transferred to the empty vessel of Condensate Polishing plant.

(2) This shall be initiated by the operator from the control panel of condensate polishing plant of the unit from which resin was transferred to the regeneration plant in previous service. Provision shall also be kept to transfer the regenerated resin to any of the empty vessel of the CPP of any of the TG unit if required.

(3) The transfer of resin from the regeneration plant shall include operations such as hydraulic transfer of the resin and the complete drain down of the water.

(4) The sequence shall be initiated from the panel of CPP and shall be controlled in the regeneration Control Panel.

(5) The completion of resin transfer operation shall be exhibited in both the Control panels.

Rinse mode:

(1) After transfer of regenerated resin from the regeneration plant to the empty condensate polisher vessel, this rinse cycle shall be initiated from the Control system of the respective unit so that the vessel may be rinsed and kept ready for next service cycle.

(2) The rinse mode shall be a manually initiated fully automatic sequence. This sequence shall include the rinse down step using condensate at a suitable rate until the unit effluent quality is acceptable for boiler feed water. Prior to rinsing, the resin shall be given air scrub by means of air blowers provided near the CPP.

(3) The effluent quality shall be determined by conductivity monitoring of the rinse water outlet, which is returned to the condenser hotwell for recycle.

(4) Cation conductivity values shall be monitored and interlocked to prevent advancing of the automatic sequence until the rinse down is complete.

(5) The completion of rinse operation shall be annunciated in the panel so that the rinsed vessel may be selected for “Standby mode” or “Service mode” as per requirement.

6) The differential pressure (DP) across the inlet and outlet headers of CPU services vessels shall be measured and the bypass control valve will also modulate as per the DP. The bypass system shall also be actuated upon high condensate temperature.

3.4.2 External Regeneration Control System

a) A manually initiated automatic sequence for physical cleaning and chemical regeneration of the resin shall be provided. Control for chemical dosing system and alkali preparation facility shall also be provided in it.

b) Physical cleaning of the resin shall consist of three steps, drain to level, air scrub and rinse. The air scrub and rinse steps are of short duration, approximately 1 and 2 to 3 minutes respective time. However, the program will allow the operator to increase or decrease the number of times the sequence is repeated to meet the requirements existing at that time.

c) The chemical regeneration is a many step sequence. This will include hydraulic reclassification of the resins and the transfer of the resins to the respective regeneration vessels. The layer of inert,

intermediate density resin may be inserted to achieve a better separation of the cation and anion resins, improve resin regeneration, and reduce leakage. The separated resins are then back washed, regenerated with hydrochloric acid and sodium hydroxide solutions respectively and then rinsed. Following the rinse step the resins shall be given an air scrub followed by a good backwash. The resin is then transferred back to the resin separation vessel and the resins are air mixed. The mixed resins after regeneration are given a final rinse with the discharge conductivity being monitored. The quality of this discharge will determine if the regeneration has been effective. If the quality is not satisfactory the regeneration sequence must be repeated. If satisfactory, the mixed resin is transferred to the resin storage vessel.

d) A resin mixing and final rinse may occur in the resin storage vessel provided that the system design will permit direct return of the resins to the resin separation vessel in the event of an unsatisfactory regeneration.

e) Upon satisfactory completion of regeneration, the status shall be annunciated audio-visually in the regeneration system OWS/control panel and as well as in the Balance of Plant Control System. This repeat annunciation in the CPP OWS/panel shall facilitate the operator to initiate resin transfer operation from the regeneration plant to the desired vessel of the Unit in which the service vessel is empty.

f) Upon resin transfer operation from regeneration plant as described by the operator from the Control System, the regeneration plant shall be ready to receive next batch of exhausted resin from any of the CPP. The status of regeneration plant (Whether ready to receive resin for regeneration or under regeneration etc.) shall be available in the Control System of CPP.

g) Demineralized water shall be used throughout the regeneration process for backwashing, diluting the regenerant, rinsing and resin transfer.

h) A conical bottom hopper having a water ejector will be used for resin make-up.

i) At any time only one of the sequences shall be in progress.

3.4.3 Interlocks

- All interlocks for safe operation of the plant shall be provided. They shall specifically include the following as minimum requirement.
- Service vessels can be back in service, only after they have been pressurized.
- Service vessels can be taken up for resin transfer only after they have been completely isolated from the condensate system and depressurized.
- Resin can be transferred to and from only one service vessel at a time.
- Resin transfer between the service and the regeneration skids shall be permitted only when the receiving vessel is initially empty.
- Regeneration sequence can commence, only when the level in the waste neutralization pit is low enough to receive the entire waste quantity of waste water from the regeneration operation.
- Wherever possible, completion of all timed steps in the regeneration and resin transfer process shall be physically verified by effluent conductivity etc. as applicable. The automatic sequence shall be prevented from advancing to next step, till these required physical conditions are achieved, and at the same time this delay shall be annunciated in the control panel, to draw the attention of the operator. The automatic sequence of operations shall be interruptive at any time by the operator and he shall be able to take over the control to manual from that step onwards. Further operator should be able to override sequence, if required. It shall be possible for the operator to extend the timing of a particular step by isolating the timer for the duration. The timer will restart once the operator puts back the system on ‘auto’ and the other steps will then follow as programmed.
- The regeneration sequence shall be prevented from advancing further in the event of tripping of a running motor or other fault condition, which do not permit the various desired parameter of this step to

be achieved. A manual override for this shall also be provided.

- Annunciation logic shall be carefully designed so that the alarms are activated only under abnormal conditions. As for example, low flow of diluent water is only relevant when the chemical dosing is in progress. All other times, when no diluent water flow is required, this annunciation should be blocked. In general, Normal and trouble-free operation of the plant shall not activate any of these alarms.
- Adequate diluent water flow shall be established before starting of the ejectors/ dosing pumps for acid and alkali.
- The immersion heater in the hot water tank can be put on only when there is adequate water level in the tank.
- CPU service vessel inlet & isolate valves will close automatically in the event of tripping of condensate extraction pump.

3.4.4 PAINTING FOR CPU PACKAGE

1) All the Piping, Valves and Equipments of this system shall be protected against external corrosion by providing suitable painting.

2) The surfaces of stainless steel, Gunmetal, brass, bronze and non-metallic components shall not be applied with any painting.

3) The condensate pipelines and valves near the condensate polisher vessels shall be painted as specified under Power Cycle Piping chapter included elsewhere in the tender technical specification.

4) All the condensate polisher vessels and other equipments, piping, valves and equipments in the regeneration area shall be painted as follows:

.

a. For all the steel surfaces inside the building (indoor installation), a coat of chlorinated rubber-based zinc phosphate primer of minimum DFT of 50 microns followed up with undercoat of chlorinated rubber paint of minimum DFT of 50 microns shall be applied. Then, intermediate coat consisting of one coat of chlorinated rubber-based paint pigmented with Titanium di-oxide with minimum DFT of 50 microns and topcoat consisting of two coats of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 100 microns shall be provided. Total DFT of paint system shall not be less than 200 microns.

b. For all the steel surfaces exposed to atmosphere (outdoor installation), one primer coat of epoxy resin-based zinc phosphate primer of having a minimum DFT of 100 microns followed up with undercoat of epoxy resin-based paint pigmented with Titanium Oxide with minimum DFT of 100 microns shalt be applied. Thereafter top coat shall be applied consisting of one coat of epoxy paint suitably pigmented of approved shade with glossy finish and DFT of 75 microns. Additionally, finishing coat of polyurethane of minimum DFT of 25 microns shall be provided over the topcoat. The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied. Total OFT shall not be less than 300 microns.

c. Specification for the application of Epoxy coating for internal protection of DM tank shall be as follows:
Primer hardener: One coat of unmodified epoxy resin along with polymide.
Paint hardener: Two (2) coats unmodified epoxy resin along with Aromatic adduct.

Total thickness of primer and paint should not be less than 400 microns.

4. CHEMICAL (HYDRAZINE, AMMONIA & NaOH) DOSING SYSTEM (CDS) (SKID BASED) (TYPE-B SG PACKAGES)

4.1 SCOPE OF SUPPLY

Chemical Dosing System, complete with all accessories for the total scope as specified hereinafter for the following systems: -

a) HYDRAZINE DOSING SYSTEM - 2 Nos. Skids.
b) AMMONIA DOSING SYSTEM - 2 Nos. Skids.
c) NaOH DOSING SYSTEM - 3 Nos. Skids.

DESIGN CRITERIA

The following drawings/ data sheets are enclosed for the reference:

a) P&ID for Hydrazine dosing system (PE-DG-528-154-W001)
b) P&ID for Ammonia dosing system (PE-DG-528-154-W001).
c) P&ID for NaOH dosing system (PE-DG-528-154-W001).
d) DATA SHEET – A for all above systems.

The LP dosing consists of Hydrazine dosing system & Ammonia dosing system for boiler feed water and NaOH dosing skids for ECW system. The details of each dosing system are given below:

4.2 HYDRAZINE DOSING SYSTEM: (TOTAL NO. OF SKIDS= 2 NO.)
(Refer Drawing no. PE-DG-528-154-W001, SHEET 01 OF 03)

One skid of Hydrazine Dosing System shall consist of the following:

a) One number Hydrazine Measuring Tank.
b) One number Hydrazine Mixing cum storage tank.
c) Two (2 X 100%) Hydrazine Dosing Pumps.
d) One Hand Pump with flexible hose.
e) One no. safety shower and eye wash facility
f) Associated Piping, valves, fitting as indicated in the P&ID of Hydrazine Dosing System and data sheet-A enclosed and as required to make the system complete.
g) Commissioning spares as per list
h) Mandatory spares as per list

CONTROL PHILOSPOHY FOR HYDRAZINE DOSING SYSTEM

The control of all dosing systems shall be realized in DDCMIS including ON/OFF command of the individual pumps and stirrers. All controls, fault indicators/ alarms, interlocks, logics shall be implemented in DDCMIS. Separate local panel shall be provided for hydrazine dosing system.

The starter of all the motors shall be clubbed with main plant MCC. Power to all pumps, agitators etc. shall be fed from MCC. DDCMIS commands shall extend to MCC.

A local panel comprising of ‘START’ push button, 'STOP' push button along with ‘ON/OFF/TRIP’ indication, local/ remote indication, stroke position indicator, raise/ lower push button for stroke position and local annunciation shall be provided for local operation. The 'START' push button and ‘STOP’ push button shall be routed to DDCMIS.

The ON/OFF operation of all motorized stirrers and pumps shall also be provided in DDCMIS with local ON, OFF facility.

The auto stroke controllers of each pump shall be mounted on the local panel of respective dosing skid. The stroke position & adjustment will be done from DDCMIS and the stroke controller shall be suitable for accepting 4-20 mA DC signals. The pumps shall be provided with 24 V DC, 2- wire LVDT Type Position feedback transmitter to generate 4-20 mA DC signals to indicate stroke position in DDCMIS & Local panel.

The Local/ Remote selection switch (soft) shall be provided in DDCMIS and its indication shall be provided in LCP. LCP shall be located on the dosing skid.

INDICATION

1. Following interlocks shall be provided at low-low Level in the mixing cum storage tank:
   i) Running Dosing pump shall be tripped.
   ii) Stirrer motor of the respective tank shall be tripped.

2. Following conditions to be ensured before starting a stirrer:
   i) Level in the tank adequate.
   ii) MCC not disturbed.

3. Following conditions to be ensured before starting a pump:

   i) Level in the tank adequate.
   ii) MCC not disturbed.
   iii) Duplex strainer- not choked

4. Following shall be provided on LCP:

   i) ON/ OFF/ Fault- Lamp Indications for all drives (pumps & agitator).
   ii) Operation ‘Local selected’ / operation ‘Remote selected’- Lamp Indication, common for all drives.
   iii) Pump- Start/ Stop & Agitator-Start/ Stop- Push Buttons.
   iv) Auto stoke controller.
   v) Stoke position indicator (may be a part of controller).
   vi) Local LED based annunciation driven by DDCMIS.

5. Following fault indications with alarm annunciations shall be provided on LCP:

   i) Low level in the mixing cum storage tank.
   ii) Low-low level in the mixing cum storage tank
   iii) High level in the measuring tank
   iv) High level in the mixing cum storage tank
   v) High-high level in mixing cum storage tank
   vi) High pressure at pump discharge header
   vii) Low pressure at pump discharge header
   viii) Strainer choked
   ix) Dosing pump-1-tripped
   x) Dosing pump-2-tripped
   xi) Stirrer motor-tripped

SIGNAL EXCHANGE

6. Following signals shall be wired from DDCMIS to LCP. These shall be 24V DC powered signals.

(PF contacts are not used to avoid the higher voltage LCP power supply reaching DDCMIS while contact interrogation).

i) Operation local selected.
ii) Operation remote selected.
iii) Pump- 1/2 & stirrer (ON/OFF/FAULT).
iv) Process conditions (as per clause 5 above).
v) Pump- 1/2 stroke length demand signal (4-20 mA).

7. Following signals shall be wired from LCP to DDCMIS. Binary signals shall be P.F. contacts.
   i) All field signals.
   ii) START & STOP–PB commands for all drives (pumps & agitator).
   iii) Pump- 1/2 stroke length feedback signal (4-20 mA).

8. Signal Exchange between DDCMIS & MCC:

   i) START & STOP command from DDCMIS to MCC.
   ii) ON, OFF & MCC Disturbed feedback from MCC to DDCMIS.

9. Signal Exchange between LCP & MCC shall be
   i) EMERGENCY STOP-PB for all drives (pumps & agitators) shall also be wired directly to MCC.

All the field instruments i.e. level transmitter, differential pressure transmitter, pressure transmitter etc. & stroke actuator shall be terminated at local panel by the vendor, for taking further to DDCMIS by BHEL.

Further, Control & instrumentation shall be as per P&ID of Hydrazine Dosing System, Data Sheet-A.

4.3 AMMONIA DOSING SYSTEM: (TOTAL NO. OF SKIDS= 2 NO.)

(Refer Drawing no. PE-DG-528-154-W001, SHEET 02 OF 03)

One skid of Ammonia Dosing System shall consist of the following:

i) One number Ammonia Measuring Tank.
j) One number Ammonia Mixing cum storage tank.
k) Two (2 X 100%) Ammonia Dosing Pumps.
l) One Hand Pump with flexible hose.
m) One no. safety shower and eye wash facility
n) Associated Piping, valves, fitting as indicated in the P&ID of Ammonia Dosing System and data sheet-A enclosed and as required to make the system complete.
o) Commissioning spares as per list
p) Mandatory spares as per list

CONTROL PHILOSPOHY FOR AMMONIA DOSING SYSTEM

The control of all dosing systems shall be realized in DDCMIS including ON/OFF command of the individual pumps and stirrers. All controls, fault indicators/ alarms, interlocks, logics shall be implemented in DDCMIS. Separate local panel shall be provided for ammonia dosing system.

The starter of all the motors shall be clubbed with main plant MCC. Power to all pumps, agitators etc. shall be fed from MCC. DDCMIS commands shall extend to MCC.

A local panel comprising of ‘START’ push button, 'STOP' push button along with ‘ON/OFF/TRIP’ indication, local/ remote indication, stroke position indicator, raise/ lower push button for stroke

position and local annunciation shall be provided for local operation. The 'START' push button and 'STOP' push button shall be routed to DDCMIS.

The ON/OFF operation of all motorized stirrers and pumps shall also be provided in DDCMIS with local ON, OFF facility.

The auto stroke controllers of each pump shall be mounted on the local panel of respective dosing skid. The stroke position & adjustment will be done from DDCMIS and the stroke controller shall be suitable for accepting 4-20 mA DC signals. The pumps shall be provided with 24 V DC, 2- wire LVDT Type Position feedback transmitter to generate 4-20 mA DC signals to indicate stroke position in DDCMIS & Local panel.

The Local/ Remote selection switch (soft) shall be provided in DDCMIS and its indication shall be provided in LCP. LCP shall be located on the dosing skid.

INDICATION

1. Following interlocks shall be provided at low-low Level in the mixing cum storage tank:
   i) Running Dosing pump shall be tripped.
   ii) Stirrer motor of the respective tank shall be tripped.

2. Following conditions to be ensured before starting a stirrer:
   i) Level in the tank adequate.
   ii) MCC not disturbed.

3. Following conditions to be ensured before starting a pump:

   i) Level in the tank adequate.
   ii) MCC not disturbed.
   iii) Duplex strainer- not choked

4. Following shall be provided on LCP:

   i) ON/ OFF/ Fault- Lamp Indications for all drives (pumps & agitator).
   ii) Operation 'Local selected' / operation 'Remote selected'- Lamp Indication, common for all drives.
   iii) Pump- Start/ Stop & Agitator-Start/ Stop- Push Buttons.
   iv) Auto stoke controller.
   v) Stoke position indicator (may be a part of controller).
   vi) Local LED based annunciation driven by DDCMIS.

5. Following fault indications with alarm annunciations shall be provided on LCP:

   i) Low level in the mixing cum storage tank.
   ii) Low-low level in the mixing cum storage tank
   iii) High level in the measuring tank
   iv) High level in the mixing cum storage tank
   v) High-high level in mixing cum storage tank
   vi) High pressure at pump discharge header
   vii) Low pressure at pump discharge header
   viii) Strainer choked
   ix) Dosing pump-1-tripped
   x) Dosing pump-2-tripped
   xi) Stirrer motor-tripped

SIGNAL EXCHANGE

6. Following signals shall be wired from DDCMIS to LCP. These shall be 24V DC powered signals. (PF contacts are not used to avoid the higher voltage LCP power supply reaching DDCMIS while contact interrogation).

   i) Operation local selected.
   ii) Operation remote selected.
   iii) Pump- 1/2 & stirrer (ON/OFF/FAULT).
   iv) Process conditions (as per clause 5 above).
   v) Pump- 1/2 stroke length demand signal (4-20 mA).

7. Following signals shall be wired from LCP to DDCMIS. Binary signals shall be P.F. contacts.
   i) All field signals.
   ii) START & STOP–PB commands for all drives (pumps & agitator).
   iii) Pump- 1/2 stroke length feedback signal (4-20 mA).

8. Signal Exchange between DDCMIS & MCC:

   i) START & STOP command from DDCMIS to MCC.
   ii) ON, OFF & MCC Disturbed feedback from MCC to DDCMIS.

9. Signal Exchange between LCP & MCC shall be
   i) EMERGENCY STOP-PB for all drives (pumps & agitators) shall also be wired directly to MCC.

All the field instruments i.e. level transmitter, differential pressure transmitter, pressure transmitter etc. & stroke actuator shall be terminated at local panel by the vendor, for taking further to DDCMIS by BHEL.

Further, Control & instrumentation shall be as per P&ID of Ammonia Dosing System, Data Sheet-A.

4.4 NaOH DOSING SYSTEM FOR ECW SYSTEM: (TOTAL NO. OF SKID = 3 NOS)

(Refer Drawing. No. PE-DG-528-154-W001, SHEET 03 OF 03)

One skid of NaOH Dosing System consists of the following:

a) One number NaOH Mixing cum storage tank.
b) Two (2 X 100%) NaOH Dosing Pumps.
c) Associated Piping, valves, fitting as indicated in the P&ID of NaOH dosing system and data sheet-A enclosed and as required to make the system complete.
d) Commissioning spares as per list
e) Mandatory spares as per list

CONTROL PHILOSPOHY FOR NaOH DOSING SYSTEM

The control of all dosing systems shall be realized in DDCMIS including ON/OFF command of the individual pumps and stirrers. All controls, fault indicators/alarms, interlocks, logics shall be implemented in DDCMIS. Separate local panel shall be provided for each of the above said system.

The starter of all the motors shall be clubbed with main plant MCC. Power to all pumps, agitators etc. shall be fed from MCC. DDCMIS commands shall extend to MCC.

A local panel comprising of ‘START’ push button, 'STOP' push button along with ‘ON/OFF/TRIP’ indication, local/ remote indication, stroke position indicator, raise/ lower push button for stroke

position and local annunciation shall be provided for local operation. The 'START' push button and 'STOP' push button shall be routed to DDCMIS.

The ON/OFF operation of all motorized stirrers and pumps shall also be provided in DDCMIS with local ON, OFF facility.

The auto stroke controllers (I/E converter) of each pump shall be mounted on the local panel of respective dosing skid. The stroke position & adjustment will be done from DDCMIS and the stroke controller (I/E converter) shall be suitable for accepting 4-20 mA DC signals. The pumps shall be provided with 24 V DC, 2- wire LVDT Type Position feedback transmitter to generate 4-20 mA DC signals to indicate stroke position in DDCMIS & Local panel.

The Local/ Remote selection switch (soft) shall be provided in DDCMIS and its indication shall be provided in LCP. LCP shall be located on the dosing skid.

INDICATION

1. Following interlocks shall be provided at low-low Level in the mixing cum storage tank:
   i) Running Dosing pump shall be tripped.
   ii) Stirrer motor of the respective tank shall be tripped.

2. Following conditions to be ensured before starting a stirrer:

   i) Level in the tank adequate.
   ii) MCC not disturbed

3. Following conditions to be ensured before starting a pump:

   i) Level in the tank adequate.
   ii) MCC not disturbed.
   iii) Duplex strainer- not choked

4. Following shall be provided on LCP:

   i) ON/ OFF/ Fault- Lamp Indications for all drives (pumps & agitator)
   ii) Operation 'Local selected' / operation 'Remote selected'- Lamp Indication, common for all drives.
   iii) Pump- Start/ Stop & Agitator-Start/ Stop –Push Buttons
   iv) Auto stoke controller
   v) Stoke position indicator (may be a part of controller)
   vi) Local LED based annunciation driven by DDCMIS.

5. Following fault indications with alarm annunciations shall be provided on LCP:

   i) Low level in the mixing cum storage tank.
   ii) Low-low level in the mixing cum storage tank
   iii) High level in the mixing cum storage tank
   iv) High-high level in mixing cum storage tank
   v) High pressure at pump discharge header
   vi) Low pressure at pump discharge header
   vii) Strainer choked
   viii) Dosing pump-1--tripped
   ix) Dosing pump-2--tripped
   x) Stirrer motor—tripped

SIGNAL EXCHANGE

6. Following signals shall be wired from DDCMIS to LCP. These shall be 24V DC powered signals. (PF contacts are not used to avoid the higher voltage LCP power supply reaching DDCMIS while contact interrogation).

   i) Operation local selected.
   ii) Operation remote selected.
   iii) Pump- 1/2 & stirrer (ON/OFF/FAULT).
   iv) Process conditions (as per clause 5 above).
   v) Pump- 1/2 stroke length demand signal (4-20 mA).

7. Following signals shall be wired from LCP to DDCMIS. Binary signals shall be P.F. contacts.

   i) All field signals.
   ii) START & STOP–PB commands for all drives (pumps & agitator).
   iii) Pump- 1/2 stroke length feedback signal (4-20 mA).

8. Signal Exchange between DDCMIS & MCC:
   i) START & STOP command from DDCMIS to MCC.
   ii) ON, OFF, MCC Disturbed feedback from MCC to DDCMIS.

9. Signal Exchange between LCP & MCC shall be

   i) EMERGENCY STOP-PB for all drives (pumps & agitators) shall also be wired directly to MCC.

   All the field instruments i.e. level transmitter, differential pressure transmitter, pressure transmitter etc. & stroke actuator shall be terminated at local panel by the vendor, for taking further to DDCMIS by BHEL.

   Further, Control & instrumentation shall be as per P&ID of NaOH Dosing System, Data Sheet-A.

4.5 SPECIAL TOOLS AND TACKLES

a) One set of all special tools shall be furnished and shipped with each piece of equipment for dismantling, maintenance, adjustment, and calibration of the equipment. The tools shall be shipped in separate heavily constructed wooden boxes provided with hinged covers and padlock hasps.
b) The Contractor shall supply under this contract all maintenance tools for each piece of equipment/ system and it shall be boxed separately and the boxes shall be appropriately marked for shipment and identification of contents.
c) A weather-proof itemized list of the contents shall also be attached to the outside of each container.
d) The maintenance tools shall include all special handling rigs, bars, slings, cable and all specialized equipment for control system maintenance such as extender boards, scopes, and all software and hardware. Further, Bidder shall also include a full set of regular maintenance tools and tackles required. Bidder shall also include all maintenance tools and tackles in their scope. Total price of all the maintenance tools and tackles shall be included in the quoted lump sum price.

4.6 The material of construction specified in Data Sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty which shall be subjects to Customer/ BHEL approval during detailed engineering.

4.7 All instrument-wetted parts will be suitable for requested application.

4.8 All high points on any, tanks, pumps, piping or instrumentation will be vented and provided with valve. All low points on any, tanks, pumps, piping or instruments will be drained and provided with valve.

4.9 5 mm (min.) thick IS 2062 Checker plate shall be provided by bidder covering the skid frame and for elevated platform for the preparation/ measuring tank, wherever applicable. The tanks support, pumps and pipe support and LCP/ LCP support shall be welded to the checker plate.

4.10 Stuffing box shall be provided for mounting the agitator to avoid air ingress.

4.11 Vent/ overflow pipe from tank shall at least reach the bottom half of the breather/ water seal/ CO2 absorber.

4.12 SS pad shall be provided for welding MS structural supports to SS tanks.

4.13 Step ladder and chemical charging platform shall be provided for easy access to top of tank.

4.14 All the terminal points shall be easily accessible and towards one side of skid.

4.15 All valves shall be easily accessible for the operator.

4.16 All tanks/ pumps shall have name plate clearly indicating the equipment name.

4.18 Pipe fittings of the system shall be done using elbows and tees. Pipe bending is not acceptable.

4.19 All equipment shall have SS name plate.

4.20 All LCP shall be mounted in their respective dosing skids only.

4.21 All the terminal points where flange joints are involved, bidder shall terminate it along with matching counter flange, nuts, bolts, gaskets etc.

4.22 KKS codes for all drives and instruments for the project have to be followed.

4.23 All the instruments/ equipment/ electrical items shall be provided & designed with maximum star rating as available in line with energy conservation policies notified by BEE, GOI at the time of supply.

5. OXYGEN DOSING SYSTEM (ODS) (SKID BASED) (TYPE-B SG PACKAGES)

5.1 SCOPE OF SUPPLY

Broad scope of work of this package includes all equipment and accessories.

The Oxygen dosing system as specified in Technical Specification shall consist of the followings:

- Entire Oxygen dosing system mounted on skid as per P&IDs and Data Sheet-A.
- Instrumentation (minimum) as per the enclosed P&ID.
- Start-up & commissioning spares as required.
- Racks (2 No.) each to hold 32 cylinders, cylinders (60 Nos.), injector assemblies (10 nos.), tees (40 nos.), elbows (40 nos.), tubing (500 meter), compression fittings (85 nos.) for loose tubing.
- Foundation nuts & bolts to fix each skid on the floor, as required.

DESIGN CRITERIA

The following drawings/ data sheets are enclosed for the reference:

a) P&ID for Oxygen Dosing System (PE-DG-528-154-W101).
b) DATA SHEET – A

The objective of providing the dosing systems is to maintain the chemistry of the boiler feed water and also to comply with different modes of operation i.e. “Combined Water Treatment mode” during continuous plant operation and “Ammoniacal mode or AVT (O) mode” during start-up & shutdown conditions for super critical boiler of main plant.

The chemical feed for Combined Water Treatment (CWT) involves the feed of only aqueous ammonia and gaseous oxygen.

Erection and commissioning shall be in bidder’s scope.

5.2 OXYGEN DOSING SYSTEM: (TOTAL 8 SKIDS FOR STATION)

(Refer Drawing. No. PE-DG-528-154-W101)

One skid of Oxygen Dosing System consists of the following: -

- One (01) oxygen cylinders shall be connected to each cylinder manifold (total 2 nos.), dosing at downstream of Deaerator/ CPU outlet.
- Two numbers of Pressure Regulator as per Data Sheet – A.
- Associated Piping, valves, instruments, fitting as indicated in the P&ID of oxygen dosing system and Data Sheet-A enclosed and as required to make the system complete.

CONTROL AND INSTRUMENTATION

The mode of operation of the oxygen dosing system shall be from DDCMIS only. All the logics, controls and interlocks shall be implemented in DDCMIS. Local manual intervention is not envisaged. Both manual/ automatic controls shall be implemented in DDCMIS. The provision to select “Auto” or “Manual” mode shall be provided in DDCMIS OWS only.

Control of all dosing system shall also be done from SWAS room in addition to the CCR and one no. OWS shall be provided for control & operation of all dosing system from SWAS room.

The oxygen gas shall be at high pressure (204 Kg/cm2) in the cylinders. The same shall be brought to a lower pressure by the Pressure Regulator (set pressure of 45 Kg/cm2 for skid dosing at CPU outlet and set pressure of 20 Kg/cm2 for skid dosing at deaerator outlet) attached with each cylinder.

Each of the two oxygen cylinder banks in the skid shall have a dedicated set of solenoid valve,

pressure gauge and pressure transmitter. Five cylinders bank provided on skid will serve at a time based on the pressure at the inlet of solenoid valve. In case the pressure at the inlet of SV1 reaches at the set point, the solenoid valve SV1 will close and solenoid vale SV2 will open and other five-cylinder bank shall be taken in to service provided the pressure at the inlet of SV2 is not low and vice versa. Alarm for pressure low at the inlet of solenoid valves shall be provided in DDCMIS.

A pressure relief valve shall be fitted at the upstream of solenoid valve to relieve system pressure if the system pressure goes above set pressure.

The pressure of the oxygen shall be further reduced & set by pressure reducing valve in the skid {set point – "ADEQUATE--(Set points–44 kg/cm2 for skid dosing at CPU outlet & 17 kg/cm2 for skid dosing at deaerator outlet). The flow and pressure of oxygen can be monitored from DDCMIS by the signal from mass flow controller (MFC) and from pressure transmitter provided at the downstream of pressure reducing regulating valve. The flow of oxygen dosing will be controlled manually/automatically from DDCMIS by adjusting mass flow controller (MFC) provided on skid based on the feedback from the dissolved oxygen analyzer located in the economizer inlet. The MFC shall have a position feedback transmitter that shall transmit the feedback signal to DDCMIS.

The flow of Oxygen Dosing shall be controlled manually/ automatically from DDCMIS by adjusting MFC provided on skid based on feedback from the dissolved oxygen analyzer located at the economizer inlet.

All solenoid valves mounted on the oxygen dosing skids shall be 24 V DC powered from DDCMIS and routed through the local skid mounted junction box. All the field instruments, MFC and solenoid valves (SV1 & SV2) shall be terminated at a junction box in the skid by oxygen dosing vendor for further connection to DDCMIS.

At each dosing point, viz. CPU outlet and deaerator outlet, an injection assembly containing 15 NB tubing, fixing collar, solenoid valve and NRV shall be supplied loose by oxygen dosing vendor.

The set points indicated below for operation of pressure reducing valve are tentative. Final value of the same shall be decided by oxygen dosing vendor during detailed engineering as per the requirement of the flow meter-cum-transmitter manufacturer.

Bidder to provide a flame arrestor in the vent header of each of oxygen dosing skids.
Further, Control & instrumentation shall be as per P&ID of Oxygen Dosing System, Data Sheet-A, Section IIA, IC and IIC.

5.3 SPECIAL TOOLS AND TACKLES

a) One set of all special tools shall be furnished and shipped with each piece of equipment for dismantling, maintenance, adjustment, and calibration of the equipment. The tools shall be shipped in separate heavily constructed wooden boxes provided with hinged covers and padlock hasps.
b) The Contractor shall supply under this contract all maintenance tools for each piece of equipment/ system and it shall be boxed separately and the boxes shall be appropriately marked for shipment and identification of contents.
c) A weather-proof itemized list of the contents shall also be attached to the outside of each container.
d) The maintenance tools shall include all special handling rigs, bars, slings, cable and all specialized equipment for control system maintenance such as extender boards, scopes, and all software and hardware. Further, Bidder shall also include a full set of regular maintenance tools and tackles required. Bidder shall also include all maintenance tools and tackles in their scope. Total price of all the maintenance tools and tackles shall be included in the quoted lump sum price.

5.4 TEST PROCEDURE FOR OXYGEN DOSING SYSTEM

a) A Factory Acceptance Testing will be conducted at vendor's Factory. This will be for verification of the functional performance of critical equipment/instruments and hardware design when run at design pressure, temperature and flow.

b) FAT will be carried out using only the inert gas such as Nitrogen. Following will be the FAT protocol.

c) Checking the completeness of the system. This will include visual inspection of equipment and instruments as per the P & ID s & GA along with skid after assembling on skid.

d) Soap joint leak test of tubing/fittings/valves using nitrogen at 1.25 times of maximum operating pressure.

e) (ANSI B31.8), for 2 hours. The allowable pressure drop would be up to 0.5 bar over 2 hours.

f) Functional testing of calibrated components (equipment/ instruments) using nitrogen. The test controller will be connected to Mass flow controller. The set point will be given from test controller & this will be monitored.

g) Testing of Assembly of skid, instruments, termination box will be done by BHEL as per approved Quality Assurance Plan.

h) Inert test run using nitrogen to demonstrate flow.

i) Final Assembly & Factory Acceptance Test will be witnessed by BHEL & CUSTOMER.

5.6 The material of construction specified in Data Sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty which shall be subjects to Customer/ BHEL approval during detailed engineering.

5.7 All instrument-wetted parts will be suitable for requested application.

5.8 5 mm (min.) thick IS 2062 Checker plate shall be provided by bidder covering the skid frame. LCP/ JB supports shall be welded to the checker plate.

5.9 All the terminal points shall be easily accessible and towards one side of skid.

5.10 All valves shall be easily accessible for the operator.

5.11 All equipment shall have SS name plate.

5.12 KKS codes for all drives and instruments for the project have to be followed.

5.13 All the instruments/ equipment/ electrical items shall be provided & designed with maximum star rating as available in line with energy conservation policies notified by BEE, GOI at the time of supply.

6. EFFLUENT TRRANSFER SYSTEM (ETS) (TYPE-B SG PACKAGES)

Broad scope of supply for this package is detailed below and as indicated in relevant portion of this specification.

REFERENCE DOCUMENTS

A. **P & ID OF ETS (PE-DG-528-164-W001)**
B. DATASHEET-A
C. PLOT PLAN

6.0 SCOPE OF SUPPLY EFFLUENT TRANSFER SYSTEM (ETS)

a. Two (2) nos. (1W+1S) UNIT-3 DRAIN OIL WASTE WATER SUMP TRANSFER PUMPS complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling etc.
b. Two (2) nos. (1W+1S) DRAIN OIL WASTE WATER SUMP TRANSFER PUMPS complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling etc.
c. Two (2) nos. (1W+1S) MRS UNIT-3 WASTE WATER TRANSFER PUMPS-1 complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling etc.
d. Two (2) nos. (1W+1S) MRS UNIT-3 WASTE WATER TRANSFER PUMPS-2 complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling etc.
e. Two (2) nos. (1W+1S) MRS UNIT-4 WASTE WATER TRANSFER PUMPS-1 complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling etc.
f. Two (2) nos. (1W+1S) MRS UNIT-4 WASTE WATER TRANSFER PUMPS-2 complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling etc.
g. Two (2) nos. (1W+1S) ESP UNIT-3 WASTE WATER TRANSFER PUMPS complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling, re-circulation line, etc.
h. Two (2) nos. (1W+1S) ESP UNIT-4 WASTE WATER TRANSFER PUMPS complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling, re-circulation line etc.
i. Two (2) nos. (2W) SG UNIT-3 WASTE WATER TRANSFER PUMPS-1 complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling, re-circulation line etc.
j. Two (2) nos. (1W+1S) SG UNIT-3 WASTE WATER TRANSFER PUMPS-2 complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling, re-circulation line etc.
k. Two (2) nos. (2W) SG UNIT-4 WASTE WATER TRANSFER PUMPS-1 complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling, re-circulation line etc.
l. Two (2) nos. (1W+1S) SG UNIT-4 WASTE WATER TRANSFER PUMPS-2 complete with all instrumentation, valves, piping, fittings, motor, base plate, coupling, re-circulation line etc.
m. Two (2) nos. (2W) Belt type Oil Skimmers each complete with all instrumentation, valve, piping, fittings etc., along with Two (2) Nos MS oil drum of 200 litre capacity.
n. Two (2) nos. trolley mounted portable oil Centrifuge complete with all accessories as required.
o. Two (2) nos. (2W) trolley mounted TROLLEY MOUNTED SCREW PUMPS complete with LPBS and all instrumentation, valves, piping, fittings, motor, base plate, coupling, hose pipe, slope oil tank, etc
p. Instrumentation, valves etc. indicated in P & ID of Effluent Transfer System are bare minimum requirement; however, bidder has to provide complete system for trouble free operation meeting technical specification requirement.
q. Effluent lifting sumps, E1, E2, E3, E4, E5, E6, E7, E8, E9 & E10 shall be located outside ETS area as shown plot pan.
r. Chain pulley block 1 Ton Capacity 2 Nos.
s. For all pumps, while calculating the pump head, 10% margin shall be considered on friction losses.
t. Maximum operating speed of all the pumps and blowers shall be limited to 1500 rpm or less unless specified otherwise
u. Depth of ETS sump may vary from 2 to 4 meters.
v. Unless specifically mentioned, design criteria of piping, valves, rubber expansion, shall be provided.
w. Painting requirement shall be as per Painting Specification unless otherwise specified.
x. Isolation gates as per P & ID enclosed.

y. Bidder to adhere Format of operation and maintenance manual requirement as per specified in technical specification else where.
z. Bidder to adhere packaging requirements requirement as per specified in technical specification else where.
aa. Sumps E1, E2, E3, E4, E5, E6, E7, E8, E9 & E10 (RCC work by BHEL) along with piping, valves, fittings, instrumentation and associated accessories.
ab. Bidder to refer Data Sheet A for technical requirements.

6.1 PIPING

Complete piping indicated in P & ID of Effluent Transfer System is in bidder's scope of supply and erection. In addition, any additional piping required to make the system complete shall be in bidder's scope.

Pipe distances from sumps outside ETS area up to Ash Slurry sump have been listed below. Bidder to note that no commercial settlement / adjustment shall be entertained for variation upto +/- 10% of pipe lengths during detailed engineering.

S. No.	Piping From	Piping To	Distance to be considered in Bidder's scope for supply (in Meters)
1.	MRS Waste Water Sump (E-1) Unit-3	CHP RUN OFF Collection Pit	170
2.	MRS Waste Water Sump (E-2) Unit-3	CHP RUN OFF Collection Pit	250
3.	MRS Waste Water Sump (E-3) Unit-4	CHP RUN OFF Collection Pit	370
4.	MRS Waste Water Sump (E-4) Unit-4	CHP RUN OFF Collection Pit	480
5.	ESP Unit-3 Floor Wash Water Sump (E-7)	Ash Slurry Sump	375
6.	ESP Unit-4 Floor Wash Water Sump (E-8)	Ash Slurry Sump	210
7.	SG Unit-3 Floor Wash Water Sump (E-5)	Ash Slurry Sump	350
8.	SG Unit-4 Floor Wash Water Sump (E-6)	Ash Slurry Sump	150
9.	SG UNIT-3 OIL DRIAN PIT (E-9)	TP AT C- ROW (Further piping up to WSWS of ETS is in customer's (DVC) scope)	300 (1450 for head calculation)
10.	SG UNIT-4 OIL DRIAN PIT (E-10)	TP AT C- ROW (Further piping up to WSWS of ETS is in customer's (DVC) scope)	300 (1250 for head calculation)

6.2 OPERATION AND CONTROL

Effluent Transfer System shall be operated through its Relay based control panel (bidder's scope). The control philosophy of various systems is described below. However, for all the systems, following basic process related interlocks, alarms/ pre-warning signals shall be implemented in the control system as per system requirement.

a) Among the equipment, it shall be possible to select a specific pump or tank or sump for working/standby/ maintenance etc. through control system.

b) Permissive & Interlocks:

(i) Starting & tripping of pumps with respect to liquid level in the respective sump/ tanks or liquid pressure in the suction lines.

(ii) Starting & tripping of agitators with respect to liquid level in the respective sump/tanks.

(iii) Starting & tripping of pumps (which are provided with forced water lubrication) with respect to lubricating water flow (through low pressure/ low flow signal as the case may be).

(iv) Tripping of pumps when the discharge pressure is very high to avoid operation of the pump under shutoff head.

(v) Stopping/ tripping of equipment due to abnormal parameters related to safety of equipment like high vibration, very high bearing lubrication water (and /or oil) temperature to the drive/pumps, very high bearing temperature of the of pump/drive etc. as applicable based on the recommendations of Equipment Supplier.

(vi) Automatic opening of the re-circulation valve to pre-set percentage, in case of failure of opening of pump(s) discharge valve to ensure minimum flow through the pump, as per the recommendation of manufacturer.

(vii) Automatic starting of standby pumps upon failure of starting of selected pump or tripping of running pump as the case may be.

(viii) Capacity of the metering pump shall be controllable from 10-100% continuously by adjusting the stroke length manually by a micro meter dial calibrated for 0–100% of pump capacity integral with the pump.

(ix) Various annunciations related to low level of the chemical tanks & sumps shall be provided.

(x) Alarms/ signals

(xi) Abnormal parameters such as low & high level in tanks/sumps, high pressure at pump discharge, low header pressure, low lubrication water flow to pumps (provided with forced water lubrication system) etc.

(xii) Failure of starting of equipment such as pumps, blowers etc. upon start command.

(xiii) Tripping of equipment due to protection logic.

In addition, the control system shall facilitate the operator to know the status of various equipment (Whether equipment is running or stopped or tripped etc., whether the equipment is selected for operation/ standby duty /maintenance mode etc. as the case may be).

7. SEWAGE TREATMENT PLANT (STP) (TYPE-B SG PACKAGES)

Complete Sewage Treatment Plant for facilities within the plant is in bidder's scope. Bidder shall provide 'De-centralized Sewage Treatment' units. The capacity of the Decentralized Sewage Treatment' units should be as per the design requirements, subject to minimum combined capacity of 75 Cum/day. Design of Sewage treatment plant shall be as per CPHEEO manual. Primary, Secondary and Tertiary treatment to be provided. Treated sewage water shall be used for horticulture purpose as per quality requirement of CPHEEO manual.

Bidder shall have to provide complete arrangement for sewage disposal up to the sewage treatment plant including pumping facilities.

REFERENCE DOCUMENTS

A. PROCESS FLOW DIAGRAM (P&ID) (PE-V0-512-673-W001).
B. DATASHEET-A

7.1 SCOPE OF SUPPLY FOR SEWAGE TREATMENT PLANT

7.1.1 SCOPE OF SUPPLY (MECHANICAL) for de-centralised sewage treatment plant -1 ((NEAR AHP-COMBINED ASH SLURRY PUMP HOUSE)

1. One no.(1W) coarse bar screen in S-4 for sewage sump located near ESP control room unit #4) (Outside STP area).
2. One no. (1W) of sewage sump S-4 for below ground (RCC work in BHEL scope) along with valves, piping, fittings, instruments and required accessories.
3. Two (2) nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S-5) complete with all instrumentation, valves, piping, fittings, motor and other accessories.
4. One no.(1W) coarse bar screen in S-3 sewage sump located near ESP control room unit #4 (Outside STP area).
5. One no. (1W) of sewage sump S-3 below ground along with valves, piping, fittings, instruments and required accessories.
6. Two (2) nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S-3) complete with all instrumentation, valves, piping, fittings, motor and other accessories.
7. One no.(1W) coarse bar screen in S-5 sewage sump located near AHP-MCC1 (Outside STP area).
8. One no. (1W) of sewage sump S-5 below ground along with valves, piping, fittings, instruments and required accessories.
9. Two (2) nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S-5) complete with all instrumentation, valves, piping, fittings, motor and other accessories.
10. One (1) no. Of bar screen chamber (RCC work in BHEL scope) along with valves, piping, fittings, instruments and required accessories located inside STP area.
11. One (1) nos.(1W) coarse bar screen in bar screen chamber (RCC work in BHEL scope) along with, fittings, isolation gates and required accessories.
12. One (1) no. (1W) of oil & grease chamber (RCC work in BHEL scope) along oil skimmer, oil collection tank, instruments, fittings, valves and required accessories.
13. One (1) nos. (1W) De-centralised STP module is required along with valves, pipes, fittings, instruments and required accessories
14. Two (2) nos. (1W+1S) sludge recirculation pumps for STP Skid complete with all instrumentation, valves, piping, motor, etc., if required as per supplier recommendation.
15. Two (2) nos. (1W+1S) oil free type air blowers with piping, instrumentation, valves, fittings, air diffusers, electric motor drives for supplying air required for STP skid, if required as per supplier recommendation. Each blower shall be complete with motor, v-belt drive with belt guard, inlet

filter/silencer, flexible couplings and discharge snubber, all mounted on a single base. Relief valve(s) shall be provided.

16. One (1) no. filter feed tank for effluent storage after treatment in STP skid along with valves, piping, fittings, instruments and required accessories.
17. Two (2) nos. (1W+1S) filter feed pumps complete with all instrumentation, valves, piping, motor, etc. for feeding water to multi grade filter & activated carbon filter for tertiary treatment.
18. One no. (1W) (1x100%) multi grade filter along with filter media, media, trap piping, valves, electrically operated multiport valve, backwashing arrangement, fittings, instrumentation and accessories associated with automatic backwash arrangement.
19. One (1) no. (1W) (1x100%) Activated Carbon filter along with filter media, media, trap piping, valves, electrically operated multiport valve, fittings, instrumentation and accessories associated with automatic backwash arrangement.
20. One (1) no. (1W) sodium hypochlorite dosing tank for dosing chemical to treated water storage tank feed line, complete with valve, fittings, instrumentation and accessories.
21. Two (2) (1W+1S) no. Electronic type Sodium hypochlorite dosing pump with auto stroke controller complete with all instrumentation and accessories, valves, piping, motor, etc.
22. One (1) no. treated water tank for effluent storage after tertiary treatment along with valves, piping, fittings, instruments and required accessories.
23. Two (2) nos. (1W+1S) treated water disposal pumps for treated water tank complete with all instrumentation, valves, motor, piping and required accessories etc.
24. 50-meter hose pipe from treated water disposal pumps for STP shall be provided by bidder for horticulture purpose.
25. All sewage transfer piping from sewage sump up to Sewage treatment plant shall be routed on pedestals/ buried. Wrapping, coating and protection of all the buried pipe is also in bidder's scope & shall be as per AWWA C 203. However, all auxiliary steel structure (U-clamps, nuts, bolts, channels etc.) for fixing pipes on pedestal shall be in bidder's scope. Inputs for pipe pedestals as per requirement and layout shall be furnished.
26. Bidder to take care of the length of piping as included elsewhere in the technical specification. Pipe routings shall be decided during detailed engineering.
27. All necessary drains, vents, breathers, CO2 absorbers, seal pots, fume absorbers and sampling points with valves as specified and as required are in bidder's scope.
28. Any statutory requirement / clearance required from government / local body shall be in bidder's scope. Bidder to also comply local body / government norms.
29. All Valve, piping, fitting, and instrument shall be of minimum PN 10/ 150 class rating.
30. Initial charge of all lubricants & grease in bidder's scope.
31. Diaphragm seal for instruments shall be provided by bidder as per technical requirement.
32. One (1) no. Chain Pulley Block with tripod arrangement of adequate capacity, to meet the erection and maintenance requirements shall be provided by bidder.

7.1.2 SCOPE OF SUPPLY (MECHANICAL) for de-centralised sewage treatment plant -2 (near COMPRESSOR HOUSE)

1. One no.(1W) coarse bar screen in S-1 sewage sump near compressor house (Outside STP area).
2. One no. (1W) of sewage sump S-1 below ground (RCC work in BHEL scope) along with valves, piping, fittings, instruments and required accessories.
3. Two (2) nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S-1) complete with all instrumentation, valves, piping, fittings, motor and other accessories.
4. One no.(1W) coarse bar screen in S-2 sewage sump located near CHP/AHP-2 MCC ROOM (Outside STP area).
5. One no. (1W) of sewage sump S-2 below ground (RCC work in BHEL scope) along with valves, piping, fittings, instruments and required accessories.
6. Two (2) nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S-2) complete with all instrumentation, valves, piping, fittings, motor and other accessories.
7. One (1) no. Of bar screen chamber (RCC work in BHEL scope) along with valves, piping, fittings, instruments and required accessories located inside STP area.

8. One (1) nos.(1W) coarse bar screen in bar screen chamber (RCC work in BHEL scope) along with, fittings, isolation gates and required accessories.
9. One (1) no. (1W) of oil & grease chamber (RCC work in BHEL scope) along oil skimmer, oil collection tank, instruments, fittings, valves and required accessories.
10. One (1) nos. (1W) De-centralised STP module is required along with valves, pipes, fittings, instruments and required accessories.
11. Two (2) nos. (1W+1S) sludge recirculation pumps for STP Skid complete with all instrumentation, valves, piping, motor, etc., if required as per supplier recommendation.
12. Two (2) nos. (1W+1S) oil free type air blowers with piping, instrumentation, valves, fittings, air diffusers, electric motor drives for supplying air required for STP skid, if required as per supplier recommendation. Each blower shall be complete with motor, v-belt drive with belt guard, inlet filter/silencer, flexible couplings and discharge snubber, all mounted on a single base. Relief valve(s) shall be provided.
13. One (1) no. filter feed tank for effluent storage after treatment in STP skid along with valves, piping, fittings, instruments and required accessories.
14. Two (2) nos. (1W+1S) filter feed pumps complete with all instrumentation, valves, piping, motor, etc. for feeding water to multi grade filter & activated carbon filter for tertiary treatment.
15. One no. (1W) (1x100%) multi grade filter along with filter media, media, trap piping, valves, electrically operated multiport valve, fittings, instrumentation and accessories associated with automatic backwash arrangement.
16. One (1) no. (1W) (1x100%) Activated Carbon filter along with filter media, media, trap piping, valves, electrically operated multiport valve, fittings, instrumentation and accessories associated with automatic backwash arrangement.
17. One (1) no. (1W) sodium hypochlorite dosing tank for dosing chemical to treated water storage tank feed line, complete with valve, fittings, instrumentation and accessories.
18. Two (2) (1W+1S) no. Electronic type Sodium hypochlorite dosing pump with auto stroke controller complete with all instrumentation and accessories, valves, piping, motor, etc.
19. One (1) no. treated water tank for effluent storage after tertiary treatment along with valves, piping, fittings, instruments and required accessories.
20. Two (2) nos. (1W+1S) treated water disposal pumps for treated water tank complete with all instrumentation, valves, motor, piping and required accessories etc.
21. 50-meter hose pipe from treated water disposal pumps for STP shall be provided by bidder for horticulture purpose.
22. All sewage transfer piping from sewage sump up to Sewage treatment plant shall be routed on pedestals/ buried. Wrapping, coating and protection of all the buried pipe is also in bidder's scope & shall be as per AWWA C 203. However, all auxiliary steel structure (U-clamps, nuts, bolts, channels etc.) for fixing pipes on pedestal shall be in bidder's scope. Inputs for pipe pedestals as per requirement and layout shall be furnished.
23. Bidder to take care of the length of piping as included elsewhere in the technical specification. Pipe routings shall be decided during detailed engineering.
24. All necessary drains, vents, breathers, CO2 absorbers, seal pots, fume absorbers and sampling points with valves as specified and as required are in bidder's scope.
25. Any statutory requirement / clearance required from government / local body shall be in bidder's scope. Bidder to also comply
26. All Valve, piping, fitting, and instrument shall be of minimum PN 10/ 150 class rating.
27. Initial charge of all lubricants & grease in bidder's scope.
28. Diaphragm seal for instruments shall be provided by bidder as per technical requirement.
29. One (1) no. Chain Pulley Block with tripod arrangement of adequate capacity, to meet the erection and maintenance requirements shall be provided by bidder.

7.1.3 SCOPE OF SUPPLY (MECHANICAL) for de-centralised sewage treatment plant -3 (near AHP - SILO UTILITY BUILDING)

1. One no.(1W) coarse bar screen in S-6 sewage sump (Outside STP area).

2. One no. (1W) of sewage sump S-6 below ground (RCC work in BHEL scope) along with valves, piping, fittings, instruments and required accessories.
3. Two (2) nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S-6) complete with all instrumentation, valves, piping, fittings, motor and other accessories.
4. One (1) no. Of bar screen chamber (RCC work in BHEL scope) along with valves, piping, fittings, instruments and required accessories located inside STP area.
5. One (1) nos.(1W) coarse bar screen in bar screen chamber (RCC work in BHEL scope) along with, fittings, isolation gates and required accessories.
6. One (1) no. (1W) of oil & grease chamber (RCC work in BHEL scope) along oil skimmer, oil collection tank, instruments, fittings, valves and required accessories.
7. One (1) nos. (1W) De-centralised STP module is required along with valves, pipes, fittings, instruments and required accessories.
8. Two (2) nos. (1W+1S) sludge recirculation pumps for STP Skid complete with all instrumentation, valves, piping, motor, etc., if required as per supplier recommendation.
9. Two (2) nos. (1W+1S) oil free type air blowers with piping, instrumentation, valves, fittings, air diffusers, electric motor drives for supplying air required for STP skid, if required as per supplier recommendation. Each blower shall be complete with motor, v-belt drive with belt guard, inlet filter/silencer, flexible couplings and discharge snubber, all mounted on a single base. Relief valve(s) shall be provided.
10. One (1) no. filter feed tank for effluent storage after treatment in STP skid along with valves, piping, fittings, instruments and required accessories.
11. Two (2) nos. (1W+1S) filter feed pumps complete with all instrumentation, valves, piping, motor, etc. for feeding water to multi grade filter & activated carbon filter for tertiary treatment.
12. One no. (1W) (1x100%) multi grade filter along with filter media, media, trap piping, valves, electrically operated multiport valve, fittings, instrumentation and accessories associated with automatic backwash arrangement.
13. One (1) no. (1W) (1x100%) Activated Carbon filter along with filter media, media, trap piping, valves, electrically operated multiport valve, fittings, instrumentation and accessories associated with automatic backwash arrangement.
14. One (1) no. (1W) sodium hypochlorite dosing tank for dosing chemical to treated water storage tank feed line, complete with valve, fittings, instrumentation and accessories.
15. Two (2) (1W+1S) no. Electronic type Sodium hypochlorite dosing pump with auto stroke controller complete with all instrumentation and accessories, valves, piping, motor, etc.
16. One (1) no. treated water tank for effluent storage after tertiary treatment along with valves, piping, fittings, instruments and required accessories.
17. Two (2) nos. (1W+1S) treated water disposal pumps for treated water tank complete with all instrumentation, valves, motor, piping and required accessories etc.
18. 50-meter hose pipe from treated water disposal pumps for STP shall be provided by bidder for horticulture purpose.
19. All sewage transfer piping from sewage sump up to Sewage treatment plant shall be routed on pedestals/ buried. Wrapping, coating and protection of all the buried pipe is also in bidder's scope & shall be as per AWWA C 203. However, all auxiliary steel structure (U-clamps, nuts, bolts, channels etc.) for fixing pipes on pedestal shall be in bidder's scope. Inputs for pipe pedestals as per requirement and layout shall be furnished.
20. Bidder to take care of the length of piping as included elsewhere in the technical specification. Pipe routings shall be decided during detailed engineering.
21. All necessary drains, vents, breathers, CO2 absorbers, seal pots, fume absorbers and sampling points with valves as specified and as required are in bidder's scope.
22. Any statutory requirement / clearance required from government / local body shall be in bidder's scope. Bidder to also comply local body / government norms.
23. All Valve, piping, fitting, and instrument shall be of minimum PN 10/ 150 class rating.
24. Initial charge of all lubricants & grease in bidder's scope.
25. Diaphragm seal for instruments shall be provided by bidder as per technical requirement.
26. One (1) no. Chain Pulley Block with tripod arrangement of adequate capacity, to meet the erection and maintenance requirements shall be provided by bidder.

7.2 TERMINAL POINTS

- Service water connection (40 NB connections) at 5-meter distance from all three sewage treatments plants area battery limit. however, distribution and piping inside STP area shall be in bidder's scope.
- Potable water connection (40 NB connections) at 5-meter distance from all three sewage treatments plants area battery limit. however, distribution and piping inside STP area shall be in bidder's scope.

7.3 PIPING

a) Complete piping of Sewage treatment plant is in bidder's scope of supply and erection. In addition, any additional piping required to make the system complete inside STP area shall be in bidder's scope. Pipe length inside STP area has to be considered by bidder in their scope as per layout. The below indicated pipes shall be designed, supplied, erected, laid and tested by the bidder. Elbows, tees, flanges, counter flanges, Hangers and supports etc. required for the below given piping shall also be provided by the bidder.

b) Pipe distances are given below:

SL. NO.	FROM	TO	DISTANCE (In meters)
1.	Sewage sump (S3)	STP -1	450
2.	Sewage sump (S4)	STP -1	150
3.	Sewage sump (S5)	STP -1	350
4.	Sewage sump (S1)	STP -2	400
5.	Sewage sump (S2)	STP -2	150
6.	Sewage sump (S6)	STP -3	100
7.	STP-1 Area	Nearest Drain	20
8.	STP-2 Area	Nearest Drain	20
9.	STP-3 Area	Nearest Drain	20

Sewage sump, S1, S2, S3. S4, S5 & S6 shall be located outside STP area however rest facilities of STP shall be located inside STP area provided in plot plan included in this specification.

Bidder to further note that above piping distances are in bidder's scope. Distances given above are from one area to other area only, however inside piping in respective area shall be in bidder's scope which is not included in above distances.

c) In addition, any additional piping and associated accessories required to complete the system shall be in bidder's scope. Further, 8 Nos of pipe culvert to be considered for road crossing.

7.4 OPERATION AND CONTROL

Sewage treatment packages shall be operated through its Relay based control panel (bidder's scope). The control philosophy of system is described below. Basic process related interlocks, alarms/ prewarning signals are to be implemented in the control system as per system requirement.

a) Among the equipment, it shall be possible to select a specific pump or tank or sump for working/ standby/ maintenance etc. through control system.

b) Permissive & Interlocks:

- Starting & tripping of pumps with respect to liquid level in the respective sump/ tanks or liquid pressure in the suction lines.
- Tripping of pumps when the discharge pressure is very high to avoid operation of the pump under shutoff head.
- Stopping/ tripping of equipment due to abnormal parameters related to safety of equipment like high vibration, very high bearing lubrication water (and /or oil) temperature to the drive/pumps, very high bearing temperature of the of pump/drive etc. as applicable based on the recommendations of Equipment Supplier.
- Automatic starting of standby pumps upon failure of starting of selected pump or tripping of running pump as the case may be.
- Various annunciations related to low level of the chemical tanks & sumps shall be provided.

c) Alarms/ signals:

- Abnormal parameters such as low & high level in tanks/sumps, high pressure at pump discharge, low header pressure, low lubrication water flow to pumps (provided with forced water lubrication system) etc.
- Failure of starting of equipment such as pumps, blowers etc. upon start command.
- Tripping of equipment due to protection logic.
- In addition, the control system shall facilitate the operator to know the status of various equipment (Whether equipment is running or stopped or tripped etc., whether the equipment is selected for operation/ standby duty /maintenance mode etc. as the case may be).

7.5 SUB QR FOR STP SEWAGE TRATMENT PLANT)

The bidder should have executed the contract for design, supply, erection and commissioning (or supervision of erection & commissioning) of Sewage Treatment plant of minimum capacity of 25 KLD (Kilo Liter Per Day) of similar technology as proposed by the Bidder for this package. Copy of minimum one (1) performance certificate in English from end user along with copy of related Purchase Order (PO) or letter of intent (LOI) or letter of award (LOA) or work order (WO) specifying that the system/package is running successfully for One (1) year meeting the minimum pre-qualifying requirement.

8.0 COMMON SCOPE & TECHNICAL DETAILS FOR TYPE-A PACKAGES (TGPACKAGES) I.E. CHEMICAL (NAOH) DOSING SYSTEM (CDS-TG) & CONDENSATE POLISHING PLANT (CPU-TG) AND TYPE-B PACKAGES (SG PACKAGES) I.E CHEMICAL (HYDRAZINE, AMMONIA AND NAOH) DOSING SYSTEM (CDS-SG), OXYGEN DOSING SYSTEM (ODS-SG), EFFLUENT TRANSFER SYSTEM (ETS-SG) & SEWAGE TREATMENT PLANT (STP-SG).

8.1 SCOPE OF SUPPLY (ELECTRICAL)

Complete electrical scope as per specification/ details indicated in Section IB (Specific Technical Requirement Electrical) and IIB (General Technical Requirement Electrical).

8.2 SCOPE OF SUPPLY (C&I)

Complete C&I scope as per specification/ details indicated in Section IC (Specific Technical Requirement C&I) and IIC (General Technical Requirement C&I).

8.3 SCOPE OF SUPPLY (CIVIL)

Total Civil work (including Civil Raw Material like Cement, Reinforcement Steel) is in BHEL scope of work. However, the detailed civil assignment drawings shall be furnished by successful bidder during detailed engineering. The corresponding civil design & construction drawing prepared by BHEL, based on civil assignment drawing of bidder, will be furnished to the successful bidder for concurrence. In case any modification is required in the civil work already carried out based on final civil inputs given by bidder, BHEL reserves the right to debit cost of such rework to vendor.

8.4 SPARES

The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares as indicated in the relevant sections of specifications.

8.5 EXCLUSIONS

8.5.1 Dismantling or rerouting of any underground pipeline/ buried utilities.

8.5.2 Instrument air & service air up to terminal points.

8.5.3 Air conditioning (**Except Analyser Room in CPU**), ventilation & firefighting facilities. However, heat dissipation data for all motors & panels as applicable shall be finished by the bidder during detail engineering for sizing of HVAC equipment.

8.5.4 All civil structural, architectural & construction works, civil works including foundation of equipment & acid resistant tilling/lining, structural steel and works required for shed/ building, excavation and back-filling for structure and buried piping. However complete grouting (with material) for equipment, fixing and any concreting inside vessels shall be in the scope of the bidder.

8.5.5 Main pipe trestles.

8.5.6 Supply of ISMB monorail (if applicable)

8.5.7 Service water, potable water and service air up to terminal points.

8.6.8 Other exclusions are mentioned in the electrical & C&I parts of this specification.

8.6 SITE VISIT BEFORE SUBMISSION OF OFFER.

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

8.7 SCOPE OF SERVICES

8.7.1 Unloading, Storage, handling and transportation at site.

8.7.2 Minor Civil work such as, Chipping of foundation, grouting below base plate for all structures, equipment, grouting of anchor bolts wherever these are not placed in the foundation during casting of foundation itself, excavation & filling of earth for buried MS pipes if and as required. To the extent possible, vendor shall ensure to supply all foundation bolts timely so as to facilitate placement of these bolts while casting the foundation.

8.7.3 Pre- Commissioning work such as flushing, hydraulic testing etc. Necessary consumables and instrumentation as required for inspection and testing at works as well as at site including pre-commissioning activities shall be arranged by the successful bidder at their own cost.

8.7.4 Erection and Commissioning.

8.7.5 **Bidder to refer Annexure-XII for pre-commissioning and commissioning.**

8.7.6 Arrangement of all lubricants, instruments, reagents for carrying out trial run, commissioning and PG test.

8.7.7 Arrangement of all instruments, reagents, monitoring gadgets for monitoring, & lab facilities to carry out, pre-commissioning, trial run, commissioning, Performance guarantee test & till handover.

8.7.8 Monitoring gadgets, instruments and equipment's required for maintenance (till PG test & Plant Handover).

8.7.9 All personnel required during pre-commissioning, commissioning, trial run and PG Test / Demonstration test.

8.7.10 Trial run for requisite period.

8.7.11 Performance Guarantee testing. Refer Annexure-III (FUNCTIONAL GUARANTEE) for further details.

8.7.12 Bidder shall perform the guarantee parameters as per specification requirement to the satisfaction of owner. The exact modalities of verifying guarantee for the parameters indicated in the specification shall be finally as agreed with the owner during detailed engineering & mutually agreed.

8.7.13 During FAT of DCS, bidder will depute his concerned representative for technical support as and when required by customer / BHEL.

8.7.14 Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance. Bidder to refer relevant details for other information also.

8.7.15 Relevant requirements as per GTR, GCC, ECC & SCC.

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

8.7.17 Bidder to attend regular engineering meeting with BHEL and Customer fortnightly in BHEL or Customer office as decided during detail engineering. Vendor will depute his entire concerned engineering representatives along with the project manager for discussion and approval of engineering drawings/ documents during detailed engineering to meet project's various milestones and completion schedule, without any price implication to BHEL and Customer. Meeting can be held at site also.

8.7.18 Supply of all tools/ supporting tools/ items / equipment/ instruments required for performance guarantee test shall be bidder's scope. These shall remain the property of the BHEL/Customer after trial test/demonstration test/ PG test.

8.7.19 Successful bidder shall furnish detailed erection manual for each of the equipment as well as complete system supplier under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.

8.8 QUALITY PLAN (QP) REQUIREMENTS

Minimum QP requirements are specified as ANNEXURE -I. However, any additional comments as given by BHEL/Customer shall be adhered by the bidder without any commercial & delivery implication to BHEL. BHEL & customer reserves the right for inspection of imported items by BHEL/customer officials (if felt necessary). The same shall be decided during detail engineering during approval of QP's. The cost of third-party inspection for all components shall also be in bidder's scope.

8.9 SUB-VENDOR ITEMS

The sub vendor list (Annexure- II) enclosed is indicative only and is subject to BHEL and Customer approval during detailed engineering stage without any commercial & delivery implication to BHEL.

Bidder to propose sub vendor list with following back up documents within 4 weeks of placement of LOI/LOA. Thereafter no request for additional sub-vendor shall be entertained. The sub vendor list shall subject to BHEL and Customer approval during detailed engineering stage without any commercial & delivery implication to BHEL.

1) Documentation to show that the equipment /system has been supplied for a plant of similar or higher capacity.
2) End user performance certificate that the equipment/system has been operating satisfactorily for minimum one year as on the scheduled date of bid opening.

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

For approval of Sub vendor list proposed by bidder, meetings shall be arranged by BHEL in Customer office for which bidder representative along with sub supplier as desired by BHEL/Customer will attend the meetings.

8.10 ADDITIONAL SCOPE OF BIDDER AND DETAILS

i. Charging platform for all the chemical tanks along with required handrails, accessories etc. Permanent ladder (not rungs) for approaching the top of tanks, valves for All steel inserts plates with lugs, plates, bolts, nuts, sleeves, edge angles and all other embedding components etc as required to grout in civil works and to support/hold the equipment's for opening/maintenance purpose, shall be in bidder's scope.

ii. Manholes/Hand Holes: All the pressure vessels and horizontal type storage tanks shall be provided with at least one manhole of 600 mm diameter. The vertical type storage tanks shall be provided with a manhole of 600 mm dia on the top cover, if the diameter of the tank is 1200 mm or more. For the vertical cylindrical atmospheric tanks, manholes shall be provided as per IS: 803.

iii. All the vessels and tanks shall be normally provided with a hand hole of 150 mm gasket located near the bottom of the straight side.

iv. All lined vessels connections shall be conformed to required class/rating. Nozzle material shall be ASTM-106 Grade B, Schedule 80.

v. All vessels of internal, diameter of 1200 mm or greater shall be provided with minimum four (4) lifting lugs for safe and effective handling during erection. Smaller vessels shall be provided with at least two (2) lifting lugs. Material of construction for these vessel supports, saddles, lugs shall conform to IS: 2062 of tested quality.

vi. The starting of pumps (wherever applicable) which are provided with forced water lubrication shall be interlocked with the availability of lube water by means of starting of lubrication water pumps, availability of adequate flow, pressure etc. The standby lubrication pump shall be started automatically during inadequate pressure or while tripping of working pump(s).

vii. Wrapping, coating and protection of all the buried pipe shall be as per IS 10221 or AWWA C 203.

viii. Diaphragm seal type instrument for Chemical (all type and concentration), corrosive, viscous fluids application.

ix. Instrumentation, valves etc. indicated in P & ID of Water treatment packages are bare minimum requirement; however, bidder has to provide complete system for trouble free operation meeting technical specification requirement.

x. All pipes, fittings etc. required for hand railing, platforms, and ladders shall be in the scope of bidder. All ladders shall be non-civil work. All insert plates, nuts and bolts, puddle pipes, counter flanges wherever applicable shall be in the scope of bidder. Supply and erection of Hand railing as desired for safety purpose will be in bidder's scope.

xi. Safety equipment for all water treatment packages shall be provided by bidder as per requirement included elsewhere in specification.

xii. Special tools and tackles as required for the system. All special tools necessary for proper maintenance or adjustment of the equipment packaged in permanent box.

xiii. All the first fill and one Year's topping requirements or 10 % of first fill quantity, whichever is more for consumable such as greases, oil, lubricants, servo fluids/control fluids, gases, reagent for analyzers and etc. which will be required to put the equipment covered under the scope of specifications, into successful commissioning / initial operation and to establish completion of facilities shall be furnished by the bidder. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum.

xiv. Initial charge of all lubricants & grease in bidder's scope.

xv. Instrument hook up material shall be in bidder's scope.

xvi. **Painting shall be as specified in "Surface Preparation & Painting" ANNEXURE-V** of this technical specification. Bidder to note that paint shed shall be finalized during detailed engineering as per customer & BHEL requirement and any variation in the painting schedule as finally approved by customer shall be taken care by bidder without any commercial and delivery implication.

xvii. Bidder shall also provide one final coat additionally of same DFT as specified in tender specification at site after completion of erection of each equipment / item.

xviii. Preparation of civil assignment drawings i.e. pedestals details; insert plates / embedment's plates required for supporting pipes and equipment etc. and review of civil drawing prepared by BHEL based on civil assignment drawing of bidder. In case any modification is required in the civil work already done based on civil inputs given by vendor, rework shall be done at the cost and risk of the vendor.

xix. All the sumps, tanks, reservoirs and other water retaining structures shall be provided by bidder with access ladders/rungs from operating platforms/ground level as the case may be and de-watering pits one for each section (civil work by BHEL).

xx. Preparation & submission of all drawings & documents as per drawing/documents requirement & distribution schedule enclosed as Annexure-IV.

xxi. Bidder to refer Annexure-XIII for drawing list of all water treatment packages.

xxii. Two sets of all special tools and tackles required for installation, commissioning, testing, calibration, modification and maintenance of equipment(s)/ system shall be supplied. One set of these tools and tackles shall be used during the installation, commissioning, testing, calibration, modification and maintenance. Another set consists of new and unused set of tools & tackles. These tools and tackles shall be separately packed, brought to site and handed over to customer.

xxiii. Supply of any tools/ supporting tools/ items / equipment required for Erection and Commissioning shall be bidder's scope. These shall remain the property of the BHEL/Customer after trial test/demonstration test/ PG test.

xxiv. Bidder to take care the length of piping as included elsewhere in specification of All Water Treatment packages, if not given any of the package bidder to consider pipe distances from plot plan. Pipe routing shall be decided during detailed engineering; Wherever pipes are running on pipe rack, Bidder will consider 12 m static head + 10% margin, in addition to the losses in straight length and bend in pipes and valves etc. while selection of pump head during detailed engineering.

xxv. Pipe racks shall be provided by BHEL wherever available. Wherever pipe racks are not available, pipes shall run on pedestals or below ground. All auxiliary structure & fixing items such as U clamps, nuts, bolts, channels, insert plates etc. required to lay the pipes on pedestals

shall be in bidder's scope of work. Wrapping, coating and protection of all the buried pipe is also in bidder's scope & shall be as per IS 10221.

- Buried piping shall be protected as under (as per IS-10221).
- Surface cleaning by wire brush, power tool cleaning etc.
- Apply one coat of coal tar/primer/enamel.
- Apply one layer of tape comprising of coal tar. Application of tape shall conform to AWWA C- 203/IS 10221 (Appendix-B) with Minimum thickness of tape as 4MM +10%.

xxvi. All steel inserts plates with lugs, rungs, ladder, puddle pipes, bolts, edge angle in desired shape, nuts, sleeves, and all other embedding components etc. as required to grout in BHEL civil works and to support/hold the equipment being supplied under this specification shall be in bidder's scope.

xxvii. The pipe sizes indicated in the tender specification/ P & I diagram are minimum. Wherever pipe sizes are not indicated, the same shall be selected based on the specification requirement and shall be subject to BHEL /customer approval during detailing engineering. All pipes shall be carbon steel unless exclusively mentioned.

xxviii. All necessary drains, vents and sampling points with valves as specified and as required are in bidder's scope. All above ground tanks /sumps shall have overflow and drain connections with isolation valves.

xxix. Manhole covers (Metallic) shall be in bidder's scope.

xxx. For Low pressure piping, based on the inside diameter so established, minimum thickness calculation shall be made asper ANSI B 31.1 OD. Manufacturing allowance shall be added to minimum calculated thickness and next higher standard thickness of pipes shall than be selected as per ANSI B 36.10/IS-1239 Heavy grade/IS-3589/ASTM-A-53/API-5L/ANSI B36.19 as the case may be. Alternatively, manufacturers standard thickness can also be accepted subject to that such thickness shall be equal to or more than the minimum calculated thickness after considering manufacturing allowance. Selected thickness then shall be checked for vacuum loading criterion as per the guidelines given in AWWA-M-11. However, in no case, the selected Thickness for various pipe sizes shall be less than the following for indicated Pipe Sizes as below:

- 200 NB - 6mm
- 250 NB – 6 mm
- 300 NB - 6 mm
- 350 NB- 6mm
- 400 NB- 6 mm
- 450 NB- 6 mm
- 500 NB- 6 mm
- 600 NB- 6mm
- 700 NB- 7mm
- 800 NB- 8 mm
- 900 Nb – 10 mm
- 1000 Nb – 10 mm
- 1100 Nb – 10mm
- 1200 Nb – 12 mm

xxxi. All motorized valves shall be provided with integral starter.

xxxii. The efficiency of all motor upto 50 kW shall be IE4 and above 50 kW it shall be IE3 minimum.

xxxiii. Wherever gravity is not possible or pumping is required at any stage to make the system complete for process requirement of supplier. Then, 2x100% pumps are in bidder along with all accessories, all instrumentation, valves, piping, motor, etc.

xxxiv. Edge angle required in proper shape for protection of edges in civil works shall be in bidder's scope.

xxxv. Finish paints for touch-up painting of equipment after erection at site in sealed container.

xxxvi. All necessary structural steel for pipe supporting structure, platforms, walkways / pathways and access stairs for mechanical plant and equipment, mechanical services and pipe work associated with water treatment packages.

xxxvii. Chain pulley block and Electric monorail hoist along with travelling trolley and trailing cable. Refer criteria given elsewhere in this specification.

xxxviii. Hangers and supports for all the piping as per the requirement shall be in bidder's scope.

xxxix. ISMC/ ISMB required to support Cable tray shall be supplied and erected by bidder.

xl. Start up, erection and commissioning spares and all spares as required for erection, commissioning and operation and maintenance till handing over of the complete plant.

xli. Complete piping (including interconnecting), all fittings, bends, tees, reducers, flanges, nuts & bolts, gaskets, specials, isolation valves, permanent strainers etc, supports, jointing etc, and any other work as required for the system.

xlii. Sufficient numbers of portable type ladders with plate form to be supplied for ease of maintenance.

xliii. During detailed engineering, bidder to furnish complete and detailed scheme in all respects including all valves, equipment's etc.as required for smooth, safe, efficient, trouble free operation and completeness of the respective packages, meeting the specification requirement.

xliv. All channels & brackets, mounting plates as required for mounting of motors, pumps, stirrers, tank etc. shall be in bidder's scope.

xlv. The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and dispatch release issued by BHEL/Customer.

xlvi. BHEL's/Customer's representative shall be given full access to the shop in which the equipment are being manufactured or tested and all test records shall be made available to him.

xlvii. Pump suction valves, re-circulation valves and discharge valves shall be provided with required limit switches for interlock & control.

xlviii. The starting of pumps (wherever applicable) which are provided with forced water lubrication shall be interlocked with the availability of lube water by means of starting of lubrication water pumps, availability of adequate flow, pressure etc. The standby lubrication pump shall be started automatically during inadequate pressure or while tripping of working pump(s).

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

l. The engineering for packages will essentially be done using Intelligent 3D modelling. Preparation of 3D modelling drawing shall be in bidder's scope for bidder's supplied and design engineered items/structures for turn key water treatment packages. **AVEVA E3D** is being used at BHEL's end for BHEL scope items hence bidder has to use same software for preparation of 3D drawings. Bidder has to submit 3D drawings in editable format for integration with BHEL's 3D drawings. Further detailing shall be shared by BHEL during detailed engineering.

li. Service water shall be available near to all WATER TREATMENT PLANTS area at approximately 1.5 to 2.0 Kg/ Cm2. Hence, bidder to take care for cooling/ lubrication of the pumps being supplied by the bidder under this technical specification. If service water pressure requirement is more than available pressure, bidder to consider cooling pump/lubrication pump as required.

lii. All drawings/documents shall be approved by BHEL/Customer during detailed engineering stage. Successful Bidder shall comply with the comment of the customer/BHEL without price & delivery implication.

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

liv. In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.

lv. All the vertical pumps shall be self-lubricated type.

lvi. Bidder shall indicate the constituents of the chemical's formulation used for the treatment.

lvii. Screen control cable is meant for electrical as well as signal/ instrumentation cables.

lviii. Apart from package specific design requirement indicated in this technical specification, design of various systems/ sub-systems and all equipment/ items will also strictly meet stipulations of General Technical Requirements of Customer's Technical Specification (refer section II) as relevant to Package.

lix. KKS numbering for all items/ equipment including electrical and control & instrumentation to be provided by bidder during detailed engineering.

lx. Bidder to adhere to Packing Procedure as per Annexure-VIII.

lxi. Bidder to adhere to Operation and Maintenance as per Annexure-XI.

lxii. Bidder to follow site storage and preservation guidelines as per Annexure-IX.

ANNEXURE - I

QUALITY PLAN
(COMMON FOR TG & SG)

Introduction to the Quality Assurance Specification

For fulfilment of the relevant clauses (Test and inspection) of the General Conditions of Contract and General Technical Requirements of Contract, the Quality Assurance Specification acts as a part of the Technical Specification and is included in the Contract.

This part of the Technical Specification shall be read in conjunction with other parts of the technical specifications, General Technical Requirements and Erection Conditions of the Contract.

This document specifies the quality requirements, to be detailed in terms of Tests/Checks/Procedures at the times of manufacturing, Testing, Inspection and also during installation of various Equipment / Components at the place of manufacturer and / or on the site.

Various standards referred in this document shall be the latest revisions.

The quality requirements are spelt out in the following ways;

1) Thorough description
2) In the form of tables

In either of the above two forms the test /checks / procedures are mentioned against particular item/ equipment/ component/ system etc.

This specification also contains the Indicative vendor list (with disclaimer) mentioned against particular item/ equipment/ component/ system etc.

The quality requirements specified in this document and also the vendor list are only indicative and not exhaustive.

LOW PRESSURE PIPING

PIPES, FITTINGS, BENDS, VALVES, COATING-WRAPPING, STRAINERS EXPANSION, JOINTS, TANKS, FASTENERS, LINING ETC.

	Tests/Check / Items / Components	Material Test	DPT/MPI / RT	Ultrasonic Test	WPS/ WQS/PQR	Hydraulic / Water Fill Test	Pneumatic Test	Assembly Fit up	Dimensions	Functional/operational Test	Other Tests	All Tests as per relevant Std	REMARKS
1	Pipes & Pipe Fittings	Y[a]	Y[b]			Y1			Y			Y	
2	Diaphragm Valves	Y[a]				Y[5]			Y		Y[6]		
3A	Cast Butterfly Valves (Low Pressure)					Y		Y	Y	Y	Y[7]		
	Body	Y[a]	Y[b]										
	Disc	Y[a]	Y[b]										
	Shaft	Y[a]	Y	Y[c]									
3B	Fabricated Butterfly Valves	**REFER NOTE 14**											
4	Gate/ Globe/Swing Check / Ball Valves	Y[a]	Y[b]	Y[c]		Y[5]	Y	Y	Y	Y	Y[8]		
5	Dual Plate Check Valves	Y[a]	Y[b]	Y[c]		Y	Y	Y	Y	Y	Y[4]		
6	Rolled & Welded Pipes and Mitre Bends	Y[a]	Y[3]		Y	Y[3]			Y		Y[3&15]	Y	
7	Coating & Wrapping of Pipes	Y[2]									Y[2]		
8	Tanks & Vessels	Y[a]	Y[b]		Y	Y			Y		Y[16]		
9	Strainers	Y[a]	Y[b]		Y #	Y					Y[11]		#For Fabricated Strainer
10	Rubber Expansion Joints	Y[a]				Y[12]		Y	Y		Y[13]		
11	Internal Lining of Pipes	Y[a]							Y		Y[9]		
12	Site Welding		Y[10]		Y	Y							

NOTES (MEANING OF SUPERSCRIPTS)

a	One per heat/heat treatment batch/lot.
b	On machined surfaces only for castings and on butt welds.
c	For shaft/spindles > or = 40 mm
1	100% Hydraulic test shall be carried out. Weld joints not subjected to hydraulic test due to some unavoidable reasons, shall be subjected to 100% RT/PAUT.
2	Spark Test, Adhesion Test and Material Test for primer and enameled & Coal Tar Tapes as per AWWA-C-203-91/ IS-10221 & IS 15337 as applicable.
3	Followings are the testing requirements for fabrication of pipes at site

TESTS	**QUANTUM OF CHECKS**
WPS, PQR, Welder Qualification Test	100% Welders and WPS shall be qualified as per ASME- section IX
DPT on root run	100% for pipes up to 1200 mm diameter
DPT after back gauging	100% for pipes above 1200 mm diameter
RT / UT by (TOFD/PAUT) Technique	5% (100% of T Joints)
DPT on finished butt weld joints	10%

	Hydraulic Test	100%, 1.5 times the design pressure or 2 times the working-pressure whichever is higher.
4	Dry Cycle Test on Dual Plate Check valve spring for one lakh Cycles shall be carried out as a type test. If Dry Cycle test carried out earlier for same material & diameter, Test report shall be reviewed.	
5	Seat Leakage Test for Actuator Operated Valves, shall be done with by closing the valves with actuator.	
6	Tests on rubber parts shall be conducted per batch of rubber mix for tensile, Elongation, hardness, adhesion, spark test, bleed resistance test. In addition, type test for 50,000 cycles of each type of diaphragm shall also be conducted.	
7	Hydraulic Test of Body, Seat and disc-strength shall be carried out in accordance with governing design standard in presence of owner / owner's representatives. Actuator operated valves shall be checked for Seat Leakage by closing the valves with actuator. For Proof of Design Test refer respective chapters of engineering portion in the technical specification.	
8	Blue matching, wear travel for gates, valves, pneumatic seat leakage, and reduced pressure test for check valves shall be done as per relevant standard. Maximum allowable vacuum loss is 0.5 mm of Hg abs. for valves to be tested for vacuum operation for internal pressure 25 mm of Hg abs. for a period of 15 minutes. Fire safe test for ball valve shall be done wherever specified. In case of already carried out, the test report shall be submitted for review and acceptance by owner / owner's representatives. Valves shall be offered for hydro test in unpainted condition.	
9	Tensile, Elongation, Hardness, Specific Gravity, Lining Thickness, Humidity Check, Pipe temperature check, Adhesion Test and Holiday Detection Test etc as per applicable standard shall be done for all lining material and application.	
10	10% of welds (Root and finished welds) shall be subjected to DPT. (100% DPT for compressed air line and boiler & deaerator fill line.).	
11	Pressure drop across the strainer for each type and size as a special test shall be carried out. In case of already carried out, the test report shall be submitted for review and acceptance by owner / owner's representatives.	
12	During hydraulic and vacuum tests at 25mm Hg abs in 3 positions, the change in the circumference of arch should not be more than 1.5%. 24 hrs after the test permanent set in dimension should not exceed 0.5%.	
13	Tests on rubber for tensile, elongation, hardness, hydraulic stability check as per ASTM D 471, ozone resistance test as per ASTM D 1149/IS 3400 Part 20 aging test and adhesion strength of rubber to fabric, rubber to metal adhesion shall be carried out.	
14	In addition of all tests as indicated for Cast Butterfly valve being applicable for fabricated butterfly valves, following test shall be done for Fabricated Butterfly Valve: a. UT as per ASTM A-435/IS 11630 & IS 4225 on plate material for body and disc shall be carried out for plate thickness 25mm and above. b. 100% RT and DPT as per ASTM, Section-VIII, Division-I, on butt joins of body and disc. 10% DPT on other welds shall be done. c. Post weld heat treatment as per ASME, Section-VIII, Division-I on butt joints of body and disc. d. Welders and WPS shall be qualified as per ASME- section IX	
15	Maximum number of segments in segmental flanges shall be four (04) only. All butt weld joints in the segmental flanges shall be examined by RT/UT. Segmental flanges exceeding 37.5 mm thickness shall be stress relieved as per norms of ASME Section VIII after welding.	
16	For pressure vessel welds RT shall be done as per design code requirements.	

All Valves shall be offered for inspection in unpainted condition.

No repair welding is permitted on Cast Iron / Alloy Cast Iron Castings.

RAW WATER PIPING

PIPES, FITTINGS, BENDS, VALVES, COATING-WRAPPING, STRAINERS EXPANSION, JOINTS, TANKS, FASTENERS, LINING ETC.

	Tests/Check / Items / Components	Material Test	DPT/MPI / RT	Ultrasonic Test	WPS/ WQS/PQR	Hydraulic / Water Fill Test	Pneumatic Test	Assembly Fit up	Dimensions	Functional/operational Test	Other Tests	All Tests as per relevant Std	REMARKS
1	Pipes & Pipe Fittings	Y[a]	Y[b]			Y1			Y			Y	
2	Diaphragm Valves	Y[a]				Y[5]			Y		Y[6]		
3A	Cast Butterfly Valves (Low Pressure)					Y		Y	Y	Y	Y[7]		
	Body	Y[a]	Y[b]										
	Disc	Y[a]	Y[b]										
	Shaft	Y[a]	Y	Y[c]									
3B	Fabricated Butterfly Valves	**REFER NOTE 14**											
4	Gate/ Globe/Swing Check / Ball Valves	Y[a]	Y[b]	Y[c]		Y[5]	Y	Y	Y	Y	Y[8]		
5	Dual Plate Check Valves	Y[a]	Y[b]	Y[c]		Y	Y	Y	Y	Y	Y[4]		
6	Rolled & Welded Pipes and Mitre Bends	Y[a]	Y[3]		Y	Y[3]			Y		Y[3&15]	Y	
7	Coating & Wrapping of Pipes	Y[2]									Y[2]		
8	Tanks & Vessels	Y[a]	Y[b]		Y	Y			Y		Y[16]		
9	Strainers	Y[a]	Y[b]		Y #	Y					Y[11]		#For Fabricated Strainer
10	Rubber Expansion Joints	Y[a]				Y[12]		Y	Y		Y[13]		
11	Internal Lining of Pipes	Y[a]							Y		Y[9]		
12	Site Welding		Y[10]		Y	Y							

	NOTES (MEANING OF SUPERSCRIPTS)
a	One per heat/heat treatment batch/lot.
b	On machined surfaces only for castings and on butt welds.
c	For shaft/spindles > or = 40 mm
1	100% Hydraulic test shall be carried out. Weld joints not subjected to hydraulic test due to some unavoidable reasons, shall be subjected to 100% RT/PAUT.
2	Spark Test, Adhesion Test and Material Test for primer and enameled & Coal Tar Tapes as per AWWA-C-203-91/ IS-10221 & IS 15337 as applicable.
3	Followings are the testing requirements for fabrication of pipes at site

	TESTS	QUANTUM OF CHECKS
	WPS, PQR, Welder Qualification Test	100% Welders and WPS shall be qualified as per ASME- section IX
	DPT on root run	100% for pipes up to 1200 mm diameter
	DPT after back gauging	100% for pipes above 1200 mm diameter
	RT / UT by (TOFD/PAUT) Technique	5% (100% of T Joints)
	DPT on finished butt weld joints	10%
	Hydraulic Test	100%, 1.5 times the design pressure or 2 times the working-pressure whichever is higher.
4	Dry Cycle Test on Dual Plate Check valve spring for one lakh Cycles shall be carried out as a type test. If Dry Cycle test carried out earlier for same material & diameter, Test report shall be reviewed.	
5	Seat Leakage Test for Actuator Operated Valves, shall be done with by closing the valves with actuator.	
6	Tests on rubber parts shall be conducted per batch of rubber mix for tensile, Elongation, hardness, adhesion, spark test, bleed resistance test. In addition, type test for 50,000 cycles of each type of diaphragm shall also be conducted.	
7	Hydraulic Test of Body, Seat and disc-strength shall be carried out in accordance with governing design standard in presence of owner / owner's representatives. Actuator operated valves shall be checked for Seat Leakage by closing the valves with actuator. For Proof of Design Test refer respective chapters of engineering portion in the technical specification.	
8	Blue matching, wear travel for gates, valves, pneumatic seat leakage, and reduced pressure test for check valves shall be done as per relevant standard. Maximum allowable vacuum loss is 0.5 mm of Hg abs. for valves to be tested for vacuum operation for internal pressure 25 mm of Hg abs. for a period of 15 minutes. Fire safe test for ball valve shall be done wherever specified. In case of already carried out, the test report shall be submitted for review and acceptance by owner / owner's representatives. Valves shall be offered for hydro test in unpainted condition.	
9	Tensile, Elongation, Hardness, Specific Gravity, Lining Thickness, Humidity Check, Pipe temperature check, Adhesion Test and Holiday Detection Test etc as per applicable standard shall be done for all lining material and application.	
10	10% of welds (Root and finished welds) shall be subjected to DPT. (100% DPT for compressed air line and boiler & deaerator fill line.).	
11	Pressure drop across the strainer for each type and size as a special test shall be carried out. In case of already carried out, the test report shall be submitted for review and acceptance by owner / owner's representatives.	
12	During hydraulic and vacuum tests at 25mm Hg abs in 3 positions, the change in the circumference of arch should not be more than 1.5%. 24 hrs after the test permanent set in dimension should not exceed 0.5%.	
13	Tests on rubber for tensile, elongation, hardness, hydraulic stability check as per ASTM D 471, ozone resistance test as per ASTM D 1149/IS 3400 Part 20 aging test and adhesion strength of rubber to fabric, rubber to metal adhesion shall be carried out.	
14	In addition of all tests as indicated for Cast Butterfly valve being applicable for fabricated butterfly valves, following test shall be done for Fabricated Butterfly Valve: a. UT as per ASTM A-435/IS 11630 & IS 4225 on plate material for body and disc shall be carried out for plate thickness 25mm and above. b. 100% RT and DPT as per ASTM, Section-VIII, Division-I, on butt joins of body and disc. 10% DPT on other welds shall be done. c. Post weld heat treatment as per ASME, Section-VIII, Division-I on butt joints of body and disc. d. Welders and WPS shall be qualified as per ASME- section IX	
15	Maximum number of segments in segmental flanges shall be four (04) only. All butt weld joints in the segmental flanges shall be examined by RT/UT. Segmental flanges exceeding 37.5 mm thickness shall be stress relieved as per norms of ASME Section VIII after welding.	
16	For pressure vessel welds RT shall be done as per design code requirements.	

All Valves shall be offered for inspection in unpainted condition.

No repair welding is permitted on Cast Iron / Alloy Cast Iron Castings.

WATER SYSTEM EQUIPMENT

Items / Components \ Tests/Check		Material Test	DPT/MPI	Ultrasonic test	RT	Balancing	Hydraulic / Water Fill test	Pneumatic Test	Assembly/ fit up	Dimensions	Functional/operational Test	Performance Test	Other Test	All Test as per relevant Std/ Approved Data Sheets	Remarks
A.	**VT PUMPS & CENTRIFUGAL PUMPS (HORIZONTAL / VERTICAL), SUMP PUMPS, SUBMERSIBLE PUMPS, DRAINAGE PUMP**								Y[1]	Y		Y[2]			
1	Shaft	Y[a]	Y[b]	Y[c]		Y				Y					
2	Impeller	Y[a]	Y[b]		Y[3]	Y							Y[d]		
3	Suction Bell / Bowl Castings/ Inserts	Y[a]	Y[b]				Y			Y			Y[6]		
4	Discharge Head / Column Pipes / Distance Piece/Base Plate	Y[a]	Y[b]	Y[c]	Y[4]		Y		Y						
5	Companion Flanges	Y[a]	Y[b]	Y[c]	Y[5]				Y						
5	Thrust Bearing (Tilting Pad type)	Y[a]	Y	Y					Y	Y				Y	
B.	**RE JOINTS**	Y[a]					Y[10]		Y	Y			Y 11		
C.	**CRANES & HOISTS**	**REFER BELOW FOR QA CHECKS ON EOT CRANES AND HOISTS**													
E.	**VENTILATION FANS**									Y		Y		Y	
1)	Hub/Blades/Casing /Impeller	Y	Y			Y									
2)	Shaft	Y[a]	Y	Y[c]											
3)	Pre/Fine Filters												Y 14		

Notes:

a	One per Heat/ Heat Treatment Batch/ Lot.
b	On machined surfaces only for Castings / Forgings and on Welds of Fabricated Components.
c	For Shaft diameter. ≥ 50 mm and for plate thickness ≥ 25 mm
d	Inter Grannular Corrosion (IGC) Test shall be carried out on SS Castings.
1	Trial assembly of all Vertical Turbine Pump components with Column Pipes, Discharge Head, and Motor Stool shall be carried at shop.
2	Performance testing of Pumps shall be carried out at shop, as per HIS standard to determine Head & Flow Characteristics.
3	In case of pump impellers, Radiographic Examination shall be conducted as per ASTM E186/446 with Severity Level 2 for Gas porosity, Level 3 for Sand, Slag and Shrinkage. Cracks, Inserts and Mottling are not acceptable. Radiographic Examination should cover Vanes, Vane Junctions, Full Radial depth of Hub & other accessible areas of the rest of the Impeller.
4	Random 10% RT to be conducted on butt welds for Thk ≥ 10 mm & ≤ 25 mm and 100% RT to be conducted on butt welds for Thk > 25 mm (RT may be replaced by Ultrasonic Test due to constraint if any.) Stress relieving shall be carried out as per norms of ASME Section VIII.
5	Segmental Flanges exceeding 37.5 mm thickness shall be stress relieved after welding. All butt weld joints in segmental flange shall be examined by Radiographic Test. (RT may be replaced by Ultrasonic Test due to constraint if any.) Maximum number of segments shall be 4 only.
6	No repair welding is permitted on Cast Iron / Alloy Cast Iron Castings.
7	Hydraulic Test of Body, Seat and Disc strength shall be carried out in accordance with latest edition of AWWA C-504. Actuator operated Valves shall be checked for Seat Leakage by closing the Valve with Job Actuator. Seat Leakage test shall be carried out in both directions.
8	For Proof of Design Test refer respective chapters of engineering portion in the technical specification.
9	For Butterfly Valves of Fabricated construction (Sizes 600mm and above), butt Welds of thickness 20mm & above shall be subjected to 100% Radiography and Components shall undergo stress relieving.
10	During Hydraulic & Vacuum test at 30 mm Hg absolute in 3 different positions, the change in Circumference of the Arch should not be more than 1.5%. Permanent Set, after 24 hours of the test, should not exceed 0.5% of Arch.
11	Tests on Rubber for Tensile, Elongation, Hardness, Hydraulic Stability as per ASTM D-471, Ozone Resistance test as per ASTM D-1149, Aging test, Adhesion strength of Rubber to Fabric and Rubber to Metal shall be carried out.
14	Type / Routine tests as per requirements of BS-6540/ ASHRAE-52-76 for Dust arrestance shall be carried out.

Notes:

1. This is an indicative list of tests / checks. The manufacturer is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.
2. Make of all major Bought Out Items will be subject to NTPC approval.
3. Temperature rise test reports for diode plates with actual heat sink will be verified.

*. CRCA Galvanized steel with metal coating composed of Al (55%), Zn (43.4%) & Si (1.6%),

MOTOR

TESTS/CHECKS / TEMS/COMPONENTS	Visual	Dimensional	Make/Type/Rating /General Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-4722 /IS- 9283/IS 2148/IEC60034\IEC 60079-I/ IS-12615	Vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion
Plates for stator frame, end shield, spider etc.	Y	Y	Y	Y	Y				Y										
Shaft	Y	Y	Y	Y	Y	Y			Y										
Magnetic Material	Y	Y	Y	Y			Y			Y		Y							
Rotor Copper/Aluminium	Y	Y	Y	Y			Y		Y										
Stator copper	Y	Y	Y	Y			Y		Y			Y							
SC Ring	Y	Y	Y	Y	Y		Y	Y	Y										
Insulating Material	Y		Y	Y			Y					Y							
Tubes, for Cooler	Y	Y	Y	Y	Y				Y		Y								
Sleeve Bearing	Y	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	Y										
Wound stator	Y	Y					Y	Y											
Wound Exciter	Y	Y					Y	Y											
Rotor complete	Y	Y					Y						Y	Y					
Exciter, Stator, Rotor, Terminal Box assembly	Y	Y					Y												

Accessories, RTD, BTD, CT, Space heater, antifriction bearing, gaskets etc.	Y	Y	Y																
Complete Motor	Y	Y	Y												Y	Y	Y	Y1	Y

Note:

1. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, following methodology to be followed for Inspection Categorization:

Note for LT Motor:

i) Motor rating up to 50 KW: Inspection CAT- III : Acceptance of Motor up to 50 KW is based on COC of the Manufacturer and Main Contractor confirming as follows:
"It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequen torque, starting KVA/KW, temperature rise, distance between center of stud gland plate and tested in accordance with approved drawing /data sheets."

ii) Motor rating above 50 KW & less than 75 KW: Inspection CAT- II as per NTPC approved MQP: Acceptance of Motor rating above 50 KW & less than 75 KW is based Test inspection report as per IS:12615 - 2018 (including latest revision) duly witnessed by main contractor along with COC of the Manufacturer and Main Contractor confirmin "It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage frequen torque, starting KVA/KW, temperature rise, distance between center of stud gland plate, space heater and tested in accordance with approved drawing /data sheets."

iii) Motor rating 75 KW & above: Inspection CAT-I: As per NTPC approved MQP.

2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard
3. Makes of major bought out items for HT motors will be subject to NTPC approval.
4. Y1 = for HT Motor / Machines only.
5. For LT Motors, stator core stack length & grade, no load loss and winding resistance w.r.t. type tested motor for IE3/IE4 shall be checked/verified in additi Compliance of relevant standard IS:12615/IEC requirement. In case actual results are not within the tolerance limit as declared by manufacturer during QP s the motor shall be subjected to efficiency test.

VFD MODULE

ATTRIBUTES / CHARACTERISTICS ITEMS/COMPONENTS, SUB SYSTEM ASSEMBLY	Visual & Dimensional checks	Make / Type / Rating etc.	Final Inspection as ISS / IEC	Remarks
HT Breaker (IEC 56)	Y	Y	Y	
DC Reactor	Y	Y		
Transformer	Y	Y		For details refer table for LT Indoor Transformer & Auxiliary Transformer
Motor	Y	Y		For details refer separate table for Motor
VFD Panel	Y	Y		For details refer table for VFD Panel

Note : 1) This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed alongwith relevant supporting documents during QP finalization.

2) Make of all major Bought Out Items will be subject to NTPC approval.

VFD PANEL

Attributes / Characteristics Item Components / Sub System Assembly	Electrical Properties	Mechanical Properties	Chemical Properties	Dimensions / Finish	Type/ Rating/Functional check	HV/IR	Routine test as per relevant std.	Constructional Features	IS:6005 ,Seven tank process	Paint finish/ shade/thickness	Mountings / BOM/ Make, Completeness	Interlock Functional & Operation Testing / Simulation check	Degree of Protection Test	Final testing as per Relevant IS/IEC
Sheet Steel (IS-513)		Y	Y	Y										
Aluminum / Copper Bus-bar(IS-5082/IS-613/IS-1987)	Y	Y	Y	Y										
Support Insulator (BS-2782/IEC-660/IS-10912)	Y	Y	Y	Y										
Control / Selector Switch(IS-6875)					Y	Y	Y							
Contactor/ MCB(IS-13947)					Y	Y	Y							
O/L Protection relays(IS-3231)					Y		Y							
C.T /V.T/ Indicating Meter(IS-2705/3156/1248)					Y	Y	Y							
Fuse/ Fuse carrier(IS-13703)					Y	Y	Y							
Terminals/lugs/pvc wires(IS-13947//IS-694)	Y			Y	Y	Y	Y							
Timers(IS-3231)					Y	Y	Y							
Push Button/ Lamp/ (IS-6875)					Y	Y	Y							
Control Transformer (IS-12021)					Y	Y	Y							
Mimic, Annunciater					Y		Y							
GASKET(IS-11149)		Y	Y	Y	Y		Y							
Fabrication								Y						
Pretreatment & Painting									Y	Y				
VFD panel										Y	Y	Y	Y	Y

NOTE:

1. This is an indicative list of Test/ Checks. The manufacturer to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.
2. All major Bought Out Items will be subject to NTPC approval.

MEASURING INSTRUMENTS **Page- 1/2**

Item Components Sub System Assembly	Attributes Characteristics								
	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (As applicable)(R)	Hydro Test(R)	Material Test certificate ®
1. PR Gauge (IS-3624)	Y	Y	Y	Y	Y				
2. Temp. Gauge (BS-5235)	Y	Y	Y	Y	Y				
3. Pr./D.P.Switch(BS-6134)	Y	Y	Y	Y	Y	Y			
4. Electronic Transmitter(IEC-60770)	Y	Y	Y	Y	Y	Y			
5. Temp. Switch	Y	Y	Y	Y	Y	Y			
6. Electrical Metering Instrument (IS-1248)	Y	Y	Y	Y	Y	Y			
7. Transducer (IS-14570)	Y	Y	Y	Y	Y	Y			
8. Thermocouples (IEC – 584 / ANSI-MC-96.1)	Y	Y	Y	Y	Y	Y			
9. RTD(IS-2848)	Y	Y	Y	Y	Y	Y			
10. Thermowell	Y		Y				Y	Y	Y

R-Routine Test A- Acceptance Test Y – Test applicable

Note: **1)** This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.

MEASURING INSTRUMENTS **Page- 2/2**

Item Components Sub System Assembly	Attributes Characteristics												
	GA, Dimensions, Paint Thickness (P)	Make, Model, Type, Rating	Process / Electrical connection (R)	Calibration/Functional (R)	Requirement as per standard (R)	WPS approval (A)	Non-destructive testing (R)	Calculation for accuracy (R)	HV/ IR Test (R)	IBR Certification as applicable (R)	Hydro test (R)	Material test certificate (A)	Integral Testing of complete
11. Orifice plate(BS-1042)	Y	Y	Y	Y *	Y	Y **	Y **			Y	Y **	Y	
12. Flow nozzle(BS-1042)	Y	Y	Y	Y *	Y	Y	Y			Y	Y	Y	
13. Impact head type element	Y	Y	Y					Y				Y	
14. Electronics Water Level Indicator (EWLI)	Y	Y	Y		Y		Y		Y	Y	Y	Y	Y
15. Flue Gas & Ambient Air Analysers	Y	Y	Y	Y					Y				Y
16- SWAS System with Analyser & Chiller#	Y	Y	Y	Y			Y		Y	Y	Y	Y	Y

R-Routine Test A- Acceptance Test Y – Test applicable

*Calibration to be carried out on one flow element of each type and size if calibration carried out as type test same shall not be repeated.
** As applicable
#Vaccuminasation test of chiller assembly

Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted along with relevant supporting documents.

INSTRUMENTATION CABLE

TESTS / ITEMS	Conductor Resistance ® & (A)	High Voltage ® & (A)	Insulation Resistance ® & (A)	Constructional detail, dimensions (A)	Outer-Sheathe/core marking, end sealing (A)	Thermal Stability (A) +	Visual, Surface finish (A) +	Electrical Parameters ** (A) +	Persulphate Test (A) +	Overall/Coverage/Continuity (A)	Swidesh chimney Test (SS-4241475) (A) ++	FRLS Test * (A) ++	Tensile & Elongation before & after aging (A) ++	Vol. Resistivity. at room & Elevated Temp. (A) ++	Spark test report review ®
1. Instrument cable twisted and shielded															
Conductor(IS-8130)	Y			Y			Y								
Insulation(VDE-207)				Y	Y	Y	Y						Y		Y
Pairing/Twisting				Y	Y		Y								
Shielding				Y			Y			Y					
Drain wire	Y			Y			Y		Y	Y					
Inner Sheath				Y	Y	Y	Y					Y	Y		
Outer Sheath				Y	Y	Y	Y					Y	Y		
Over all cable	Y	Y	Y	Y	Y		Y	Y			Y			Y	
Cable Drums(IS-10418)				Y			Y								

Note : High Temp. cables shall be subjected to tests as per VDE-207(Part-6) Compensating cables shall be checked for Thermal EMF/Endurance test as per IS 8784.

Note : This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating his practice & Procedure along with relevant supporting documents during QP finalization for all items.

Note : ® - Routine Test A - Acceptance Test Y - Test Applicable

Note : Sampling Plan for Acceptance test shall be as per IS 8784 (As applicable)

- * FRLS Tests: Oxygen / Temp Index (ASTM D-2863), Smoke Density Rating (ASTM – D 2843), HCL Emission (IEC-754-1)
- ** Characteristic Impedance, Attenuation, Mutual Capacitance, Cross Talk (As applicable)

\+ Sample size will be One No. of each size/type per lot.

++ Sample size will be One No. sample for complete lot offered irrespective of size/type.

CONTROL VALVE ACTUATORS AND ACCESSORIES.

TESTS / ITEMS	MAKE,MODEL, TAG (R)	DIMENSION®	SURFACE FINISH®	HEAT TREATMENT®	MATERIAL TEST CERTIFICATES®	IBR CERTIFICATES®	HYDRAULIC TEST , SEAT LEAKAGE ®	UT/RADIOGRAPHY FOR >900 LB RATING®	MPI/DP®	PRESSURE RESISTANCE®	TIMING OPEN/CLOSE®	LINEARITY/HYSTERISIS®	FUNCTIONAL TEST, REVIEW FOR MAKE AND TC OF ACCESSORIES®
CONTROL VALVE AND ACTUATOR													
OVERALL	Y	Y	Y			Y	Y				Y	Y	Y
BODY		Y	Y	Y	Y			Y	Y	Y			
BONNET		Y	Y	Y	Y								
TRIM		Y			Y			Y*					
PNEUMATIC ACTUATOR	Y	Y								Y			
ELECTRO PNEUMATIC POSITIONER	Y												Y

R- ROUTINE TEST A - ACCEPTANCE TEST Y - TEST APPLICABLE

Y* - UT ON SPINDLE DIA >= 40 MM.

NOTE : 1) THIS IS AN INDICATIVE LIST OF TESTS/CHECKS. THE MANUFACTURE IS TO FURNISH A DETAILED QUALITY PLAN INDICATING HIS PRACTICE & PROCEDURE ALONG WITH RELEVANT SUPPORTING DOCUMENTS DURING QP FINALISATION FOR ALL ITEM.

ELECTRICAL ACTUATOR WITH INTEGRAL STARTER

Test/Attributes Characteristics ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING	RPM ®	No Load Current ®	IR & HV Test®	Mounting Dimension®	All routine Test as per Standard & Specification®	Correct Phase Sequence®	Operation & Setting of limit Switch/Torque Switch®	Stall Torque/Current (A)	Hand Wheel operation/ Auto de clutch function (A)	Function of Aux. like Potentiometer, space heater, position indicator ®	EPT output ®	Local/ Remote (Open-Stop-Close) Operation®	Safety check (Single phasing, Phase correction, Tripping etc.) (A)
ELECTRICAL ACTUATOR with Integral Starter , Non- Intrusive Electrical Actuator (EN15714-2)													
Motor	Y	Y	Y	Y	Y								
Final Testing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: 1) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the practices and procedure adopted along with relevant supporting documents.

- SIL 2 certificate if applicable

® - Routine Test (A) - Acceptance Test Y - Test applicable

Process, Connection & piping FOR C&I SYSTEMS

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

*-applicable for painted junction boxes.

Note: R-Routine Test A- Acceptance Test Y – Test applicable

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

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
	PROJECT:		PO NO.:	DATE:
	ITEM: AC ELECT. MOTORS UPTO 50KW(415V)	SYSTEM:	SECTION: II	SHEET 1 of 2

S. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY				REMARKS
1	2	3	4	5	6		7	8	9	*	**			
					M	C/ N				D	M	C	N	
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	-	MFG. SPEC.	MFG. SPEC.	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	VISUAL	100%	-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	LOG BOOK		P	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	-	MFG.SPEC./	MFG.SPEC.	LOG BOOK		P	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	-	MFG. SPEC/ APPROVED DATASHEET	MFG. SPEC/ APPROVED DATASHEET	LOG BOOK	✓	P	V	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST	MA	VISUAL	100%	-	IS-325 / IS-12615/ APPROVED DATA SHEET	IS-325 / IS-12615/ APPROVED DATA SHEET	TEST/ INSPN. REPORT	✓	P	V *	-	* NOTE -1
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	-	APPROVED DRG/ DATA SHEET	APPROVED DRG/ DATA SHEET	TEST/ INSPN. REPORT	✓	P	V *	-	* NOTE -1 & NOTE-2

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	HEMA KUSHWAHA	HEMA KUSHWAHA	Checked by:		KUNAL GANDHI		
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	RITESH KUMAR JAISWAL		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

THIS IS PART OF TECHNICA... DOC. NO. ... 01-A502 Rev 0

		3.NAMEPLATE DETAILS	MA	VISUAL	100%	-	IS-325 / IS-12615 / APPROVED DATA SHEET	SAME AS COL. 7	TEST/ INSPN. REPORT	✓	P	V	-	
4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL	100%	100%	AS PER MFG. STANDARD / (#)	AS PER MFG. STANDARD / (#).	INSPC. REPORT	✓	P	W	-	(#) REFER NOTE-8

NOTES:
1. Routine tests on 100% motors shall be done by the vendor. However, BHEL/ Customer shall witness routine tests on random samples. The sampling plan shall be mutually agreed upon.
2. For exhaust/ventilation fan motors of rating up to 1.5 KW, only routine test certificates shall be furnished for scrutiny.
3. In case test certificates for these tests on similar type, size and design of motor from independent laboratory are available, the same is valid for 5 years.
4. BHEL reserves the right to perform repeat test, if required.
5. After packing and prior to issue MDCC, photographs of items to be despatched shall be sent to BHEL for review.
6. In case of any changes in QP commented by customer at contract stage, same shall be carried out by bidder without any implication to BHEL/ Customer.
7. Project specific QP to be developed based on customer requirement.
8. For export job, BHEL technical specification for seaworthy packing to be followed.
9. Packing shall be suitable for storage at site in tropical climate conditions.
10. Latest revision/ year of issue of all the standards (IS/ ASME/ IEC etc.) indicated in QP shall be referred.

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, B: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **C**: CUSTOMER,
P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE
MA: MAJOR, **MI**: MINOR, **CR:** CRITICAL
D: DOCUMENTATION

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	HEMA KUSHWAHA	HEMA KUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

THIS IS PART OF TECHNIC
97-501-A502 Rev 0

BHEL	MANUFACTURER'S NAME & ADDRESS :		QUALITY PLAN				PROJECT					
			ITEM: CHEMICAL DOSING SYSTEM		QP.NO :			PACKAGE	CHEMICAL DOSING SYSTEM			
			SUB - SYSTEM : CHEMICAL DOSING SYSTEM		REV. :	0		CONTRACT NO.				
					DATE :			MAIN SUPPLIER	BHEL/PEM, NOIDA			
					PAGE :	1 OF 4						

S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/ METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY**			REMARKS
									M	B	N	
1	2	3	4	5	6	7	8	9	10			11
1.0	**WELDER'S QUALIFICATION**											
1.1	WELDING PROCEDURE SPECIFICATION (WPS)	CORRECTNESS	MA	SCRUTINY	100%	ASME IX	ASME IX	QW 482	P	V	V	
1.2	WELDER PERFORMANCE & PROCEDURE QUALIFICATION RECORD	WELD SOUNDNESS & WELDING PERFORMANCE	MA	PHYSICAL TEST	ASME IX	ASME IX	ASME IX	QW 483 & QW 484	P	V	V	
2.0	**TANKS**											
2.1	**RAW MATERIAL :**											
2.1.1	PLATE	CHEMICAL.& PHY. PROPERTIES	MA	CHEM &.PHY TEST	1/PLATE/HT BATCH	ASTM A 240 GR.TP 304	ASTM A 240 GR.TP 304	MFG.TC/LAB REPORT	P	V	V	IDENTIFICATION BY BHEL
		IGC TEST	MI	IGC TEST	1/PLATE/HT BATCH	ASTM A 262 PR.'E'	ASTM A 262 PR.'E'					
2.1.2	PIPE FOR NOZZLE	CHEMICAL.& PHY. PROPERTIES	MA	CHEM.& PHY.TEST	1/HT BATCH/SIZE	ASTM A 312 GR.TP 304	ASTM A 312 GR.TP 304	MFG.TC/LAB REPORT	P	V	V	
		MICRO STRUCTURE	MI	GRAIN STRUCTURE	1/HT BATCH/SIZE	FOR HEAT TREATMENT	FOR HEAT TREATMENT	MFG.TC/LAB REPORT	P	V	V	
		IGC TEST	MI	IGC TEST	1/HT BATCH/SIZE	ASTM A 262 PR.'E'	ASTM A 262 PR.'E'	MFG.TC/LAB REPORT	P	V	V	
		HYDRO TEST	NA	LEAKAGE	100%	NO LEAKAGE	NO LEAKAGE	MFG. TC/IR	P	V/W	V	REFER NOTE 4
2.1.3	FLANGES FOR TANKS	CHEMICAL & PHY PROPERTIES	MA	CHEM & PHY TEST	1/HT BATCH	ASTM A 182 GR. F 304	ASTM A 182 GR. F 304	MGF.TC/LAB REPORT	P	V	V	
2.2	**IN PROCESS**											
2.2.1	DISHED ENDS	DIMENSIONS	MA	MEASUREMENT WITH TEMPLATE	100%	APPD.DWG.(BY BHEL)	APPD.DWG.(BY BHEL)	MFG.TC./LAB REPORT	P	V	V	
		SURFACE DEFECTS ON WELDMENTS		DP TEST	100%	ASTM E 165	NO SURFACE DEFECTS	MFG.TC	P	V	V	
2.3	**FINAL ASSEMBLY FOR TANKS:**	DIMENSIONS &	MA	MEASUREMENT	100%	APPD.DWG.(BY BHEL)	APPD.DWG.(BY BHEL)	MFG.TC/INSP REPORT	P	W	W	TO BE OFFERED ALONG WITH FINAL SKID ASSEMBLY INSPECTION.
		ORIENTATION	MA	VISUAL		APPD.DWG.(BY BHEL)	APPD.DWG.(BY BHEL)	MFG.TC/INSP REPORT	P	W	W	
2.3.1		LEAKAGE	MA	WATER FILL FOR 2 HR	100%	N.A.	NO LEAKAGE	MFG.TC/INSP. REPORT	P	W	W	
3.0	**STIRRER :**											
3.1	RAW MATERIAL FOR SHAFT	CHEM.& PHY. PROPERTIES	MA	CHEM &.PHY TEST	1/BAR	ASTM A 479 GR.TP 304	ASTM A 479 GR.TP 304	MFG.TC/LAB REPORT	P	V	V	
		IGC TEST	MA	IGC TEST	1/HT BATCH	ASTM A 262 PR.'E'	ASTM A 262 PR.'E'	MFG.TC/LAB REPORT				
3.2	IMPELLER	CHEMICAL PROP.	MA	CHEMICAL TEST	1/PLATE	ASTM A 240 GR.TP 316	ASTM A 240 GR.TP 316	MFG.TC/LAB REPORT	P	V	V	
3.3	COMPLETE STIRRER UNIT WITH MOTOR	PERFORMANCE IN WATER FILLED TANK										
		- VIBRATION	MA	MEASUREMENT	100%	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC	P	V	V	
		- WOBBLING	MA	VISUAL	100%	NO WOBBLING	NO WOBBLING	MFG.TC	P	V	V	
		- POWER CONSUMPTION/ CURRENT DRAWN	MA	MEASUREMENT	100%	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC	P	V	V	
4.0	**MOTORS:**	ROUTINE TEST	MA	MFG. TC	100%	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC	P	V	V	
		TYPE TEST	MA	MFG. TC	1/ SIMILAR FRAME SIZE	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC	P	V	V	
		DEGREE OF PROTECTION	MA	MFG. TC	1/ SIMILAR FRAME SIZE	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC	P	V	V	

MANUFACTURER/ SUB CONTRACTOR

MAIN SUPPLIER--BHEL

SIGNATURE

**** LEGEND :**

M : MANUFACUTRER/SUB-CONTRACTOR/SUB-VENDOR
B : BHEL/ NOMINATED INSPECTION AGENCY N:NTPC
"P" PERFORM, **"W"** WITNESS, AND **"V"** VERIFICATION

SIGNATURE OF APPROVAL BY CUSTOMER

	MANUFACTURER'S NAME & ADDRESS :	QUALITY PLAN ITEM: CHEMICAL DOSING SYSTEM SUB - SYSTEM : CHEMICAL DOSING SYSTEM		QP.NO : REV. : 1 DATE : PAGE : 2 OF 4			PROJECT PACKAGE CHEMICAL DOSING SYSTEM CONTRACT NO. MAIN SUPPLIER BHEL/PEM, NOIDA					
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/ METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY** M	AGENCY** B	AGENCY** N	REMARKS
1	2	3	4	5	6	7	8	9	10			11
5.0	METERING PUMP:											
5.1	RAW MATERIAL :											
5.1.1	WETTED PARTS	CHEM & PHY. PROPERTIES	MA	CHEM. & PHY. TEST	1/BAR	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC/LAB REPORT	P	V	V	
		SURFACE TEST	MI	UT ON BAR>25 MM DIA	100%	ASTM A 388	REF. NOTE # 1	MFG.TC/LAB REPORT	P	V	V	
				DP ON M/C SURFACE	100%	ASME - E - 165	NO SURFACE DEFECTS	MFG.TC/LAB REPORT	P	V	V	
5.2	FINAL INSPECTION											
5.2.1	PUMP WITH MOTOR	LINEARITY	MA	PERFORMANCE	100%	API 675	API 675	INSPECTION REPORT	P	W	V	SHALL BE TESTED WITH EITHER JOB MOTOR OR SHOP MOTOR OF SIMILAR FRAME SIZE
		STEADY STATE ACCURACY	MA	SHOP TEST	100%	API 675	API 675	INSPECTION REPORT	P	W	V	
		REPEATABILITY	MA	SHOP TEST	100%	API 675	API 675	INSPECTION REPORT	P	W	V	
		POWER DRAWN @ 100% STROKE	MA	MEASURED AT WORK	100%	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	INSPECTION REPORT	P	W	V	
		LEAKAGE	MA	HYDRO TEST	100%	@1.5X DESIGN PRESSURE	NO LEAKAGE	INSPECTION REPORT	P	W	V	
		DIMENSIONS	MA	MEASUREMENT	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	INSPECTION REPORT	P	W	V	
		NOISE	MA	MEASUREMENT	100%	--	< 85 dbA AT 1 M RADIUS	INSPECTION REPORT	P	W	V	
		VIBRATION	MA	MEASUREMENT	100%	--	≤45 MICRONS (PEAK TO PEAK)	INSPECTION REPORT	P	W	V	
7.0	PRESSURE RELIEF VALVE	SET & RESET PRESSURE.	MA	PERFORMANCE	100%	BHEL APPD.DATA SHEET & API RP-520	BHEL APPD.DATA SHEET & API RP-520	MFG. TC	P	V	V	
		DIMENSIONS	MA	MEASUREMENT	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	MFG. TC	P	V	V	
		LEAKAGE DURING PERFORMANCE TEST	MA	VISUAL	100%	NO LEAKAGE	NO LEAKAGE	MFG. TC	P	V	V	
8	VALVES (GATE, GLOBE & NRV)											
8.1	RAW MATERIAL :											
8.1.1	BODY, BONNET COVER	CHEM.& PHY PROPERTIES	MA	CHEM.& PHY TEST	1/HT BATCH	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG. TC/LAB REPORT	P	V	V	
		HEAT TREATMENT	MA	HEAT TREATMENT	1/HT BATCH	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG. TC/LAB REPORT	P	V	V	
8.1.2	TRIM MATERIAL	CHEM.& PHY PROPERTIES	MA	CHEM.& PHY TEST	1/BAR/SIZE	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG. TC/LAB REPORT	P	V	V	
8.2	ASSEMBLY											
		LEAKAGE (BODY & SEAT)		HYDRO TEST	100%	BHEL APPD.DATA SHEET	NO LEAKAGE	MFG TC	P	V	V	
		LEAKAGE (SEAT)		PNEUMATIC TEST	100%	BHEL APPD.DATA SHEET	NO LEAKAGE	MFG TC	P	V	V	
		DIMENSIONS		MEASUREMENT	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	MFG TC	P	V	V	

MANUFACTURER/ SUB CONTRACTOR | **MAIN SUPPLIER--BHEL**

SIGNATURE

**** LEGEND :**
M : MANUFACUTRER/SUB-CONTRACTOR/SUB-VENDOR
B : BHEL/NOMINATED INSPECTION AGENCY N: NTPC
"P" PERFORM, **"W"** WITNESS, AND **"V"** VERIFICATION

SIGNATURE OF APPROVAL BY CUSTOMER

	MANUFACTURER'S NAME & ADDRESS :		QUALITY PLAN				PROJECT				
			ITEM: CHEMICAL DOSING SYSTEM		QP.NO :		PACKAGE	CHEMICAL DOSING SYSTEM			
			SUB - SYSTEM :		REV. :	1	CONTRACT NO.				
					DATE :						
			CHEMICAL DOSING SYSTEM		PAGE :	3 OF 4	MAIN SUPPLIER	BHEL/PEM, NOIDA			

S.NO	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/ METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY**			
									M	B	N	
1	2	3	4	5	6	7	8	9	10			11
9.0	**FITTING/FLANGES FOR PIPING:**											
9.1	RAW MATERIAL	CHEM.& PHY PRPERTIES	MA	CHEM.& PHY TEST	1/HT BATCH	ASTM A 182 GR.TP 304	ASTM A 182 GR.TP 304	MFG.TC/LAB REPORT	P	V	V	
		HEAT TREATMENT	MA	HEAT TREATMENT	100%	ASTM A 182 GR.TP 304	ASTM A 182 GR.TP 304	MFG.TC/LAB REPORT	P	V	V	
		IGC TEST	MI	IGC TEST	1/HT BATCH	ASTM A 262 PR. 'E'	ASTM A 262 PR. 'E'	MFG.TC/LAB REPORT	P	V	V	
9.2	FINAL INSPECTION	DIMENSIONS	NA	MEASUREMENT	100%	BHEL APPD.DATA SHEET/DWG/ ANSI B 16.11/16.5	BHEL APPD.DATA SHEET/DWG/ ANSI B 16.11/16.5	MFG.TC	P	V	V	
10.0	**STRAINERS :**											
10.1	RAW MATERIAL FOR BODY	PHY.& CHEM. PROPERTIES	MA	PHY. & CHEM.TEST	1/BAR/SIZE	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TCLAB REPORT	P	V	V	
10.2	SCREEN	CHEMICAL	MA	CHEMICAL	1/SIZE	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC/LAB REPORT	P	V	V	
		MESH SIZE	MA	MEASUREMENT	1/SIZE	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC/LAB REPORT	P	V	V	
10.3	FINAL INSPECTION	DIMENSIONS	MA	MEASUREMENT	100%	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC	P	V	V	
		LEAKAGE		HYDRO TEST	1	BHEL APPD.DATA SHEET	NO LEAKAGE	MFG.TC	P	V	V	
11.0	**PIPE (SEAMLESS)**											
11.1	MATERIAL	CHEMICAL	MA	CHEMICAL	1/HT BATCH/SIZE	ASTM A 312 GR.TP 304	ASTM A 312 GR.TP 304	MFG.TC/LAB REPORT	P	V	V	
		MECHANICAL TEST	MA	MECHANICAL TEST	1/HT BATCH/SIZE	ASTM A 312 GR.TP 304	ASTM A 312 GR.TP 304	MFG.TC/LAB REPORT	P	V	V	IDENTIFICATION BY BHEL. REFER NOTE 4.
		MICRO STRUCTURE	MI	GRAINS STRUCTURE	1/HT BATCH/SIZE	FOR HEAT TREATMENT	FOR HEAT TREATMENT	MFG.TC/LAB REPORT	P	V	V	
		IGC TEST	MI	IGC TEST	1/HT BATCH/SIZE	ASTM A 262 PR 'E'	ASTM A 262 PR 'E'	MFG.TC/LAB REPORT	P	V	V	
		HYDRO TEST	MA	LEAKAGE	100%	NO LEAKAGE	NO LEAKAGE	MFG.TC/IR	P	V/W	V	
12.0	**LEVEL GAUGE :**											
12.1	RAW MATERIAL	CHEM.PROPERTIES	MA	CHEM.TEST	1/HT BATCH	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MGF.TC/LAB REPORT	P	V	V	
12.2	FINAL INSPECTION	DIMENSION	MA	MEASUREMENT	100%	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC	P	V	V	
		LEAKAGE	MA	HYDRO TEST	100%	BHEL APPD.DATA SHEET	NO LEAKAGE	MFG.TC	P	V	V	
13.0	**PRESSURE & DP GAUGE**											
13.1	MAT. FOR WETTED PARTS & BOU	CHEM.PROPERTIES	MA	CHEM.TEST	1/HT BATCH	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC/LAB REPORT	P	V	V	
13.2	FINAL INSPECTION	DIMENSIONS	MA	MEASUREMENT	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	MFG.TC/LAB REPORT				
13.3	PERFORMANCE	ACCURACY & OVERLOAD PROTECTION	MA	CALIBRATION	100%	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG. TC	P	V	V	
14.0	**SWITCHES(LEVEL, PRESURE & DP) & TRANSMITTERS (LEVEL, PRESSURE & DP):**											
14.1	MAT. FOR WETTED PARTS	CHEM.PROPERTIES	MA	CHEM.TEST	1/HT BATCH	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC/LAB REPORT	P	V	V	
14.2	PERFORMANCE	FUNCTIONAL	MA	CALIBRATION & VISUAL	100%	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC	P	V	V	
		IR-HV-IR		ELECTRICAL	100%	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC	P	V	V	
		DIMENSIONS		MEASUREMENT	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	MFG.TC	P	V	V	
		DEGREE OF PROTECTION	MI	VERIFICATION OF TYPE TEST CER	TYPE TEST	BHEL APPD.DATA SHEET	BHEL APPD.DATA SHEET	MFG.TC/LAB REPORT	P	V	V	

MANUFACTURER/ SUB CONTRACTOR	MAIN SUPPLIER--BHEL	** LEGEND :	
		M : MANUFACUTRER/SUB-CONTRACTOR/SUB-VENDOR **B** : BHEL/NOMINATED INSPECTION AGENCY **"P"** PERFORM, **"W"** WITNESS, AND **"V"** VERIFICATION	
SIGNATURE			SIGNATURE OF APPROVAL BY CUSTOMER

MANUFACTURER'S NAME & ADDRESS :

QUALITY PLAN

ITEM: CHEMICAL DOSING SYSTEM
SUB - SYSTEM : CHEMICAL DOSING SYSTEM

QP.NO :
REV. : 1
DATE :
PAGE : 4 OF 4

PROJECT
PACKAGE CHEMICAL DOSING SYSTEM
CONTRACT NO.
MAIN SUPPLIER BHEL/PEM, NOIDA

S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/ METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY** M	AGENCY** B	AGENCY** N	REMARKS
1	2	3	4	5	6	7	8	9	10			11
15.0	**CONTROL PANEL :**	DIMENSIONS	MA	MEASUREMENT	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	INSPECTION REPORT	P	W	W	CONTOL PANEL TEST TO BE OFFERED ALONG WITH FINAL SKID ASSEMBLY.
		CONTINUITY, IR-HV-IR	MA	ELECTRICAL	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	INSPECTION REPORT	P	W	W	
		VERIFICATION OF MAKE	MA		100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	INSPECTION REPORT	P	W	W	
		RATING OF COMPONENTS	MA		100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	INSPECTION REPORT	P	W	W	
		PAINT SHADES, THICKNESS	MA		100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	INSPECTION REPORT	P	W	W	
		ADHESION	MA		100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	INSPECTION REPORT	P	W	W	
		DEGREE OF PROTECTION	MI	VERIFICATION OF TYPE TEST CERTIFICATE	TYPE TEST	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	MFG.TC/LAB REPORT	P	V	W	
16.0	**COMPLETE SKID ASSEMBLY:**	DIMENSIONS & ORIENTATION	CR	MEASUREMENT	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	INSPECTION REPORT	P	W	W	
		LEAKAGE, CHECK ON WELDMENTS		VISUAL & HYDRO TEST	100%	DISCH.PIPING - 1.5 x DISCH PR. OF PUM	NO LEAKAGE	INSPECTION REPORT	P	W	W	
		FUNCTIONAL TEST FOR INTERLOCKS	MA	VISUAL	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	INSPECTION REPORT	P	W	W	
	PMI Test for SS	GRADE CONFIRMATION	MA	CHEM.TEST	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/DWG	INSPECTION REPORT	P	W	W	
		PAINTING	MA	VISUAL & MEASUREMENT	100%	BHEL APPD PAINTING SCHEME	APPD DWG/PAINTING	INSPECTION REPORT	P	W	W	

NOTE-1) WHEN BACK WALL ECHO IS SET TO 100% OF FSH IN SOUND AREA, DEFECT ECHO SHALL NOT EXCEED 20% OF FSH. MAX BACH WALL ECHO IS 20% OF FSH. TOTAL NO OF DEFECTS SHALL BE MAX. 5 NO IN ONE METER LENGTH. MIN DISTANCE BETWEEN TWO DEFECTS SHALL BE 3 TIMES THE DIA OF BAR.

NOTE-2) CHEMICAL DOSING SKID VENDOR SHALL BE SELECTED FROM CUSTOMER APPROVED SOURCES. ALL THE BOUGHT OUT ITEMS OF THE CHEMICAL DOSING VENDOR SHALL BE PROCURED FROM BHEL APPROVED SOURCES.

NOTE- 3) ALL VENDOR DRAWINGS/DATASHEETS SHALL BE APPROVED BY BHEL. ONLY MANUFACTURING QP(PREPARED IN LINE WITH THIS STANDARD QP) OF THE VENDOR SHALL BE FORWARDED FOR CUSTOMER APPROVAL. ALL THE BHEL APPROVED DOCUMENTS SHALL BE FURNISHED TO CUSTOMER FOR INFORMATION/RECORDS ALONG WITH O&M MANUAL. COPY OF THE SAME SHALL ALSO BE FURNISHED TO INSPECTION AGENCY DURING INSPECTION.

NOTE 4) FOR PIPES PURCHASED DIRECTLY FROM MANUFACTURER'S OR AUTHORIZED DEALERS, APART FROM TC REVIEW, CHECK WILL BE AS PER CLAUSE 2.1.2 AND 10.0; HOWEVER FOR HYDRAULIC TEST, MANUFACTURER TC SHALL BE REVIEWED . IN CASE ON IMPORTED PIPES PURCHASED FROM OPEN MARKET, TEST SHALL BE PERFORMED AS PER CLAUSE 2.1.2 AND 10.0 (INCLUDING HYDRAULIC TEST).

NOTE 5) FOR RAW MATERIAL (BARS/PIPES/CASTINGS/FORGINGS) WHERE HEAT TREATMENT ARE CARRIED OUT BY MATERIAL PRODUCERS ON BULK QUANTITIES, THEIR TEST CERTIFICATE SHALL BE REVIEWED (EXCEPT TIME TEMPERATURE CHART)

NOTE 6) NDT REQUIREMENT ON WELDING (TANK, PIPE, BREATHER/WATER SEAL/CO2 ABSORBER) SHALL BE AS -- A) ON BUTT WELD-- 25% DP & 25% RT FOR PUMP SUCTION SIDE & 100% DP & 100% RT FOR PUMP DISCHARGE SIDE. B) ON FILLET WELD--100% DP TEST

MANUFACTURER/ SUB CONTRACTOR | **MAIN SUPPLIER--BHEL**

**** LEGEND :**

M : MANUFACUTRER/SUB-CONTRACTOR/SUB-VENDOR
B : BHEL/NOMINATED INSPECTION AGENCY N: NTPC
"P" PERFORM, **"W"** WITNESS, AND **"V"** VERIFICATION

SIGNATURE | **SIGNATURE OF APPROVAL BY CUSTOMER**

		MANUFACTURER'S NAME & ADDRESS :		MANUFACTURING QUALITY PLAN				PROJECT PACKAGE CONTRACT NO. MAIN SUPPLIER BHEL QP. NO NTPC QP. NO					
				ITEM: OXYGEN DOSING SYSTEM SUB - SYSTEM : DEAERATOR & CEP DISCHARGE DOSING		QP. NO : REV. : DATE : PAGE :		: BHEL/PEM/NOIDA					
S.NO.	COMPONENTS/ OPERATION	CHARACTERISTICS CHECKED	CATEGORY	TYPE/ METHOD CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY**			REMARKS
										M	B	N	
1	2	3	4	5	6	7	8	9	D*	10			11
1.0	**WELDER'S QUALIFICATION**												
1.1	WELDING PROCEDURE SPECIFICATION (WPS)	CORRECTNESS	MA	SCRUTINY	100%	ASME IX	ASME IX	QW 482		P	V	V	
1.2	WELDER PERFORMANCE & PROCEDURE QUALIFICATION RECORD	WELD SOUNDNESS & WELDING PERFORMANCE	MA	PHYSICAL TEST	100%	ASME IX	ASME IX	QW 483 & QW 484		P	V	V	
2	EMPTY OXYGEN CYLINDER	MTC, HYDRO TEST & RELEVANT TESTS AS PER IS 7285	MA	IS 7285	100%	APPROVED DATASHEET	AS PER APPROVED DATASHEET	MFRS CERTIFICATE		P	V	V	
3	VALVES (BODY & BONNET)	MATERIAL	MA	--	100%	APPROVED DATASHEET	AS PER MODEL DECODIFICATION MENTIONED IN MFRS CATALOGUE	MANUFACTURERS COC		P	V	V	
4	INSTRUMENTS												
4.A	PRESSURE GAUGE	MOC FOR WETTED PARTS, CALIBRATION & BOURDON OVER PRESSURE PROTECTION & TYPE TEST CERTIFICATE	MA	MEASUREMENT	1/TYPE	APPROVED DATASHEET	AS PER APPROVED DATASHEET	MFRS CERTIFICATE		P	V	V	
4.B	PRESSURE TRANSMITTER	CALIBRATION, OVER LOAD PROTECTION & TYPE TEST CERTIFICATE	MA	MEASUREMENT	100%	APPROVED DATASHEET	AS PER APPROVED DATASHEET	MANUFACTURERS COC		P	V	V	
5	SOLENOID VALVES	MATERIAL	MA	VISUAL	100%	APPROVED DATASHEET	AS PER MODEL DECODIFICATION MENTIONED IN MFRS CATALOGUE	MANUFACTURERS COC		P	V	V	
6	CYLINDER PRESSURE REGULATOR	MATERIAL	MA	VISUAL	100%	APPROVED DATASHEET	AS PER MANUFACTURERS CATALOGUE	MANUFACTURERS COC		P	V	V	
7	TERMINATION BOX	COUNTUNITY,IR-HV-IR & DEGREE OF PROTECTION	MA	ELECTRICAL	100%	APPROVED DATASHEET	AS PER APPROVED DATASHEET	MFRS COC & INSPECTION REPORT		P	V	V	
8	TUBING	CHEMICAL & PHYSICAL	MA	CHEMICAL & PHYSICAL TEST	100%	APPROVED DRAWING DATASHEET	APPROVED DRAWING DATASHEET	LAB REPORT		P	V	V	
9	MASS FLOW CONTROLLER	CALIBRATION REPORT	MA	ELECTRICAL	100%	APPROVED DRAWING & DATASHEET	APPROVED DRAWING & DATASHEET	CALIBRATION REPORT		P	V	V	
10	FITTING	MATERIAL	MA	VISUAL	100%	APPROVED DRAWING	AS PER MODEL DECODIFICATION MENTIONED IN MFRS CATALOGUE	MANUFACTURERS COC		P	V	V	
11	FINAL ASSAMBLY	DIMENSION, ORIENTATION & COMPLETENESS.	MA	MEASUREMENT	100%	APPROVED DRAWING	APPROVED DRAWING	INSPECTION		P	W	W	
	FAT	LEAKAGE		N2 FILL FOR 2HR	100%	APPROVED DRAWING / FACTORY ACCEPTANCE TEST	NO LEAKAGE	INSPECTION REPORT		P	W	W	
12	POWDER COATING STAMPING	DFT MEASUREMENT	MI	VISUAL	100%	NTPC APPROVED PAINTING SCHEME				P	W	V	
13	PMI Test for SS	GRADE CONFIRMATION	MA	CHEM.TEST	100%	BHEL APPD.DATA SHEET/DWG	BHEL APPD.DATA SHEET/ DWG	INSPECTION REPORT		P	W	W	

NOTES: ALL INSTRUMENTS SHALL BE OXYGEN CLEANED AND SUITABLE FOR OXYGEN SERVICE. MANUFACTURERS COC CERTIFYING THE SAME REGARDING OXYGEN CLEANED SHALL BE SUBMITTED FOR REVIEW DURING FINAL INSPECTION.

		LEGEND : * RECORDS IDENTIFIED WITH "TICKS" SHALL BE ESSENTIALLY INCLUDED BY CONTACTION IN QA DOCUMENTATION. ** **M** : MANUFACTURER/SUB-CONTRACTOR B : BHEL, N:NTPC		**DOC NO.** / **REV :** / **CAT :**
MANUFACTURER/ SUB SUPPLIER	**MAIN SUPPLIER**			
SIGNATURE		INDICATE **"P"** PERFORM, **"W"** WITNESS, AND **"V"** VERIFICATION AS APPROPRIATE, "CHP" SHALL BE IDENTIFIED IN COLUMN **"N".**	**FOR CUSTOMER USE**	**REVIEWED BY** / **APPROVED BY** / **APPROVAL SEAL**

ANNEXURE - II
SUB VENDORS LIST

(INDICATIVE)
(COMMON FOR TG & SG)

Disclaimer for Indicative Vendor List

1.1 Reasonable efforts have been made to collate the sub-vendors proposed by the various main contractors from time to time against different Projects/Packages and accepted by NTPC for various items. However, in case of error/omission, if any, and represented by the successful bidder this will be addressed during the execution of the contract based on the material evidence available with NTPC / BHEL.

1.2 The approved sub-vendor list drawn is not based on NTPC driven enlistment process but based on the sub- vendors proposed by various Main Contractors. As such, it is possible that some of the Suppliers/Manufacturers who may be involved in similar work/process may not be appearing in the list as such sub-vendors may not have been proposed by bidders against NTPC Contracts.

1.3 In case the successful bidder chooses to propose additional sub-vendors with relevant experience after the award of the contract such sub-vendors will be considered in terms of GCC, provided the proposals are received sufficiently in time: 90 days prior to ordering date of a Bought Out Items/Start of Manufacturing so as not to impede the progress of the contract.

1.4 Sub-vendors have been grouped under different categories of items. It is possible that an item characterized by certain specific features such as range and type required as per Bidder's design requirements may not be in the range of the listed subvendor's manufacturing process/capability. As such the main contractor to ascertain the vendor's capability to meet his specific requirements before considering a subvendor.

1.5 It is to be noted by the bidders that any shortfall in contract performance attributable to the sub-vendor listed will not absolve the contractor from his contractual obligations in any manner.

1.6 The approval was granted based on the evaluation of relevant capabilities and facilities possessed by the sub-vendor at the time of evaluation. Also, some of the sub-vendors may not be active. As such, the successful bidder is to carry out his own due diligence before considering the listed sub-vendor for subletting: the current status of the sub-vendor, the continued availability of productive resources including Human Resources.

1.7 The list of sub-vendors is periodically revised to include new sub-vendors. Such a revision may also see a deletion of certain sub-vendors who may have been disqualified on grounds of inadequate performance or banned in line with NTPC's banning policy. The then current list will be shared with the successful bidder immediately on award.

		Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:		
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)							REVISION NO : 00		
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.04.2023		
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)		
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	
1	RAPH	I			REFER SUB QR ITEM LIST Refer Note 1				STATIC COMPONENTS, ROTATING COMPONENTS, GUIDE/SUPPORT BEARINGS-NTPC APPROVED VENDORS		
2	FD, PA & ID FANS	I			REFER SUB QR ITEM LIST Refer Note 1				STATIC, ROTATING COMPONENTS AND BLADES - NTPC APPROVED VENDORS		
3	COAL MILL	I			REFER SUB QR ITEM LIST Refer Note 1				MILL COUPLING, PGB, GRINDING ROLLS, BULL RING SEGMENTS, MILL HOUSING, SEPARATOR AND OTHER MAIN COMPONENTS - FROM NTPC APPROVED SOURCES		
4	ESP	I			REFER SUB QR ITEM LIST Refer Note 1				COLLECTING ELECTRODE, EMITTING ELECTRODE - NTPC APPROVED VENDORS		
5	GRAVIMETRIC COAL FEEDERS	I			REFER SUB QR ITEM LIST Refer Note 1						
6	RECIRCULATION PUMP	I			REFER SUB QR ITEM LIST Refer Note 1						
7	AUXILIARY BOILER	I			REFER SUB QR ITEM LIST Refer Note 1						
8	ESP SUPPORT STRUCTURE (AUTO WELDED COLUMNS & ROOF BEAMS)	I			NTPC APPROVED SOURCES		A		REFER BOILER STRUCTURE LIST		
9	SEAMLESS TUBES	$			VALLOUREC & MANNESMANN TUBES	FRANCE, GERMANY	A		CS & AS T-11, T-22, T-23, T-91, T-92		
		$			TENNARIS GLOBAL SERVICES SA, URUGUAY	DALMINE, ITALY	A		CS & AS T-11, T-22		
		$			TENNARIS GLOBAL SERVICES SA, URUGUAY	SILCO, ROMANIA	A		CS & AS T-11, T-22, T-23, T-91		
		$			TENNARIS GLOBAL SERVICES SA,URUGUAY	NKK TUBES, JAPAN	A		CS & AS T-11, T-22, T-91		
		$			MAHARASHTRA SEAMLESS LTD	RAIGAD	A		CS HOT FINISHED OD:21.0 MM TO 168.3 MM WT: 2.0 MM TO 20.0 MM COLD FINISHED OD:19.0 MM TO 88.9 MM WT: 1.0 MM TO 12.0 MM		
		$			IBF S.P.A	ITALY	A		CS & AS T-11, T-12, T-22, T-91		
		$			JFE STEEL CORPORATION	JAPAN	A		CS & AS T-11, T-22, T-23, T-91, T-92		
		$			TUBOS REUNIDOS INDUSTRIAL, S.L.U	SPAIN	A		CS & AS T-11, T-22, T-23, T-91, T-92		
		$			JINDAL SAW LIMITED	NASHIK	A		CS & AS T-11, T-12, T-22 HOT FINISHED OD: 33.4 MM TO 168.3 MM WT: 3.5 MM TO 21.95 MM COLD FINISHED OD: 6.0 MM TO 140.0 MM WT: 0.8 MM TO 15.0 MM		

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		$			REMI METALS GUJARAT LTD	BHARUCH	A		CS & AS T-11, T-12, T-22 HOT FINISHED OD: 28.6 MM TO 177.8 MM WT: 3.0 MM TO 28.0 MM COLD FINISHED OD: 9.0 MM TO 127.0 MM WT: 1.6 MM TO 20.0 MM	
		$			WAYMAN GORDAN	USA	A		CS,T11,T12,T22,T91	
		$			BENTELER STEEL/TUBE GMBH	GERMANY	A		CS,T-11, T23, T-22, T-91 & T-92	
		$			HEAVY METALS & TUBES LTD	AHMEDABAD	A		CS HOT FINISHED UP TO OD: 76.2 MM AND WT:12.0 MM	
		$			PRODUCTOS TUBULARES,	SPAIN	A		CS & AS T-11, T-22. T-23. T-91	
		$			ISMT	AHMEDNAGAR,BARAMATI	A		CS, T11, 12, 22 HOT FINISHED OD: 38.0 MM TO 273.0 MM WT: 3.5 MM TO 40.0 MM COLD FINISHED OD: 18.0 MM TO 140.0 MM WT: 1.5 MM TO 15.0 MM	
		$			NIPPON STEEL & SUMITOMO METAL CORPORATION	JAPAN	A		CS, T-11, T-22, T23, T-91, & T-92	
		$			BENTELER STEEL/TUBE GMBH	GERMANY	A		CS, T-11, T23, T-22, T-91 & T-92	
		$			BHEL SSTP	TRICHY	A		CS, T-11, T-12, T-22	
10	SEAMLESS TUBES(RIFFLED)	$			SALZGITTER MANNESAMANN PRECISION	FRANCE	A		CS	
11	SEAMLESS TUBES(SS)	$			KOBE SPECIALITY STEEL CO LTD	JAPAN	A		SS304, SS347H	
		$			SMST	ITALY	A		SS304, 347H, SUPER 304	
		$			TUBACEX	SPAIN	A		SS304, 347H, SUPER 304	
		$			PASCO SPL STEEL CO.	SOUTH KOREA	A		SS304, 347H, SUPER 304	
		$			NIPPON STEEL & SUMITOMO METAL CORPORATION	JAPAN	A		SS 304, SS347H, SUPER 304 OD UP TO 114.3 MM	
12	SEAMLESS PIPES	$			TENNARIS GLOBAL SERVICES SA, URUGUAY	DALMINE, ITALY	A		CS & AS P-11, P-22, P-91	
		$			TENNARIS GLOBAL SERVICES SA, URUGUAY	SILCO, ROMANIA	A		CS & AS T-11, T-22, T-91 UPTO DIA 159 MM	
		$			TENNARIS GLOBAL SERVICES SA,URUGUAY	NKK TUBES, JAPAN	A		CS & AS T-11, T-22, T-91	
		$			VALLOUREC & MANNESMANN TUBES	FRANCE, GERMANY	A		CS & AS P-11, P-22, P-91. P-92	

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		$			TUBOS REUNIDOS INDUSTRIAL, S.L.U	SPAIN	A		CS & AS P-11, P-22, P-91	
		$			ISMT	AHMEDNAGAR, BARAMATI	A		CS, T11, 12, 22 HOT FINISHED OD: 38.0 MM TO 273.0 MM WT: 3.5 MM TO 40.0 MM COLD FINISHED OD: 18.0 MM TO 140.0 MM WT: 1.5 MM TO 15.0 MM	
		$			REMI METALS GUJARAT LTD	BHARUCH	A		CS & AS T-11, T-12, T-22 HOT FINISHED OD: 28.6 MM TO 177.8 MM WT: 3.0 MM TO 28.0 MM COLD FINISHED OD: 9.0 MM TO 127.0 MM WT: 1.6 MM TO 20.0 MM	
		$			VALCONVY TRUB CHOMUTOV,	CZECH REPUBLIC	A		CS & P-12 & P-22	
		$			ARCELORMITTAL TUBULAR PRODUCTS ROMAN S.A	ROMANIA	A		CS	
		$			WAYMAN GORDAN	USA	A		CS & AS P-11, P-22, P-91	
		$			MAHARASHTRA SEAMLESS LTD	RAIGAD	A		CS HOT FINISHED OD:219.1 MM TO 355.6 MM WT: 6.35 MM TO 35.1 MM COLD FINISHED OD:19.0 MM TO 88.9 MM WT: 1.0 MM TO 12.0 MM	
		$			PRODUCTOS TUBULARES,	SPAIN	A		CS & AS P-11, P-12, P-22, P-91	
		$			NIPPON STEEL & SUMITOMO METAL CORPORATION	JAPAN	A		CS & AS P-11, P-22, P-91 & P-92	
		$			TENNARIS GLOBAL SA, URUGUAY	NKK TUBES, ITALY	A		P-91, P-22, P-11, P12, CS	
		$			JINDAL SAW LIMITED	NASHIK	A		CS, T11, 12, 22 HOT FINISHED OD: 33.4 MM TO 168.3 MM WT: 3.5 MM TO 21.95 MM COLD FINISHED OD: 6.0 MM TO 140.0 MM WT: 0.8 MM TO 15.0 MM	
		$			IBF S.P.A	ITALY	A		P-92, P-91, P-22, P-11, P12, CS	
		$			JFE STEEL CORPORATION	JAPAN	A		P-92, P-91, P-22, P-11, P12, CS	
		$			BHEL SSTP	TRICHY	A		CS	
		$			BENTELER STEEL/TUBE GMBH	GERMANY	A		P-11, P-22, P-91, P-92 UP TO OD 160 MM	
		$			RINGMILL SPA	ITALY	A		CS OD UP TO 914 MM & WT UP TO 102 MM & AS P-91	
		$			FORGIATURA MORANDINI SRL	ITALY	A		CS & AS P-11, P-22, P-91 & P-92	
13	PLATES AND ROLLED SECTION (CS & AS EXCLUDING CS- IS:2062 GRADES)	$			INDUS STEEL	BELGIUM	A		CS-SA515 AS UP T0 GR-91	

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		$			ILSENBURGER GROBBLECH	GERMANY	A		CS-SA 299, SA515, BS EN 10025, AS UP TO GRADE 91	
		$			DILLINGER-GTSVENTES	GERMANY	A		CS-SA 299, SA515, BS EN 10025, A36, AS UP TO GRADE 91	
		$			SIJ ACRONI D.O.O., SLOVENIA	SLOVENIA	A		CS- SA515, BS EN 10025, A36, AS UP TO GRADE 91	
		$			THYSSENKRUPP	GERMANY	A		CS- SA515 BS EN 10025 A36, AS UP TO GRADE 22	
		$			INDUSSTEEL LOIRE	FRANCE	A		CS-SA 299, SA515; AS UP TO GRADE 22	
		$			ARCELLOR MITAL NIPPON STEEL (Formerly ESSAR Steel)	HAZIRA	A		CS- SA515, BS EN 10025, A36, AS GRADE 12 &22	
		$			VOESTALPINE GROBBLECH GMBH	AUSTRIA	A		CS- SA515 BS EN 10025 A36, AS UP TO GRADE 22	
		$			SAIL	BHILAI/SALEM	A		CS- SA515 BS EN 10025 A36, AS UP TO GRADE 22	
		$			NIPPON STEEL	JAPAN	A		CS- SA515 BS EN 10025 A36, AS UP TO GRADE 22	
		$			POSCO	SOUTH KOREA	A		CS- SA515 BS EN 10025 A36, AS UP TO GRADE 22	
		$			REINER BRACH GMBH & CO.	GERMANY	A		CS- SA 299 SA515 BS EN 10025 A36, AS UP TO GRADE 22	
		$			LLYODS STEEL INDUS LTD	INDIA	A		ALLOY STEEL PLATES AS PER A-204 & A-387 UPTO THICKNESS OF 40MM FOR STRUCTURAL STEEL APPLICATION , IN NON-PRESSURE PARTS.	
14	PLATES & ROLLED SECTION (CS-IS 2062 STRUCTURAL STEEL GRADES)	$			REFER TO SUB-VENDORS MENTIONED IN THE TECHNICAL SPECIFICATIONS SEC-VI, PART-B		A			
15	PLATES(SS)	$			OUTOKUMPU	SWEDEN	A		SS PLATES UP TO 20 MM THK	
		$			INDUSSTEEL	BELGIUM	A		GRADE-304,309,310,316	
		$			JSL STAINLESS	JAIPUR	A		LINER SS 304	
		$			INDUSSTEEL LOIRE	FRANCE	A		GRADE-304,309,310,316	
		$			SAIL	BHILAI/SALEM	A		GRADE-304,309,310,317	
		$			COLUMBUS STAINLESS STEEL	SOUTH AFRICA	A		GRADE-304,309,310,318	
16	SEPARATOR & STORAGE TANK	I			ALSTOM	USA	A			
		I			BHEL	TRICHY	A			

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		I			GE INDIA	DURGAPUR	A			
		I			DOOSAN	SOUTH KOREA	A			
		I			L&T-MHPS BOILERS PVT LTD	HAZIRA	A			
17	HEADERS AND SUCTION MANIFOLDS	I			ALSTOM	USA	A			
		I			BHEL	TRICHY	A			
		I			GE INDIA	DURGAPUR	A			
		I			DOOSAN	CHENNAI	A			
		I			DOOSAN VINA	VIETNAM	A			
		I			L&T-MHPS BOILERS PVT LTD	HAZIRA	A			
18	SPIRAL WATER WALLS	I			BHEL	TRICHY	A			
		I			GE INDIA	DURGAPUR	A			
		I			ALSTOM	USA	A			
		I			DOOSAN	CHENNAI	A			
		I			DOOSAN VINA	VIETNAM	A			
		I			DOOSAN	SOUTH KOREA	A			
19	TUBULAR PRODUCTS(COILS & PANELS) EXCLUDING SPIRAL WALLS	I			GE INDIA	DURGAPUR	A			
		I			BHEL	TRICHY	A			
		I			ALSTOM	USA	A			
		I			DOOSAN	CHENNAI	A			
		I			DOOSAN VINA	VIETNAM	A			
		I			DOOSAN	SOUTH KOREA	A			
		I			L&T-MHPS BOILERS PVT LTD	HAZIRA	A			
		I			MHI	JAPAN	A			
20	CRITICAL PIPING /PCP(MS, CRH, HRH, FW) AND BOILER PIPING	I			BHEL	TRICHY, THIRUMAYAM	A			
		I			GE INDIA	DURGAPUR	A			
		I			DOOSAN	SOUTH KOREA	A			
		I			BHR	GERMANY	A			
		I			DEE DEVELOPMENT	PALWAL	A			
		I			BENTEC	USA	A			
		I			L&T PIPING CENTRE	HAZIRA	A			
		I			SEONGHWA IND CO LTD	SOUTH KOREA	A			

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
21	MISC HP PIPING EXCLUDING CRITICAL PIPING(CS, AS UP TO GRADE 91)	I			BHEL	TRICHY	A			
		I			GE INDIA	DURGAPUR	A			
		I			DOOSAN	SOUTH KOREA	A			
		I			BHR	GERMANY	A			
		I			DEE DEVELOPMENT	PALWAL	A			
		I			BENTEC	USA	A			
		I			L&T PIPING CENTRE	HAZIRA	A			
		I			SEONGHWA IND CO LTD	SOUTH KOREA	A			
		I			PAL ENGG	YAMUNANAGAR	A			
22	MISC HP PIPING EXCLUDING CRITICAL PIPING(CS, AS UP TO GRADE 22)	I					A		ABOVE MENTIONED PIPING VENDORS ARE ALSO ACCEPTABLE	
		I			ISGEC	YAMUNANAGAR	A		UP TO GRADE 22	
		I			UNITECH MACHINES LTD	SAHARANPUR	A		ONLY FOR CS GRADE	
		I			BEND JOINTS PVT LTD	BHOPAL	A		ONLY FOR CS GRADE	
		I			SEAM INDUSTRIES PVT LTD	NAGPUR	A		ONLY FOR CS GRADE	
		I			S&G	PALWAL	A		CS & AS UP TO GRADE 22 (EXCEPT BOILER PIPING & CRITICAL PIPING)	
		I			FLASH FORGE	VISAKHAPATNAM	A		ONLY FOR CS GRADE	
23	MIXING SPHERES	I			GE INDIA	DURGAPUR	A			
		I			BHEL	TRICHY	A			
		I			ALSTOM	USA	A			
		I			DOOSAN	SOUTH KOREA	A			
24	COAL BURNER ASSY & SOFA/OFA PORT/AA PORT	I			ALSTOM	USA	A			
		I			BHEL	TRICHY	A			
		I			DOOSAN	SOUTH KOREA	A			
		I			L&T-MHPS PVT LTD	HAZIRA	A			
		I			DEE DEE ENGINEERING ENTERPRISES	TRICHY	A			
25	AIR COOLED OIL GUN ASSEMBLY	I			BHEL	TRICHY	A			
		I			SIGMA POWER	TRICHY	A			
		I			DOOSAN	SOUTH KOREA	A			
26	HFO/LFO PUMPS									
		I			ALEKTON	CHENNAI	A			

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		I			UT PUMPS	FARIDABAD	A			
		I			ROTO PUMPS LTD.	GREATER NOIDA	A			
		I			ALLWEILER INDIA PVT.LTD.	GERMANY	A			
		I			BOURMANN	GERMANY	A			
		I			TUSHACO PUMPS PVT LTD/ALLWEILER INDIA PVT.LTD.	DAMAN	A			
		I			LEISTRITZ PUMPEN GmbH	GERMANY	A			
		I			KRAL	AUSTRIA	A			
27	SOOT BLOWERS(LRSB, WALL DESLAGGER, ROTARY BLOWER, TEMP PROBE)	I			BHEL	TRICHY	A			
		I			CLYDE BERGMANN	NOIDA	A		UNDER THE SUPERVISION OF M/S CLYDE BERGMANN, GERMANY	
		I			CLYDE BERGEMANN	GERMANY	A			
		I			DIAMOND POWER SPECIALITY LTD	SCOTLAND	A			
		I			DAIEYOUNG MACHINERY	KOREA	A			
28	ELECTRIC HOIST WITH TROLLEY, UNDERSLUNG CRANE	I					A		MAIN BOIS E.G. HOOK, MOTORS AND CRITICAL C&I ITEMS TO BE FROM NTPC APPROVED SOURCES	
		I			CONSOLIDATED HOISTS	SATARA	A		EOT CRANES UPTO 40 MT & HOISTS ABOVE 35 MT	
		I			REWA INDUSTRIES	FARIDABAD	A		EOT CRANES UPTO 25 MT	
		I			GRIP ENGINEERS	HYDERABAD	A		HOIST UPTO 40 MT	
		I			POWER BUILD PVT LTD,	V V NAGAR	A		HOIST UPTO 10 MT	
		I			UNIVERSAL HOIST	THANE	A		HOIST UPTO 20 MT	
		I			ARMSEL MHE PVT LTD	BANGALORE	A		UP TO 20 MT	
		I			ANUPAM INDUSTRIES	VITHAL, UDYOGNAGAR	A		EOT CRANES UPTO 50 MT	
		I			TRACTOR TRIFOR	FARIDABAD	A		HOIST UPTO 35 MT	
		I			CONSOLIDATED HOISTS	PUNE	A		HOISTS UPTO 20 MT	
		I			DYNAMECH CRANES	THANE , MUMBAI	A		UP TO 20 MT	
		I			HERCULES HOIST LTD.	MUMBAI	A		HOIST UPTO 30 MT	
		I			NAMSUNG MACHINERY	SOUTH KOREA	A		UP TO 25 MT	
		I			CENTURY CRANES	PALWAL	A		EOT CRANES UP TO 30 MT	
		I			MUKUND	PUNE	A			
		I			Mangla Hoist	India (Greater Noida)	A		UPTO 10 MT	

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
29	LP CONDENSATE PUMP	I			ITT GOULD	USA	A			
		I			FLOW SERVE	USA	A			
		I			SULZER	NAVI MUMBAI	A			
		I			CLYDE PUMPS	GHAZIABAD	A			
		I			PUMPSENSE FLUID ENGG. PVT. LTD	HOWRAH	A			
30	SCANNER AIR FAN	I			ANDREW YULE CO. LTD	NADIA	A			
		I			ACCEL	AHMEDABAD	A			
		I			PATEL AIRTEMP (I) LTD	GANDHINAGAR	A			
		I			BHEL	RANIPET	A			
		I			CB DOCTOR(IMM)	AHMEDABAD	A			
		I			AIROCHEM ENGINEERING COMPANY	KOLHAPUR	A			
		I			FLAKEWOOD INDIA	CHENNAI	A			
		I			TLT ENGG. PVT. LTD.,	MEHSANA	A			
31	SEAL AIR FAN	I			CB DOCTOR & CO.	AHMEDABAD	A			
		I			ACCEL	AHMEDABAD	A			
		I			TLT INDIA PVT. LTD.,	MEHSANA	A			
		I			PATEL AIRTEMP (I) LTD.,	GANDHINAGAR	A			
		I			BHEL	RANIPET	A			
		I			ANDREW YULE CO. LTD.,	KALYANI NADIA	A			
		I			FLAKTWOOD	SWEDEN	A			
		I			FLAKEWOOD INDIA	CHENNAI	A			
		I			DRAFT AIR/CHICAGO BLOWERS	AHMEDABAD	A			
		I			REITZ INDIA	CHENNAI	A			
		I			Howden Solyvent (India) Pvt. Ltd	Kanchipuram	A			
		I			NADI AIR TECH P LTD	CHENNAI	A			
32	FURNACE MAINTENANCE PLATFORM(SKY CLIMBER)	I			NY SKYMAN INT. SA	BELGIUM	A			
		I			NV SKCLIMBER EUROPE SA	BELGIUM	A			
		I			DAEO PRECISION IND CO LTD	SOUTH KOREA	A			
33	QUICK ERECT FURNACE SCAFFOLDING	II			BSL	UK	A			
		II			INSTANT UPRIGHT	IRELAND	A			
		II			EASTMAN IMPEX	LUDHIANA	A		CARBON STEEL SCAFFOLDING	

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		II			BSL	HARIDWAR	A			
		II			ARUFASE	SPAIN	A			
34	METALLIC EXPANSION JOINT FOR DUCTS	I			FLEXATHERM EXPANLLOW PVT LTD	VADODARA	A			
		I			FLEXICAN BELLOWS & HOSES PVT LTD	VADODARA	A			
		I			KAY ENGINEERING WORKS	TRICHY	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			RAVI STRUCTURALS	TRICHY	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			MARUTI FABRICATORS	TANJORE	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			K B TECHNOLOGIES	TRICHY	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			AURORA SHAPERS	TRICHY	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			FLEXICAN DURGA FAB(P) LTD	TRICHY	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			SRI DURGA STRUCTURALS	TRICHY	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			REGIONAL ENGINEERING ENTERPRISES	TRICHY	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			SRI RANGA INDUSTRIES	TANJORE	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			ANNAI VAILANKANNI ENGINEERING INDUSTRIES	TANJORE	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			ANNAI VAILANKANNI FABRICATORS UNIT-II	TANJORE	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			ANNAI VAILANKANNI FABRICATORS UNIT-II	TRICHY	A		MANUFACTURE OF STRAIGHT PIECES ONLY (CORNER PIECES FROM NTPC APPROVED SOURCES.)	
		I			MECHWELL INDUSTRIES	NASHIK	A			

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
35	METALLIC EXPANSION JOINT FOR PIPES	I			METALLIC BELLOWS	CHENNAI	A		UP TO 2200 NB	
		I			LONESTAR	CHENNAI	A		UP TO 2200 NB	
		I			FLEXICON BELLOWS & HOSES	VADODARA	A		UP TO 2200 NB	
		I			FLEXATHERM EXPANLLOW PVT LTD	VADODARA	A		UPTO 2000 NB	
36	LIGHT BONDED MINERAL WOOL	II			PUNJSTAR INSULATION FIBRE COMPANY	BHILAI	A			
		II			SHREERAM EQUITECH	DURG	A			
		II			GOENKA ROCKWOOL (INDIA) LTD	RAIPUR	A			
		II			LLOYDS INSULATION	BHILAI	A			
		II			THERMOCARE ROCKWOOL PVT LTD	RAJNANDGAON	A			
		II			MINWOOL ROCK FIBRES LTD	RAJNANDGAON	A			
		II			LAPINUS ROCKWOOL LTD	GWALIOR	A			
		II			ROCKWOOL INDIA	MEDAK AP	A			
		II			DHANBAD ROCKWOOL INSULATION PVT LTD	DHANBAD	A			
		II			MINSULATE MFG CO. LTD	JAMSHEDPUR	A			
		II			POLYBOND PROJECTS PVT LTD	DURG	A			
		II			HI-TECH ROCK FIBRE LTD	RAJNANDGAON	A			
		II			ROCKWOOL INDUSTRIES	BHILAI	A			
		II			JAMSHEDPUR MINERAL WOOL	JAMSHEDPUR	A			
		II			ROXUL ROCKWOOL	DAHEJ	A			
37	CLH & VLH	I			BHEL	TRICHY	A			
		I			MID AMERICA	USA	A			
		I			MANNESMANN	GERMANY	A			
		I			ITT	GERMANY	A			
		I			PIPE SUPPORTS	UK / THAILAND	A			
		I			UNISON	SOUTH KOREA	A			
		I			PIPE HANGER SUPPORTS PVT LTD	TANJAVORE	A			
		I			GILLARDINI	ITALY	A			
		I			LISEGA	GERMANY	A			

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		I			WOOKWANG	SOUTH KOREA	A			
		I			BERGEN PIPE SUPPORTS INDIA	CHITTOR	A		CLH UP TO C8-32 RANGE(MAXIMUM LOAD 39.70T). IN CASE OF CLH BEYOND THE RANGE OF C7-27(OF SUPPLIER CATALOGUE) THE SAME SHALL BE SOURCED FROM M/S PIPE SUPORTS, UK/THAILAND.	
		I			SANWA TAKI	JAPAN	A			
		I			MH	SPAIN	A			
		I			BROWICK	UK	A			
		I			CARPENTER PATTERSON	UK	A			
		I			CARPENTER PATTERSON INDIA PVT LTD	VELLORE	A		MAXIMUM LOAD: 23877 KG AND MAXIMUM DISPLACEMENT: 220 MM AND UNDER THE SUPERVISION OF M/S CARPENTER PATERSON, UK.	
		I			AAA SUPPORTS PVT LTD	VADODARA	A		MAXIMUM LOAD: 1.5MT AND MAXIMUM DISPLACEMENT: 250MM	
		I			CARPENTER & PATTERSON	RANIPET	A		SUBJECT TO CONDITIONS AND THE INVOLVEMENT OF THEIR PRINCIPALS	
38	CONVENTIONAL VALVES (GATE, GLOBE & CHECK)	I			VELAN INC.	CANADA	A		SINGLE STAGE DRAIN VALVES (FORGED), SIZE UPTO 50MM NB, CLASS UPTO 2680 FOR POWER CYCLE PIPING APPLICATION.	
		I			LEADER VALVES LTD.	JALANDHAR	A		CC NRV UP NB 800, 150# FOR STG PKG.	
		I			BHEL	TRICHY	A			
		I			CRESCENT VALVES	MUMBAI	A		UPTO NB 300 CL 600	
		I			VELAND VALVE CORP.	USA	A		GATE V/V 2-34" CL 900-4500 CAST STEEL GATE V/V 18-48" CH50-800	
		I			VELAN	UK	A		1) GLOBE V/V 1/4"-2" C14500 (2) BONNETLESS GLOBE V/V 1/2-2.5" CI 150-500)	
		I			L&T VALVES	COIMBATORE	A		UP TO CLASS 4500 & GRADE 91	
		I			TRILLIUM FLOW	HUBLI	A		UPTO NB 300 & CL-600, FORGED UPTO NB 50 CL 800	

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		I			FOURESS ENGG. INDIA LTD.,	THANE	A		(1) 10"X600 # GATE/GLOBE/CHECK VALVES (2) 16"X300# GATE/GLOBE/CHECK VALVES (3) 24"X150# GATE/GLOBE/CHECK VALVE (4) 2"X800 # FS GATE/GLOBE/CHECK (LIST) AS PER BS5352 (B) GATE GLOBE/CHECK VALVES FOR 700# TO 1500#	
		I			NITTON VALVES INDIA PVT. LTD.,	AURANGABAD	A		(1) GATE VALVE: UPTO36" CLASS 600 WCB/WCC (2) GLUBE VALVE: UPTO 16" CLASS 300 WCB/WCC (3) CHECK VALVE : UPTO 12" CLASS 600 WCB/WCC & WC6	
		I			SAMSHIN LTD.,	SOUTH KOREA	A		(1) GATE - 450 NB 3900 SPL CL SA 217 C12A (GR 91) (2) GLOBE (CAST) - 200 NB 3900 SPL, CL FOR SA 217C12 (G 91) (3) GLOBE (FORGED GR 92) - 50 NB 4500 CL GR SA182 F 92 (4) CHECK (CAST) - 200 NB 3500 SPL CL FOR SA 217C12A (GR91) (5) CHECK (FORGED GR 92) - 50 NB 4500 CL GR SA 182 F 92 (5) ANGLE (FORGED80 NB)	
		I			TOA VALVE ENGGINERING INC.	JAPAN	A		CONVENTIONAL VALVES (1) GATE VALVES UPTO SIZE 16", CLASS 4500 UPTO C12A/F91 (2) GATE VALVES UPTO SIZE 26" CLASS 2500 UPTO C12A (3) CHECK VALVES UPTO SIZE 14" CLASS 2500 UPTO C12A (4) GLOBE VALVES UPTO SIZE 3" CLASS 4500 UPTO C12A (5) GLOBE VALVES UPTO SIZE 10" CLASS 1500 & 4" CLASS 2500 UPTO F91	
		I			FOURESS ENGG. INDIA LTD.	THANE	A		(1) 10"X600 # GATE/GLOBE/CHECK VALVES (2) 16"X300# GATE/GLOBE/CHECK VALVES (3) 24"X150# GATE/GLOBE/CHECK VALVE (4) 2"X800 # FS GATE/GLOBE/CHECK (LIST) AS PER BS5352 (B) GATE GLOBE/CHECK VALVES FOR 700# TO 1500#	

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		I			BABCOCK VALVES	SPAIN	A		(1)CAST GATE VALVE (CS) VALVE CLASS UPTO 2500SPL & SIZE UPTO 10" (2)CAST GLOBE VALVE (CS) CLASS UPTO 2500SPL & SIZE UPTO 3 INCH (3) FORGED GLOBE VALVE (CS) CLASS UPTO 1500 & SIZE UPTO 1" (4) FORGED GLOBE VALVE (CS) CLASS UPTO TO 800 & SIZE UPTO 1.5"	
		I			FORBES MARSHALL PVT LTD	PUNE	A		CONVENTIONAL VALVES :CAST GATE VALVE (CS) CLASS UP TO 2500SPL & SIZE UP TO 10 INCH CAST GLOBE VALVE (CS) CLASS UP TO 2500SPL & SIZE UP TO 3 INCH	
		I			BABCOCK WILCOX ESPANOLA	SPAIN	A		CONVENTIONAL VALVES -CAST GATE VALVE (CS) CLASS UP TO 2500SPL & SIZE UP TO 10 INCH CAST GLOBE VALVE (CS) CLASS UP TO 2500SPL & SIZE UP TO 3 INCH	
		I			HP VALVES OLDENZAAL B V	NETHERLAND	A		CONVENTIONAL VALVES -CAST GATE VALVE (CS) CLASS UP TO 2500SPL & SIZE UP TO 10 INCH CAST GLOBE VALVE (CS) CLASS UP TO 2500SPL & SIZE UP TO 3 INCH	
		I			Aruna Industrial Products Pvt. Ltd.	MADURAI	A		REFER APPROVAL CONDITION	
39	SAFETY VALVES(SPRING TYPE)	I			DRESSER INDUSTRIES	USA	A			
		I			SAMPELL AG	GERMANY	A			
		I			TYCO (PENTAIR VALVES & CONTROLS	USA	A			
		I			FUKUI SEISAKUSHO CO LTD	JAPAN	A			
		I			RIENEKE GMBH	GERMANY	A		HYDRAULIC TYPE	
		I			BOPP & REUTHER	GERMANY	A		HYDRAULIC TYPE	
		I			MIEWA CORPORATION	JAPAN	A		(1) SAFETY VALVE SIZE 1/2" TO 6" & 150 TO 4500 CLASS	
		I			BHEL	TRICHY	A			
		I			PENTAIR SANMAR LTD	PUDUKOTTAI	A		AUX STEAM SYSTEM: UP TO 6" SIZE AND CLASS UP TO 600	
		I			FAINGER LESER VALVES P LTD	AURANGABAD	A		SIZE(INELT/OULET): 200/300 MM APPLICABLE TO MAX DESIGN TEMPERATURE:474 DEG C & PRESSURE:47 KG	

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
40	ELECTROMATIC RELIEF VALVE (ERV)	I			VALVES TECHNOLOGIES	USA	A		(A) 1.5"X3" CLASS 3100- F91 MATERIAL (B) 2.5"X4", CLASS 1500-F91 MATERIAL	
		I			FUKUI SEISAKUSHO CO LTD	JAPAN	A			
		I			SAMPELL AG	GERMANY	A			
		I			DRESSER INDUSTRIES	USA	A			
		I			MIEWA CORPORATION	JAPAN	A		SIZE UPTO 65MM & UPTO 4500 CLASS	
41	PLUG VALVE	I			FLOW SERVE INDIA CONTROLS	KANCHIPURAM	A		SIZE: 25 TO 300 MM, CLASS 150 & 300	
		I			3Z CORP.	SOUTH KOREA	A			
		I			HAWA VALVES	MUMBAI	A		UP TO 10” SIZE AND 300 CLASS	
42	BOILER STRUCTURE & FABRICATION ITEMS(MAIN & AUX COLUMNS, CEILING GIRDERS, BUILT-UP BEAMS, BRACINGS & BUCKSTAY), COAL BUNKER	I			M/S. BHEL	TIRUCHIRAPALLI	A		MAIN & AUX COLUMNS, CEILING GIRDERS, BUILT-UP BEAMS	
		I			CAPACITE	WADA, PALGHAR	A		(WELDED & BOLTED TYPE)BOILER PRIMARY STRUCTURES (CEILING GIRDER, MAIN COLUMNS, AUX. COLUMN, BOXES, BUCKSTAY, BRACING, MILL BAY STRUCTURE APH SUPPORT STRUCTURE ETC.)	
		I			SALEM AUTOMECH (INDIA) PVT. LTD.,	SALEM	A		BOILER STRUCTURES, I.E. CEILING GIRDER	
		I			DIAMOND ENGINEERING (CHENNAI) PVT LTD., CHENNAI	KANCHIPURAM	A		FABRICATION OF BOILER STRUCTURES -AWB UNIT-2 FABRICATION OF BOILER STRUCTURES-CEILINER GIRDER, AWB, COLMNS ETC. - BOILER STURCTURES-FABRICATION, TRIAL ASSEMBLY, BLASTING(AWB, COLUMNS, CEILING GIRDER ETC.)	
		I			SALEM AUTOMECH UNIT-I & UNIT-II	SALEM	A		CEILING GIRDERS	
		I			QUALITY ENGG.WORKS	TRICHY	A		CEILING GIRDERS	
		I			INDOFAB	TRICHY	A		CEILING GIRDERS	
		I			SANTHI ENGG. UNIT-II	PUDUKKUDI	A		CEILING GIRDERS	
		I			MASTERFAB UNIT-II	DEVARAYANERI	A		CEILING GIRDERS	

		Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW) Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची				DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 18.04.2023 SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)	
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		I			ARCEOR MITTAL DHAMM PROCESSING PVT LTD	RANIPET	A		(WELDED & BOLTED TYPE)BOILER PRIMARY STRUCTURES (WITHOUT CEILING GIRDER) I.E.MAIN COLUMNS, AUX. COLUMN, BOXES, BUCKSTAY, BRACINGS, MILL BAY STRUCTURE, APH SUPPORT STRUCTURE ETC.)	
		I			JSW SEVERFIELD STRUCTURES LTD	BELLARY	A		(WELDED & BOLTED TYPE) BOILER PRIMARY STRUCTURES (WITH OUT CEILING GIRDER) I.E, MAIN COLUMNS, AUX. COLUMN, BOXES, BUCKSTAY, BRACINGS, MILL BAY STRUCTURE, APH SUPPORT STRUCTURE ETC.)	
		I			ATMASTCO (P) LTD	DURG	A		(WELDED & BOLTED TYPE) BOILER PRIMARY STRUCTURES (WITHOUT CEILING GIRDER) I.E.MAIN COLUMNS, AUX. COLUMN, BOXES, BUCKSTAY, BRACINGS, MILL BAY STRUCTURE, APH SUPPORT STRUCTURE ETC. DUCTS)	
		I			ANG INDUSTRIES	SITARGANJ	A		FABRICATION AND SUPPLY WELDED TYPE BOILER STRUCTURES I.E. MAIN COLUMNS (PLUS AND BOX), AUTO WELDED BEAMS AND BRACINGS.	
		I			INDIANA GRATINGS PVT LTD	PURANDAR	A		FACTORY FABRICATED CIVIL STRUCTURE POWER HOUSE (TG BUILDING) STRUCTURAL ITEM (MAX SINGLE PIECE SIZE UPTO 15MT) (WELDED & BOLTED TYPE)	
		I			ESSAR HEAVY ENGINEERING SERVICES, (A UNIT OF ESSAR PROJECTS INDIA LTD)	SURAT	A		FABRICATION AND SUPPLY OF BUCKSTAYS	
		I			SIMPLEX ENGINEERING & FOUNDRY WORKS PVT LTD	BHILAI	A		(WELDED & BOLTED TYPE) BOILER PRIMARY STRUCTURES (WITH OUT CEILING GIRDER) I.E, MAIN COLUMNS, AUX. COLUMN, BOXES, BUCKSTAY, BRACINGS, MILL BAY STRUCTURE, AP	
		I			SIMPLEX ENGG & FOUNDRY WORKS	UNIT 2, BHILAI	A		CEILING GIRDERS	

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		I			SEAM INDUSTRIES LIMITED	NAGPUR	A		WELDED STRUCTURE UPTO 15T.FABRICATION AND SUPPLY OF BUNKERS & BUNKER STRUCTURES, BUCKSTAYS AND DUCTS.	
		I			SHIVAM HITECH STEELS PVT. LTD	BHILAI	A		HORIZONTAL BRACE/CIRCULAR HOLLOW SECTION ,BUCKSTAY,DUCTS	
		I			ENESTEE ENGINEERING LTD.,	NAGPUR	A		FABRICATION & SUPPLY OF BUNKERS & BUNKER STRUCTURES ,BUCKSTAY,DUCTS	
		I			SSV ENGINEERS PVT. LTD.,	PUNE	A		COAL SILOS, BUCKSTAY, DUCTS	
		I			ALLIANCE INTEGRATED METALIKS LTD.,	RAJPURA	A		BOILER PRIMARY STRUCTURES (EXCLUDING CEILING GIRDER)	
		I			TECHNOFAB MANUFACTURING LTD.	CHENNAI	A		FABRICATION AND SUPPLY OF BUNKER, BUNKER STRUCTURE, TP'S & CONVEYER GALLERIES,DUCTS	
		I			BABY ENGINEERING PVT. LTD.,	THUVAKUDI	A		BOILER PRIMARY STRUCTURES (EXCLUDING CEILING GIRDER) (WELDED & BOLTED TYPE)	
		I			COREFAB PROJECTS PVT LTD.,	BHILAI	A		FABRICATION & SUPPLY OF BOILER PRIMARY STRUCTURES - MAIN & AUX. COLUMNS, BUILT UP BEAM, BUCKSTAYS, BRACINGS, MILL BAY STRUCTURE AND APH SUPPORT STRUCTURE (EXCLUDING CEILING GIRDERS),DUCTS (WELDED & BOLTED TYPE)	
		I			MIURA INFRASTRUCTURE PVT. LTD	BHILAI-	A		BOILER PRIMARY STRUCTURE - MAIN & AUX. COLUMNS, BUILT UP BEAMS, BOXES, BUCKSTAY, BRACINGS, MILL BAY STRUCTURE, APH SUPPORT STRUCTURE (EXCLUDING CEILING GIRDERS) UPTO MAXIMUM SINGLE PIECE WEIGHT OF 30 MT (WELDED & BOLTED TYPE)	
		I			METALFAB HIGHTECH PVT LTD.	NAGPUR	A		FABRICATION AND SUPPLY OF BUCKSTAYS ,DUCTS,(WELDED & BOLTED TYPE), COAL BUNKER	

		Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.04.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)	
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		I			WHEELS INDIA LTD.	WARDHA	A		MANUFACTURING OF WELDED TYPE STRUCTURES I.E. AUTOWELDED BEAMS BRACING AND COLUMNS (UPTO 15T) ,BUCKSTAY,DUCTS(WELDED & BOLTED TYPE)	
		I			NOVOTECH PROJECTS (I) PVT LTD	KOLKATA	A		BUNKER STRUCTURE, TPS & TRESTLES	
		I			JINDAL STEEL & POWER LTD. (JSPL)	RAIGARH	A		PRIMARY STRUCTURE & CEILING GIRDER (WELDED & BOLTED TYPE)	
		I			AJANTHA FABRICATOR WORKSUNIT-II	PUDUKKOTTAI	A		BOILER PRIMARY STRUCTURES-COLUMNS, BEAMS, BRACINGS AND CEILING GIRDERS (WELDED & BOLTED TYPE)	
		I			FEEDERS LIOYDS	SIKANDRABAD	A		PRIMARY STRUCTURE - MAIN COLUMNS, AUX COLUMNS, BUILT UP BEAMS, BOXES, BUCKSTAY (WELDED & BOLTED TYPE)	
		I			L&T HEAVY FORGING & SPECIAL STEEL	HAZIRA	A		CEILING GIRDER	
		I			VASAN INDUSTRIES	PUDUKKOTTAI	A		BOILER PRIMARY STRUCTURES(WELDED AND BOLTED TYPE)	
		I			REGIONAL ENGINEERING WORKS	THUVVAKKUDY	A		BOILER PRIMARY STRUCTURE(WELDED AND BOLTED TYPE)	
		I			VRINDA ENGINEERS	PANAGARH, WB	A		COAL BUNKERS	
		I			GREAT INDIA FABRICATORS	YAMUNANAGAR	A		BOILER PRIMARY STRUCTURES EXCLUDING CEILING GIRDER(WELDED AND BOLTED TYPE), LIMITATIONS AS PER APPROVAL CONDITIONS	
		I			Goodluck Steel Tubes	Sikenderabad	A		Buckstay	
		I			GEW	Sikenderabad	A		Buckstay	
		I			JSPL	Angul	A		Boiler Primary Structure (Excluding Ceiling Girder)	
		I			L&T Limited ECC Workshop	Kanchheepuram	A		Boiler Primary Structure (Excluding Ceiling Girder)	
		I			JSPL	Raipur	A		Primary Structure -Ceiling Girder -Sub to approval condition	
		I			Steel Infra Solutions Private Limited(SISCOL)	Bhilai	A		Boiler Primary Structure (Excluding Ceiling Girder) and column directly supporting ceiling girders-Sub to approval condition	

		Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW) Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची				DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 18.04.2023 SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)	
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
43	ELECTRO FORGED GRATINGS	II			INDIANA GRATINGS PVT. LTD	PUNE	A			
		II			KARDEANAND UDYOG	PUNE	A			
		II			PREMIER POWER PRODUCTS LTD	HOWRAH	A			
		II			BHOLA RAM STEEL PVT. LTD	PATNA	A			
		II			PINAX STEEL INDUSTRIES PVT LTD	PATNA	A			
		II			GREATWELD STEEL GRATING PVT. LTD	PUNE	A			
		II			VIN FAB ENGG. PVT LTD.,	MUMBAI	A			
		II			Ratan Project & Engineering	Howrah	A			
44	TANKS & VESSELS(IBD, CBD, FLASH TANK ETC)	I			KPHE	SOUTH KOREA	A			
		I			SV TANKS & VESSELS	MUMBAI	A			
		I			PROGEN SYS TECH LTD	CHENNAI	A		UP TO 4 KSC PR	
		I			FAB TECH	PUNE	A			
		I			UNITECH MACHINES LTD	SAHARANPUR	A		UP TO 10 KSC PR	
		I			SEAM IND P LTD	NAGPUR	A		UP TO 10 KSC PR	
		I			SHAKTI HI TECH CONST PVT LTD	CHENNAI	A		UP TO 10 KSC PR	
		I			SOUTHERN HEAVY ENGG & FAB PVT LTD	CHENNAI	A		UP TO 10 KSC PR	
		I			ALTECH INFRASTRUCTURE(I) PVT LTD	ALWAR	A		UP TO 16 KSC PR	
		I			SEAM INDUSTRIES PVT LTD	NAGPUR	A		UP TO 16 KSC PR	
45	SOOT BLOWER PRESSURE REDUCING VALVES & BLOCK	I			REFER QA C&I LIST		A			
46	FITTINGS(GRADE 91/92)	I			PETROL RACCORD SPA	ITALY	A		FORMED AND FORGED FITTINGS 91/92 GRADE	
		I			BOKOYOUNG METAL CO.	SOUTH KOREA	A		FORGED FITTINGS AS PER SA-182 F92 GRADE (REDUCERS, NOZZLE, HALF COUPLING ETC.)	
		I			TF TECH CO. LTD	SOUTH KOREA	A		FORGED FITTINGS AS PER SA-182 F92 GRADE (REDUCERS, NOZZLE, HALF COUPLING ETC.)	
		I			FLASH FORGE	VIZAG	A		P91 FORMED/FORGED UPTO DIA 273MM & THICK 30MM	

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		I			BGH EDELSTAHL SIEGEN GMBH	GERMANY	A		MANUFACTURE AND SUPPLY OF FORGED FITTINGS OF CS, AS AND SS GRADES	
		I			ERNE FITTINGS GMBH	AUSTRIA	A		P-91 FORMED	
		I			GAM RACCORDI SPA	ITALY	A		P-91 FORMED	
		I			TECHNO FORGE SPA	ITALY	A		P-91 FORMED	
		I			MEGA SPA	ITALY	A		92 GRADE FITTINGS (FORGED)	
		I			BASSI LLUIGI SPA	ITALY	A		P-91 FORGED/WELDED	
		I			IBF SPA	ITALY	A		FORMED AND FORGED FITTINGS/P92 GRADE	
		I			ALLIED INT. (TACTUBI RACCORDI SPA, VIA ROMA 150, 29027 PODENZANO)	ITALY	A		P-91 FORMED	
		I			BRUCK STRASSE 16 ENSHEIM	GERMANY	A		P-91 FORGED/WELDED	
		I			SUNGKWANG BEND CO. LTD.,	SOUTH KOREA	A		FITTINGS OF P91 AND OF MTERIAL OTHER THAN P91 OF BOILER	
		I			TK CORPN. FORGITAL	S KOREA	A		FORMED FITTINGS (ELBOW, TEES, REDUCERS ETC.) OF 92 GRADE.	
		I			FORGITAL	ITALY	A		MANUFACTURING AND SUPPLY OF GRADE 91 FORTGINGS (HOLLOW FORGINGS/MATCHING PIECES WITH 508MM DIA X 75MM THICKNESS STUBS WITH OD 245MM.	
		I			DEE DEVELOPMENT	PALWAL	A		GRADE 91 WITH SIZE/TYPE LIMITATIONS	
		I			CHW FORGE	GHAZIABAD	A		GRADE 92 WITH SIZE/TYPE LIMITATIONS	
		I			FORGIATURA MORANDINI SRL	ITALY	A		GRADE 92 FORGED FITTINGS(REDUCERS, TEES & Y-PIECES)	
		I			BHARAT FORGE, PUNE	PUNE	A		GRADE 92 FORGED FITTINGS(REDUCERS, TEES & Y-PIECES)	
		I			BOKYOUNG METAL CO.LTD	SOUTH KOREA	A		GRADE 92 FORGED FITTINGS(REDUCERS, NOZZLE, HALF COUPLING)	
		I			VIAR SPA	ITALY	A		SEAMLESS FORGED Y-PIECE UP TO GRADE 91	
		I			DEE DEVELOPMENT	PALWAL	A		GRADE 92 WITH SIZE/TYPE LIMITATIONS	
		I			Goodluck Engineering Co.	Dadri	A		Forged Fittings (91/92 grade)	

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
47	AUX PRDS SYSTEM (INCLUDING CONTROL VALVE)	I			REFER C&I LIST					
48	CHEMICAL DOSING SYSTEM (SKID ASSY) FOR SG SCOPE INCLUDING AUX BOILER	I			POWER PIPING	TRICHY	A			
		I			V K PUMPS	MUMBAI	A			
		I			MILTON ROY	CHENNAI	A			
		I			TECHNO CONSULTANTS	MUMBAI	A			
		I			POSITIVE METERING SYSTEM	NASIK	A			
		I			PSI ENGG SYSTEM	CHENNAI	A			
		I			Prorites Equipments Pvt. Ltd.	Pune	A		LP Chemical Dosing System (NaOH/Ammonia/Hydrazine)	
49	SG CW BOOSTER PUMP/ ECW PUMP	I			KBL	WADI	A			
		I			WPIL LTD	GHAZIABAD	A			
		I			SAM TURBO	COIMBATORE	A			
		I			KSB	PUNE	A			
		I			BEST & CROMPTON ENGG LTD	CHENNAI	A			
		I			JYOTI LTD	BARODA	A			
		I			FLOWMORE	GHAZIABAD	A			
50	COAL BUNKER	I					A		REFER BOILER STRUCTURE LIST	
51	LUBE OIL SYSTEM FOR MILLS	I			LINCOLN HELIOS	BANGALORE	A			
		I			T A HYDRAULICS	HYDERABAD	A			
		I			CENLUB INDUSTRIES	FARIDABAD	A			
		I			BHEL	HYDERABAD	A			
		I			BIJUR DELIMON INDIA PVT LTD	PUNE	A			
		I			UNIQUE ENGINEERING ENTERPRISE P LTD	HYDERABAD	A			
		I			SOUTHERN LUB	BANGALORE	A			
52	CERAMIC LINED BEND COAL PIPES	II			BHEL EDN	BANGALORE	A			
		II			BMW	HATHRAS/ROURKEE	A			
		II			CARBORANDUM UNIVERSAL	HOSUR	A			
		II			BHEL IP	JAGDISHPUR	A			

		Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:		
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)							REVISION NO : 00		
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.04.2023		
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)		
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	
53	KNIFE EDGE GATE VALVES AT MILL OUTLET AND BURNER INLET	II			GALAXY CONTROLS PVT LTD	CHENNAI	A		UP TO SIZE 26'		
		II			ORBINOX INDIA PVT LTD	COIMBATORE	A		UP TO SIZE 30"		
		II			BRAY CONTROLS	CHENNAI	A		UP TO SIZE 28"		
		II			JASH ENGG LTD	INDORE	A		UP TO SIZE 30"		
54	VIS FOR FANS	I			GERB	BANGALORE	A				
55	LOS FOR FD, PA & ID FANS	I			PSI ENGG	CHENNAI	A				
		I			CENLUB	FARIDABAD	A				
		I			LINCOLN HELIOS	BANGALORE	A				
		I			BHEL	RANIPET	A				
		I			SOUTHERN LUBRICATION	BANGALORE	A				
		I			TA HYDRAULICS	HYDERABAD	A				
56	GATES AND DAMPERS	I			BACHMANN	FARIDABAD	A				
		I			FOURESS INDIA	BANGALORE	A				
		I			INDIRA DAMPERS	RANIPET	A				
		I			KAMAL ENGG	YAMUNANAGAR	A				
		I			BACHMANN	CHENNAI	A		GUILLOTINE GATE(2700 MM HEIGHT)		
		I			DAMPER TECHNOLOGY INDIA PVT LTD	COIMBATORE	A				
		I			Flexatherm Expanllow Pvt.Ltd	Block No-400/B, Karjan, Vadodara	A		Gates & Dampers(Flow Area/Cross-sectional area upto 5600mm X 5600mm)		
57	PA Fans	I			Bharat Heavy Electrical Limited	Ranipet	A				
		I			L&T- Howden Private limited	Hazia	A				
		I			TLT-Turbo GmBH	Germany	A				
		I			Howden	Denmark	A				
58	ID Fans	I			Bharat Heavy Electrical Limited	Ranipet	A				
		I			TLT Turbo GmBH	Germany	A				
		I			L&T Howden Private Limited	Hazira	A				
		I			Howden	Denmark	A				
59	FD Fan	I			Bharat Heavy Electrical Limited	Ranipet	A				
		I			L&T Howden Private Limited	Hazira	A				
		I			TLT-Turbo GmBH	Germany	A				

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
		I			Howden	Denmark	A			
60	Coal Pulverisers	I			BHEL	Hyderabad	A			
		I			L&T MHPS Boilers Pvt. Ltd.(LMB) (Incl. Manufacturing Facility of L&T)	Hazira	A			
		I			Loesche Energy system India pvt ltd.	Chennai	A			
		I			Doosan Heavy Industries & Construction Co. Ltd	South Korea	A			
61	Raw Coal Feeders	I			Bharat Heavy Electricals Limited	Trichy	A			
		I			Schenck Process (Stock Redler India Private Limited, India)	Bengaluru	A			
		I			Merrick Industries Pvt. Ltd., India	Bengaluru	A			
		I			Yamato Scale	Japan	A			
		I			FLSmidth	Haryana	A			
62	Boiler Start Up Drain Re-Circulation Pump	I			Torishima Pump Mfg Co. Ltd.,	Japan	A			
		I			Hayward Tyler Limited	UK	A			
		I			KSB AG	Germany	A			
63	Air Pre-Heaters	I			Bharat Heavy Electricals Limited	Ranipet	A			
		I			L&T Howden Private Limited	Hazira	A			
		I			Arvos India Pvt.LTd.	Chennai	A			
64	Auxiliary Boiler	I			ISGEC John Thampson (IJT)	Yamuna Nagar	A			
		I			Thermax Babcock & Wilcox Ltd.	Pune	A			
		I			Bharat Heavy Electricals Limited & BHEL (HVPB)	Trichy, Vizag	A			
65	ESP	I			Bharat Heavy Electricals Limited	Ranipet	A			
		I			Larsen & Toubro Limited	India	A			
		I			GE Power India	India	A			
	Main Contractor approved sources									
1	ALUMUNIUM CLADDING	III			Main Contractor approved sources					
2	NON IBR PIPING / LP PIPING - PRESSURE UP TO 10 KSC	III			Main Contractor approved sources					
3	CASTABLE REFRACTORY	III			Main Contractor approved sources					

	Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.:
	Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)		REVISION NO : 00
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 18.04.2023
	Contract No./ अनुबंध सं.:		SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
4	POURABLE INSULATION	III			Main Contractor approved sources					
5	STEEL STRUCTURE FOR DUCTS, FURNACE ENCLOSURE, GUIDE, STAIRS & LADDERS, HANDRAILS, PLATFORMS	III			Main Contractor approved sources					
6	SILENCERS	III			Main Contractor approved sources					
7	COAL PIPES & BENDS (WITHOUT CERAMIC LINERS)	III			Main Contractor approved sources					
8	FITTINGS(CS, SS & AS UP TO GRADE 22)	III			Main Contractor approved sources					
9	ELECTRIC HOIST WITH TROLLEY, UNDERSLUNG CRANE < 05 TON CAPACITY	III			Main Contractor approved sources					
10	DUCTS	III			Main Contractor approved sources					
11	AIR RECEIVER TANK	III			Main Contractor approved sources					
12	COUPLING FOR FANS	III			Main Contractor approved sources					
13	SCAPH	III			Main Contractor approved sources					
14	OXYGEN DOSING SYSTEM	III			Main Contractor approved sources					
15	CE & DE SUSPENSION ASSEMBLY WITH RAPPING(MECHANICAL) MECHANISM	III			Main Contractor approved sources					
16	PERFORATED GD PLATE/SCREEN	III			Main Contractor approved sources					
17	ESP SUPPORT STRUCTURE (COLUMNS & ROOF BEAMS MANUFACTURED FROM ROLLED SECTIONS), CASING	III			Main Contractor approved sources					
18	ESP- MECH SAFETY INTERLOCK	III			Main Contractor approved sources					
19	Spray header for FGD	III			Main Contractor approved sources					
20	Mist eliminators for FGD	III			Main Contractor approved sources					
21	STEEL STRUCTURE FOR DUCTS, FURNACE ENCLOSURE, GUIDE, STAIRS & LADDERS, HANDRAILS, PLATFORMS	III			Main Contractor approved sources					
22	HANGER & SUPPORTS(OTHER THAN CLH & VLH) RIGID HANGERS	III			Main Contractor approved sources					
23	SNUBBERS	III			Main Contractor approved sources					
24	Oil Preheater & Pressuring Skid	III			Main Contractor approved sources					

NOTE -1 : For final Sub-QR approval , document required to be submitted as per Sub-QR requirements given in the specification.

NOTE-2: Vendors under 'A' are approved and accepted by NTPC with/without conditions in the past. Similar conditions as the case may be for the vendor shall be applicable for this project and tied up in the quality plan.

NOTE-3: Predespatch inspection for Alloy/SS Grades needs to be tied up by Main contractor or Third-party inspection agency as required.

		Project/ परियोजना :RAGHUNATHPUR HERMAL POWERR PROJECT PHASE -II (2X660MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:		
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG.)							REVISION NO : 00		
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.04.2023		
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-SG(MECH)		
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी		Provenness Clause (Refer Note-1)
NOTE-4 : ($) Review of Mill TC for Raw Material to be done by NTPC and shall be included in the QP of corresponding equipment.											
NOTE-5: Raw Material for 91 and above Grade Material Fittings to be from NTPC approved sources as per Raw Material vendor List.											
NOTE-6:For Motorized/Pneumatic actuated valves the suppliers for actuators shall be from NTPC approved list, Refer NTPC C&I list.											
LEGENDS/ संकेतिका											
SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY /प्रणाली आपूर्तिकर्ता / सब –वेंडर की स्वीकृति की स्थिति की श्रेणी (SHALL BE FILLED BY NTPC एनटीपीसी द्वारा भरा जाएगा)											
A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter “A” in the list along with the condition of approval, if any./ इन मदों के लिए प्रस्तावित वेंडर एनटीपीसी को स्वीकार्य है। अनुमोदन की शर्त, , यदि कोई हो, के साथ-साथ पत्र "क" में इंगित किया जाए ।											
DR – For these items “Detailed required” for NTPC review. To be identified with letter “DR” in the list. एनटीपीसी द्वारा इन मदों की समीक्षा के लिए "विस्तृत ब्यौरे की आवश्यकता" होगी। सूची में "DR" पत्र में इंगित किया जाना चाहिए।											
QP/INSPN CATEGORY: क्यूपी / निरीक्षण की श्रेणी:											
CAT-I / श्रेणी- I: For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया जाता है और एनटीपीसी द्वारा अंतिम स्वीकृति भौतिक निरीक्षण के दौरान उपलब्ध गवाह के आधार पर दी जाएगी।											
CAT-II / श्रेणी- II: For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया जाता है। हालाँकि एनटीपीसी द्वारा कोई भौतिक निरीक्षण नहीं किया जाएगा। एनटीपीसी द्वारा अंतिम स्वीकृति अनुमोदित क्यूपी के अनुसार दस्तावेजों की समीक्षा के आधार पर दी जाएगी।											
CAT-III/ श्रेणी-III : For these items Quality control to be exercised as per Main contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of Conformance (COC) by Main Contractor.											
UNITS/WORKS इकाईयां / कार्य: Place of manufacturing/ निर्माण का स्थान Place of Main Supplier of multi units/works/बहु- इकाइयों / कार्यों के मुख्य सप्लाइर का स्थान.											

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)				DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
1	AIR BLOWERS -LOBE TYPE > = 5KW	I			SWAM PNEUMATIC	NOIDA	A			WTP,CPU,AHP
					EVEREST BLOWERS PVT LTD	BAHADURGARH	A		UP TO 40 HP (APPROX 1600 CUM/HR)	
					KAY INTERNATIONAL	SONEPAT	A		UP TO 4800 CUM/HR	
					KULKARNI POWER TOOLS	SHIROL	A		UP TO 2500CUM/HR	
					USHA COMPRESSORS	AHMEDABAD	A		UP TO 60 HP (APPROX 2000CUM/HR)	
2.A	EOT CRANE & ELECTRIC HOIST >5 MT	I (> 10T) / III (>5T UP TO 10T)			REVA INDUSTRIES	FARIDABAD	A		UP TO 60 MT	WTP,CT.AC&VENTILATION,CHP,LHP&GHP,AHP, CW , FDPS
					EDDY CRANE	PUNE	A		UPTO 10 MT	
					CONSOLIDATED HOIST	SATARA /PUNE *	A		SATARA UP TO 20 MT,*PUNE FOR ELECTRIC HOIST UPTO 15 MT	
					ELECTROTHERAPHY	RISHRA	A		UPTO 15 MT FOR ELECTRIC HOIST ONLY	
					HERCULES HOIST	RAIGAD	A		UPTO 15 MT FOR ELECTRIC HOIST ONLY	
					TUBRO FERGUSSON	KOLKATA	A		UP TO 20MT FOR EOT, UP TO 5 MT FOR FOR ELECTRIC HOIST	
					PRAYAS ENGG (PBL)	V V NAGAR	A		UPTO 10 MT FOR ELECTRIC HOIST ONLY	
					ALPHA SERVICES	ALWAR	A		ELECTRIC HOIST UPTO 15 MT ONLY. GEARBOX FROM NTPC APPROVED SOURCES FOR EOT CRANE.	
					CENTURY CRANE ENGINEERS PVT. LTD	BALLABHGARH	A		UP TO 25 MT	
					ARMSEL	BANGALORE	A		UPTO 10 MT EOT & UPTO 15 MT ELECTRIC HOIST	
					TRACTEL TIRFOR	PALWAL	A		UPTO 15 MT FOR ELECTRIC HOIST AND UPTO 10 MT FOR EOT	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण	Remarks/ टिप्पणी	Applicable Systems
					MILLARS INDIA	KARAMSAD	A		UP TO 25 MT	
					AVON CRANES	GURGAON	A		UP TO 25 MT	
					GRIP ENGINEERS	HYDERABAD	A		50 MT (GEARBOX FROM NTPC APPROVED SOURCES FOR EOT CRANE).	
					GRIP ENGINEERS	FARIDABAD	A		UPTO 20 MT ELECTRIC HOIST ONLY	
					CRANEX	GHAZIABAD	A		UP TO 140 MT FOR EOT ONLY	
2.B	GANTRY CRANE >5T	I (> 10T) / III (>5T UP TO 10T)			REVA INDUSTRIES	FARIDABAD	A		UP TO 60 MT	CW
					UNIQUE INDUSTRIAL HANDLERS PVT LTD	NASHIK	A		UP TO 165 MT	
					ANUPAM INDUSTRIES LTD.	ANAND	A		UP TO 60MT	
					SMACO ENGINEERING PVT. LTD	THANE	A		UP TO 60MT	
					MANGLA HOIST	GREATER NOIDA	A		UP TO 10MT	
3	FAN- AXIAL TYPE > = 5KW	I			CB DOCTOR VENTILLATOR PVT LTD	AHMEDABAD	A		up to 50000 CMH	WTP,CT.AC&VENTILATION,CHP,LHP&GHP,AHP
					HOWDEN SOLYVENT FLAKT INDIA PVT LTD,	CHENNAI	A		up to 125000 CMH	
					C DOCTOR &CO PVT LTD	KOLKATA	A		up to 50000 CMH	
					KRUGER VENTILATION INDUSTRIES (I) PVT LTD	SHAHPUR, THANE	A		Up to 6000 CMH	
					NADI AIRTECHNICS PVT LTD	CHENNAI	A		Up to 15000 CMH	
					ADVANCE VENTILATION PVT LTD	KUNDALI. SONEPAT	A		up to 40000 CMH	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
					SK SYSTEMS PVT LTD	KUNDALI PHASE-II, SONEPAT, HARYANA	A		up to 50000 CMH	
					Patel Airflow	Ahemdabad	A		up to 40000 CMH	
					ALMONAROD (P) LIMITED	CHENNAI	A		Up to 14000 CMH	
4	PIPES-MS- (BLACK/ GI) AS PER IS IS:3589 >1000NB	I			STEEL AUTHORITY OF INDIA LIMITED	ROURKELA	A			CW,CT,MUW
					WELSPUN	ANJAR	A		SAW UPTO 2600 NB	
					WELSPUN	BHARUCH	A		SAW UPTO 1300 NB	
					MAN INDUSTRIES	INDORE	A		SAW UPTO 1400 NB	
					SAMSHI	VADODARA	A		SAW 450 TO 2540 NB	
					MUKAT TANKS & VESSELS	TARAPUR	A		SAW 200 TO 1200 NB	
					MUKAT PIPES	RAJPURA	A		SAW UPTO 1800 NB	
					LALIT PIPES AND PIPES LTD	THANE	A		SAW 350 TO 1400 NB	
					RATNAMANI	CHATRAL	A		SAW 600 TO 2600 NB	
					RATNAMANI	KUTCH	A		SAW 400 TO 3600 NB	
					PSL HOLDINGS LIMITED	DAMAN	A		SAW 450 TO 1600 NB	
					PSL INTERNATIONAL LTD.	CHENNAI	A		SAW 450 TO 1600 NB	
					PSL LIMITED	KUTCH	A		SAW 450 TO 1600 NB	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
					PSL LIMITED	VISAKHAPATNAM	A		SAW 450 TO 1600 NB	
					JCO PIPES	CHHINDWARA	A		SAW UPTO 1600 NB	
					SURYA GLOBAL STEEL TUBE LTD	ANJAR	A		SAW UP TO 2032 OD	
					JINDAL SAW LTD	BELLARY	A		SAW UP TO 3632 OD , THICKNESS 16 MM	
					CAPACITE STRUCURES PVT LTD	THANE	A		406.4 MM TO 3874 MM OD	
5	PIPES & FITTINGS-GRP	I			EPP COMPOSITES PVT LTD	RAJKOT	A		UP TO 900MM	WTP,CT
					GRAPHITE INDIA	NASIK	A		UP TO 1000MM	
					SHRIRAM SEPL COMPOSITES LTD	CHENNAI	A		UP TO 1100MM	
					BALAJI FIBER REINFORCE PVT LIMITED	VADODARA	A		UP TO 650MM	
					MEGHA FIBRE GLASS INDUSTRIES PVT LTD	MEDAK	A		UP TO 900MM	
6	SERVICE VESSEL-CPU & OTHER PR VESSELS >= 10 BAR WORKING PRESSURE	I			DRIPLEX WATER ENGINEERING INTERNATIONAL PVT LIMITED	BHADARBAD	A			WTP,CPU,CAS,CHP, LHP&GHP,AHP
					BGR ENERGY SYSTEMS LTD (ENVIRONMENTAL ENGG. DIV.)	PONNERI	A		UPTO 3000MM DIA & THICKNESS UPTO 28 MM	
					ISHAN EQUIPMENTS PRIVATE LIMITED	VADODARA	A		UPTO 2900 MM DIA & THICKNESS UPTO 28 MM	
					JASMINO POLYMERTECH PVT LTD	TALOJA	A		DIA 2800MM, THICNKESS 25MM DESIGN PRESSURE UP TO 47.5 KSC	
					MAHIMA UDYOG	HARIDWAR	A		DIA UP TO 2900 MM , THICKNESS UPTO 29 MM	
					BELCO POLLUTION CONTROL PVT LTD	GREATER NOIDA	A		UPTO 3200MM DIA & THICKNESS UPTO 30 MM	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
7	PUMPS- HORIZONTAL & VERTICAL CENTRIFUGAL -UP TO 300KW	(UP TO 60 KW CAT-II , ABOVE 60 KW CAT-I)			KIRLOSKAR BROTHERS LTD	KIRLOSKARWADI	A			WTP,CW, CPU,FDPS,CHP, LHP &GHP,AC & VENTILATION,MUW, AHP
					WILO MATHER & PLATT	PUNE	A			
					WILO MATHER & PLATT	KOLHAPUR	A			
					SAM TURBO	COIMBATORE	A		FLOW UP TO 1500 CUM/HR AND POWER RATING UP TO 425 KW	
					FLOWMORE LTD	GHAZIABAD	A			
					BEST AND CROMPTON	CHENNAI	A			
					JYOTI LTD	VADODARA	A			
					WPIL	GHAZIABAD	A			
					KISHORE PUMPS	PUNE	A		UPTO 500M3/HR ONLY RUBBERLINED PUMPS ALSO	
					GRUNDFOS PUMPS INDIA PVT LTD	CHENNAI	A		HORIZONTAL UP TO 30 KW ONLY AND VERTICAL UP TO 45 KW ONLY (FOR APPLICATIONS WHERE NPSH IS NOT	
					SINTECH PRECISION	GHAZIABAD	A		HORIZONTAL UP TO 400 KW MOTOR RATING AND VERTICAL UP TO 30 KW MOTOR RATING	
					KSB	PUNE	A			
					KSB	NASHIK	A			
					FLOWSERVE INDIA CONTROLS PVT LTD	COIMBATORE	A		HOIZONTAL CENTRIFUGAL PUMP UP TO 75 KW ONLY	
					SU MOTOR	MUMBAI	A		HORIZONATL UPTO 500M3/HR ONLY RUBBERLINED PUMPS AND VERTICAL CENTRIFUGAL PUMPS UP TO 100CMH ONLY	
					BHARAT PUMPS AND COMPRESSORS	NAINI	A		FLOW UP TO 2200 M3/HR AND HEAD UP TO 60 MWC	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
8	PUMPS -VT -UP TO 300KW	I			FLOWMORE LTD	GHAZIABAD	A			WTP, CW
					KIRLOSKAR BROTHERS LIMITED	KIRLOSKARWADI	A			
					WPIL LTD	KOLKATA	A			
					WPIL LTD	GHAZIABAD	A			
					JYOTI LTD	VADODARA	A			
					XYLEM WATER SOLUTIONS INDIA PVT LTD	VADODARA	A			
					FLOWSERVE INDIA CONTROLS PVT LTD	COIMBATORE	A		UP TO 1025 KW	
					SINTECH PRECISION	GHAZIABAD	A			
					WILO MATHER & PLATT	PUNE	A			
9.A	VALVE-DUAL PLATE CHECK > 600MM OR CLASS > 300 (VALVE- DUAL PLATE CHECK UP TO 600MM & CLASS 300: CAT-II & MAIN CONTRACTOR APPROVED SOURCES)	I			ADVANCE VALVE PVT LTD	GR. NOIDA	A		DUAL PLATE CHECK VALVES CI UPTO 1000 NB CLASS 125, DUPLEX SS UP TO 600NB CLASS 600.	WTP,CW, CPU,FDPS,CAS,LP PIPING
					LEADER VALVES	JALANDHAR	A		UP TO 900MM CLASS 150 , SS 200NB CLASS#300	
					R & D MULTIPLE	VALSAD	A		CI/ CS UP TO 800NB PN 10	
9.B	VALVE-BALL > 100 MM OR CLASS > 800; (VALVE- BALL UP TO 100 MM & CLASS 800:CAT-II & MAIN CONTRACTOR APPROVED SOURCES)	I			SWIMS TECHNOLOGIES	HUBLI	A		SS BALL VALVES UP TO 500MM AND CLASS #600, CS BALL VALVES UP TO 250 MM AND CLASS# 900, CS/ SS BALL	WTP, CPU,FDPS,CAS,FOH,CHP,LHP&GHP,AHP
					MICRO FINISH VALVES PVT. LTD.	HUBLI	A		400NB CLASS#600 AND UP T0 600NB CLASS#300	
					FLOW CHEM INDUSTRIES	KALOL	A		100NB CLASS#600,200NB CLASS#300, 50 NB CLASS#800	
					L&T VALVES LIMITED	COIMBATORE	A		UPTO 150NB, CLASS #150/300, AND UPTO 50NB, CLASS #800	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब -वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
	[illegible]				PRECISSION ENGG CO VALVES PVT LTD	NASIK	A		FCS UP TO 50NB CLASS 800, CCS UP TO 400NB CLASS 150.	
					BELGAUM AQUA VALVE PVT LTD	BELGAON	A		FCS UP TO 50NB CLASS 800, CCS UP TO 200NB CLASS 150.	
					G M ENGINEERING PRIVATE LTD	RAJKOT	A		UP T0 400 NB AND CLASS #600	
9.C	VALVE-BUTTERFLY > 600MM OR CLASS>150 (VALVE-BUTTERFLY UP TO 600MM & CLASS 150::CAT-II & MAIN CONTRACTOR APPROVED SOURCES)	I			INTERVALVE POONAWALA LTD	PUNE	A		SGI / CI / D2 1400MM PN10, SGI / CI 1000MM PN16,CS/SS 500MM PN16, SS 400MM CLASS#300, MS FABRICATED	WTP, CW,CT,CPU,FDPS,CAS , AC& VENTILATION, MUW,CHP, LHP&GHP,LP PIPING,AHP
					SWIMS TECHNOLOGIES	HUBLI	A		CI/ DI BUTTERFLY VALVE UP TO 1000MM AND PN16 AND UP TO 1800MM AND PN10,CCS UP TO	
					PENTAIR VALVES	HALOL	A		FOR SS UP TO 500 NB PN-10, CI- UP TO 900NB PN-10, UP TO 500NB PN-16, 450MM CLASS#300., MS FABRICATED	
					FOURES ENGINEERING	BANGALORE	A		CAST SGI/CI/ MS FABRICATED- UP TO 1200 PN-10, UP TO 350 PN-16 ,2400 MM PN6/CLASS150	
					KIRLOSKAR BROTHERS LTD	KONDHAPURI	A		CAST SGI/CI/CS 1400 MM PN16 , SS 300 MM PN16 , 1800MM CLASS 150, MS FABRICATED 900 NB PN40,MS	
					R & D MULTIPLE	VALSAD	A		CAST SGI/CI/MS FABRICATED- UP TO 1800 MM PN-10/CLASS # 75, ,1100MM PN25,1400MM CLASS#150 ,MS	
					ADVANCE VALVES PVT LTD	GREATER NOIDA	A		METAL SEATED, TRIPLE ECCENTRIC, SS BFV OF SIZE UPTO 100NB, AND PRESSURE RATING UPTO CLASS #300.	
					BRAY CONTROLS INDIA PVT. LTD	KANCHIPURAM	A		UPTO 450 MM AND CLASS#600	
					INSTRUMENTATION LTD.	PALAKKAD	A		UPTO 2200NB CLASS # 75	
					HAWA ENGINEERS	AHMEDABAD	A		CI/ CS & FABRICATED UPTO 1200MM, CLASS #150, SS UPTO 250MM, CLASS#150	
					CRANE PROCESS FLOW	SATARA	A		UP TO 900MM PN10	
					L & T VALVES LIMITED	COIMBATORE	A		UP TO 900MM CLASS 150	
					DEMBLA VALVES	THANE	A		UP TO 2200MM CLASS#75	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)				DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
9.D	VALVE-CONVENTIONAL GATE / GLOBE / CHECK > 600NB OR CLASS > 300	II			LEADER VALVES	JALANDHAR	A		CS GATE 600MM CLASS#600, SS GLOBE 600MM CLASS#600, CS CHECK 600MM AND CLASS#600	WTP, CW,CT,CPU,FDPS,CAS , AC& VENTILATION, MUW,CHP, LHP&GHP,LP PIPING,AHP
					HAWA ENGINEERS	AHMEDABAD	A		FCS / FSS 50 NB CLASS 800.	
					FOURES ENGINEERINGS	THANE	A		400NB CLASS 600 AND 50NB CLASS 800.	
					BHEL IVP	GOINDWAL	A		GATE UP TO 300 NB CLASS 600. GLOBE 250 NB CLASS 400, CHECK 150NB CLASS 600.	
					HITECH ENGG PVT LTD	AHEMDABAD	A		50 NB CLASS 800.	
					KSB PUMPS LTD	COIMBATORE	A		300NB CLASS 2500.	
					NITON VALVES INDIA PVT LTD	NAVI MUMBAI / AURANGABAD	A		CS GATE 900 NB CLASS 600, CHECK 300 NB CLASS 600.	
					L&T VALVES LIMITED	COIMBATORE	A		650 MM CLASS 600, 50 NB CLASS 800.	
					SWIMS TECHNOLOGIES	HUBLI	A		CONVENTIONAL CCS GATE / GLOBE / CHECK VALVES UP TO 600MM AND CLASS # 1500, CSS GATE/ GLOBE/	
9.E	VALVE- DIAPHGRAGM TYPE	I			CRANE PROCESS FLOW	SATARA	A		UP TO 300NB PN10	WTP,CPU
					SWIMS TECHNOLOGIES	HUBLI	A		UPTO 250 NB - PN 10, 350MM PN6	
					PROCON ENGINEERS	MUMBAI	A		UPTO 200 NB AND PN 10/CLASS #150	
9.F	VALVE-PLUG > 100 MM OR CLASS > 800(VALVE- PLUG UP TO 100 MM & CLASS 800:CAT-II & MAIN CONTRACTOR APPROVED SOURCES)	I			SWIMS TECHNOLOGIES	HUBLI	A		SOFT SEATED 400MM AND CLASS #150, 300NB CLASS#300	WTP,CPU,CHP, LHP&GHP, FOH,AHP
					XOMOX SANMAR	TRICHY	A		UP TO 600MM AND CLASS#300	
					FLOWSERVE INDIA CONTROLS	CHENNAI	A		METALLIC SEATED 400NB CLASS#150, 300NB CLASS #300, 50NB CLASS #800	
					KSB	NASHIK	A		130 KW	WTP,CT, CPU,CHP, LHP&GHP, FOH,AHP.LP

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब -वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)				DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
10	PUMP -SUBMERSIBLE>= 30KW	I			KIRLOSKAR BROTHERS LTD	KIRLOSKARWADI	A			PIPING,FDPS
					AQUA MACHINERY	AHMEDABAD	A		UP TO 235 KW	
					WPIL	GHAZIABAD	A			
11	RUBBER EXPANSION JOINT>=1600NB (RUBBER EXPANSION JOINT < 1600NB: CAT-II & MAIN CONTRACTOR APPROVED SOURCES)	I			CORI ENGINEERS PVT LTD	CHENNAI	A		UPTO 2800 MM	ACW, ECW, CW,CT
					SRM EXOFLEX PVT LTD	KOLKATA	A		UPTO 2800 MM	
12	FAN ASSEMBLY-COOLING TOWER	I			PAHARPUR COOLING TOWERS LTD	SAHIBABAD	A		WITH SOLID FAN BLADES 288" AND 336 " DIA, WITH FOAM CORED FAN BLADES WITH 10METERS AND 10.97 METERS	CT
					PAHARPUR COOLING TOWERS LTD	BHASA	A		60" TO 288" FAN DIA	
					PAHARPUR COOLING TOWERS LTD	KOLKATA	A		60" TO 288" FAN DIA	
					M/s MAYA FANS AIR ENGG PVT LTD,	DEWAS	A		UP TO 11 METER FAN DIA	
					AMALGAMATED INDUSTRIAL COMPOSITES PVT LTD	NASHIK	A		UP TO 11 METER FAN DIA	
13	GEAR BOX -COOLING TOWER	I			PAHARPUR COOLING TOWERS LTD	SAHIBABAD	A			CT
					PAHARPUR COOLING TOWERS LTD	KOLKATA	A			
					NEW ALLENBERRY WORKS	KOLKATA	A			
					ELECON ENGINEERING	VALLABH VIDYANAGAR	A			
					PREMIUM ENERGY TRANSMISSION LTD.	FALTA	A			

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
14	DRIVE SHAFT-CARBON FIBRE -COOLING TOWER	II			M/S EUROFLEX TRANSMISSION (INDIA) PVT LTD	HYDERABAD	A			CT
					PAHARPUR COOLING TOWERS LTD	SAHIBABAD	A			
					M/s AMALGAMATED INDUSTRIAL COMPOSITES PVT LTD	NASHIK	A			
					NORTH STREET COOLING TOWERS	GHAZIABAD	A			
15	DRIVE SHAFT SS-COOLING TOWER	II			PAHARPUR COOLING TOWERS LTD	SAHIBABAD	A			CT
					PAHARPUR COOLING TOWERS LTD	KOLKATA	A			
					NORTH STREET COOLING TOWER	GHAZIABAD	A			
16	PUMP-CW PUMP	I			KIRLOSKAR BROTHER'S LIMITED	KIRLOSKARWADI	A		BOTH CV & VT TYPE	CW
					WPIL LTD	KOLKATA	A		BOTH CV & VT TYPE	
					FLOWSERVE INDIA CONTROLS PVT LTD	COIMBATORE	A		CV TYPE ONLY	
					FLOWMORE LTD	GHAZIABAD	A		VT TYPE ONLY	
					XYLEM WATER SOLUTIONS INDIA PVT LTD	VADODARA	A		VT TYPE ONLY	
					JYOTI LTD	VADODARA	A		VT TYPE ONLY.	
17	ELECTRO HYDRAULIC ACTUATOR FOR CW PUMP DISCHARGE BUTTERFLY VALVE	I			BOSCH REXROTH (INDIA) PVT LTD	SANAND	A		HYDRAULIC POWER PACK AND HYDRAULIC CYLINDER (320 MMM BORE DIA) , ACCUMUATOR FORM	CW
					HYDAC (INDIA) PVT. LTD	COIMBATORE	A		HYDRAULIC POWER PACK-HYDAC COIMBATORE, HYDRAULIC CYLINDER - HYDAC BANGLORE, ACCU MULATOR	
					ISGEC	MUZAFER NAGAR	A		FINISHED CASTING UP TO 4.0 MT APPROX	CW

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)				DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
18	IMPELLER CASTING - CW PUMP	II			THE KOLHAPUR STEEL LTD,	KOLHAPUR	A		FINISHED CASTING UP TO 4.0 MT APPROX	
					WESTERN PRECICAST PVT LTD	SANGLI	A		FINISHED CASTING UP TO 3.5 MT APPROX	
					HINDUSTAN UDYOG LIMITED	NAGPUR	A		FINISHED CASTING UP TO 3.0 MT APPROX	
					HI-MET CORPORATION	S.KOREA	A		FINISHED CASTING UP TO 3.0 MT APPROX	
					TULIP CASTING	KOHLAPUR	A		WEIGHT UPTO 3.0 MT , DIA 1600 MM	
					MATHER FOUNDARY LTD	UK	A		FINISHED CASTING UP TO 3.6 MT APPROX	
19	SHAFT-FORGING -CW PUMP	II			GORADIA SPECIAL STEELS LTD	KHAPOLI	A			CW
					BHARAT FORGE	PUNE	A			
					CFFP,BHEL	HARIDWAR	A		UP TO DIAMETER 290MM AND LENGTH APPROX. 3000MM, GRADE SS410	
20	THRUST BEARING FOR CW PUMP	I			MICHEL	BANGLORE	A			CW
					KMP	GREATER NOIDA	A			
21	DELUGE VALVE WITH TRIMS	I			HD FIRE	THANE/JALGAON	A			FDPS
					CARRIER	GURGAON	A		FOR PISTON TYPE DELUGE VALVE ONLY	
22	INERT GAS EXTINGUISHING SYSTEM	II			ANSUL	USA	A			FDPS
					KIDDE (GINGEKERR)	UK	A			
					NAFFCO	UAE	A			

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
22	INERT GAS EXTINGUISHING SYSTEM	II			MINIMAX Gmbh & Co. KG	GERMANY	A			
					TOTAL WALTHER	GERMANY	A			
					NOHMI BOSAI	JAPAN	A			
23	ALARM VALVE WITH TRIMS	II			HD FIRE	THANE	A			FDPS
					HD FIRE	JALGAON	A			
24	FOAM SYSTEM(BLADDER TYPE)	I			HD FIRE	JALGAON	A			FDPS
					FIRETECH	RATNAGIRI	A			
25	FIRE TENDER	I			WADIA BODY BUILDERS	AHEMDABAD	A			FDPS
					AAREL INDUSTRIES	INDORE	A			
					AMBALA COACH	AMBALA	A			
					VIJAY FIRE	UMBERGAON	A			
					MARATHON ELECTRIC MOTOR(I) LTD	KOLKATA	A		UP TO 50000 CMH	AC& VENTILATION, CHP, LHP&GHP,,AHP
					HOWDEN SOLYVENT FLAKT INDIA PVT LTD,	CHENNAI	A		UP TO 200000 CMH	
					ALMONAROD (P) LIMITED	CHENNAI	A		UP TO 60000 CMH	
					PATEL AIRFLOW	VATWA, AHMEDABAD	A		UP TO 250000 CMH	
					CB DOCTOR VENTILATOR PVT LTD	AHMEDABAD	A		UP TO 150000 CMH	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
26	CENTRIFUGAL FAN (≥ 5KW) MOTOR FROM NTPC ACCEPTED SOURCE	I			WOLTER VENTILATORS INDIA (P) LTD	BHIWADI,	A		UP TO 200000 CMH	
					C DOCTOR &CO PVT LTD	KOLKATA	A		UP TO 250000 CMH	
					SUVIDHA AIR ENGINEERS	AHMEDABAD	A		UP TO 190000 CMH	
					SUBURBAN INDUSTRIAL WORKS PVT. LTD	KOLKATA	A		UP TO 100000 CMH	
					KRUGER VENTILATION INDUSTRIES (I) PVT LTD	THANE	A		UP TO 90000 CMH	
					SOLYVENT FLAKT	KOLKATA	A		UP TO 200000 CMH	
					ADVANCE VENTILATION PVT LTD	SONEPAT	A		UP TO 250000 CMH	
					SK SYSTEMS PVT LTD	SONEPAT	A		UP TO 250000 CMH	
27	DIESEL ENGINE	I			CUMMINS	PUNE	A		Up to 2000 KVA	DG SET,FDPS
					PERKINS	AURANGABAD	A		UP to 313 HP	
					GREAVESS COTTON	AURANGABAD	A		Up to 1750 KVA	
28	3 LPE COATED PIPE	I			SAIL	ROURKELA	A			MUW
					RATNAMANI	KUTCH	A		UP TO 1100 NB	
					PSL LTD	KUTCH/ VIZAC	A		UP TO 1100 NB	
29	PLATE HEAT EXCHANGER	I			TRANTER INDIA	PUNE	A		HT PLATES & GASKETS FROM TRANTER SWIDEN/USA.HT PLATES FROM HISKA JAPAN	ECW
					ALPHA LAVAL	SATARA	A		HT PLATES & GASKETS FROM ALPHA LAVAL SWIDEN	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब -वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
29	PLATE HEAT EXCHANGER	I			IDMC	ANAND	A		HT PLATES & GASKETS FROM SONDEX DENMARK	
					SONDEX INDIA	VADODARA	A		HT PLATES FROM SONDEX DENMARK/INDIA (MODEL S188)	
30	DI(Ductile Iron) PIPE & FITTINGS	I			JINDAL SAW(J161)	KUTCH	A		UP T0 DN 900 CLASS K7 & K9	MUW
					JAI BALAJI(J156)	BARDWAN	A		UP T0 DN 900 CLASS K7 & K9	
					ELETRO STEEL	KOLKATA	A			
31	AIR COPMRESSOR: OIL FREE CENTRIFUGAL COMPRESSOR	I			NGERSOLL RAND INDIA	AHEMDABAD	A		Capacity Upto 60 NM3/Minute @ Pr 8 bar	CAS
					KIRLOSKAR PNEUMATIC COMPANY LTD	PUNE	A		Capacity up to 45.3 Nm3/min and pressure rating up to 9.3 kg/cm2	
32	SCREW TYPE AIR COMPRESSORS	I			ATLAS COPCO	Pune (Dapodi)	A			CAS, CHP, LHP, GHP, MRHS, AHP
		I			INGERSOL RAND INDIA	AHMEDABAD	A		UPTO MODELSH 300 (36 NM3/MIN) . AIR ENDS FROM GHH RAND - GERMANY & OTHER COMPONENTS FROM IR'S GLOBAL SOURCES ASSEMBLY & TESTING AT INGERSOL-AHMEDABAD	
		I			ELGI	COIMBATORE	A		UPTO 2830 CFM, AIR ENDS FROM HITACHI- JAPAN. ASSEMBLY AND TESTING AT ELGI COIMBATORE.	
		I			KIRLOSKER PNEUMATIC COMP LTD	PUNE	A		FLOW CAPACITY 45.3 NM3/MIN , AND PRESSURE RATING 9.3 KG/CM2	
33	AIR DRYER	I			SUMMITS HYGRONICS	COIMBATORE	A		FOR REFRIGERANT DRYER, 11893 M3/HR , REGENERATIVE DRYERS BLOWER REACTIVATED TYPE 2123 M3/HR AND REGENERATIVE DRYERS HOC TYPE 5820 M3/HR	CAS
					MELLCON ENGRS PVT LTD	GR NOIDA	A		Refrigerant type 60 m3/hr & REGENERATIVE DRYERS HOC TYPE 2548 M3/HR	
					DELAIR INDIA LTD	GURGAON	A		Refrigerant type 7500 m3/hr & REGENERATIVE DRYERS HOC TYPE 3000 M3/HR	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
					SUMESH PETROLEUM	VADODARA	A		100 CFM(169 M3/HR) & 7 KG/CM2	
					TRIDENT PNEUMATIC PVT LTD	COIMBATORE	A		Refrigerant type 10000 m3/hr & REGENERATIVE DRYERS BHR TYPE 1000 M3/HR	
34	SCREW CHILLER	II			KIRLOSKAR CHILLER	PUNE	A		UP TO 350TR	AC& VENTILATION
					DAIKIN	NEEMRANA	A		UP TO 185 TR	
					BLUE STAR (COMPRESSOR FROM HANBEL-TAIWAN)	WADA	A		SCREW CHILLER UP TO 282TR	
35	Mettalic Expansion Bellows	II			MB METTALIC BELLOWS	CHENNAI	A			MRHS
					SUR Industries	KOLKATA	A			
					LONE STAR	CHENNAI	A			
36	Conveying Compressor (Reciprocating)	I			KIRLOSKAR PNEUMATICS	PUNE	A			MRHS
					INGERSOLL RAND	AHEMDABAD	A			
					ATLAS COPCO(CHICAGO PNEUMATIC BRAND)	PUNE	A			
					CRAWLEY & RAY	KOLKATA	A			
					ALLIED FOUNDRIES	BELGAUM	A			
					PARAMOUNT CASTINGS	NAGPUR	A			
					NORTHERN ALLOY	BHAVNAGAR	A			
					MENON METALLIK	KOLHAPUR	A			

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
37	ALLOY CAST IRON PIPE, FITTINGS AND LINER	I			KOLHAPUR STEEL	KOLHAPUR	A			MRHS, AHP
					AQUA ALLOY	KOLHAPUR	A			
					MARTO PEARL	HYDERABAD	A			
					R.R.L	HOWRAH	A			
					CONCAST ENGINEERING	BURDWAN, WB	A			
					NATRAJ IRON & CASTINGS	DHANBAD	A			
					ABHIPRIYA BUSINESS	PANT NAGAR	A			
38	DRY ASH UNLOADING CHUTE	I			MELCO	FARIDABAD	A			AHP
					MACAWBER BEEKAY	KESHWANA	A			
					MINING AND MATERIAL HANDLING EQUIPMENT	KOLKATA	A			
					DCL	HYDERABAD	A			
39	BAG FILTER / SILO VENT FILTER	II			FLAKT	KOLKATA	A			AHP,MRHS
					ORIENT FANS (ACCO)	KOLKATA	A			
					THERMAX	PUNE	A			
					RIECO	PUNE	A			
					MELCO	FARIDABAD	A			

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
					MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A			
					MACAWBER BEEKAY	KESHWANA	A			
					TAP ENGINEERING	KANCHEEPURAM	A			
40	REFRIGERANT TYPE DRYER	I			SUMMITS HYGRONICS	COIMBATORE	A		Upto 11893 m3/hr	AHP
					TRIDENT	COIMBATORE	A		Upto 10000 m3/hr	
					MELLCON	GREATER NOIDA	A		Upto 7250 m3/hr	
					DELAIR	GURGAON	A		Upto 7500 m3/hr	
					ATLAS COPCO	BELGIUM	A		Upto model FD 1200. ASSEMBLY AND TESTING AT PUNE	
41	VACUUM PUMP [WATER SEAL RING TYPE]	I			KAKATI KARSHAK	HYDERABAD	A			AHP
					AEROMATIC	AHEMDABAD	A		Size Upto 200 MM , Capacity 3924 m3/hr	
42	BASALT LINE PIPE & FITTING	I			DECCAN MECHANICAL & CHEMICAL	BARAMATI	A			AHP
					ENVIRO ABRASION	PUNE	A		CAST BASALT LINERS FROM SCHOLTEN GmbH-GERMANY	
					TURBO ENGINEERS	COIMBATORE	A		CAST BASALT LINERS FROM KALENBORN - GERMANY/POLAND OR EUTIT - Czech Republic	
					GOENKA CAST ENGINEERING(I) PVT LTD	DURG	A		UP TO 350 NB	
					BMW STEEL	ROORKEE	A		UP TO 550 NB	
					BRAY CONTROLS INDIA PVT LTD, VAAS KNIFE GATE VALVE DIVISION	CHENNAI	A		UPTO PN 10 RATING	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)				DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
43	SLURRY DUTY KNIFE GATE VALVE	I			FOURESS ENGINEERING	BANGALORE	A		UPTO PN 10 RATING	AHP
					ORBINOX	COIMBATORE	A		UPTO PN 16 RATING	
					WEIR MINERALS	BANGALORE	A		UPTO 12" PN 10 RATING	
44	FLY ASH DUTY KNIFE GATE VALVE	I			BRAY CONTROLS INDIA PVT LTD, VAAS KNIFE GATE VALVE DIVISION	CHENNAI	A			AHP
					FOURESS ENGINEERING	BANGALORE	A			
					ORBINOX	COIMBATORE	A			
					JASH SCHUTTE	INDORE	A			
45	CAST IRON PIPE	II			ELECTROSTEEL	CHENNAI	A		UPTO 450 NB	AHP
					KESORAM	KOLKATA	A		UPTO 350 NB	
					IISCO	KULTI	A			
					KAPILANSH DHATU UDYOG	NAGPUR	A		APPROVED UPTO 300 NB.	
					KUSHA LAVA	VIJAYWADA	A		FOR NON STD. SIZE	
46	ASH SLURRY PUMP	I			SAM INDUSTRIAL PUMPS	COIMBATORE	A			AHP
					WEIR MINERALS	AUSTRALIA	A		MANUFACTURING AT WEIR MINERALS BANGALORE	
47	AIR LOCK FEEDER VESSEL / BOTTOM ASH OVERFLOW TANK/MIXING TANK/COARSE ASH TANK/ AIR OIL CONVERTOR TANK, AIR INTAKE VALVE	II			MELCO	FARIDABAD	A			AHP
					MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A		AIR OIL TANK- ASANSOLE , AIR INTAKE VALVE - KUMARDUBHI	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)				DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
	[illegible]				MACAWBER BEEKAY	KESHWANA	A			
48	BOTTOM ASH HOPPER / BUFFER HOPPER/DUST COLLECTOR	I			MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A			AHP
					MELCO	FARIDABAD	A		ONLY FOR BUFFER HOPPER AND DUST COLLECTOR	
					MACAWBER BEEKAY	KESHWANA	A			
49	CLINKER GRINDER	I			MELCO	FARIDABAD	A			AHP
					MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A			
					L&T	KANSBAHAL	A			
					MACAWBER BEEKAY	KESHWANA	A			
50	FLY ASH HOPPERVALVE/ASH INTAKE VALVE/FLY ASH DIFFUSER / DRIVE ARRANGEMENT FOR CLINKER GRINDER	II			MELCO	FARIDABAD	A			AHP
					MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A			
					L&T	KANSBAHAL	A			
					MACAWBER BEEKAY	KESHWANA	A			
51	FLUIDIZING PAD / FLUSHING APPARATUS	I			MELCO	FARIDABAD	A			AHP
					MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A			
					L&T	KANSBAHAL	A			
					MACAWBER BEEKAY	KESHWANA	A			

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
52	FLY ASH STORAGE SILO/HCSD SILO	I			MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A			AHP
					MACAWBER BEEKAY	KESHWANA	A			
53	FEED SUMP / VACUUM BREAKER	I			MELCO	FARIDABAD	A			AHP
					MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A			
					MACAWBER BEEKAY	KESHWANA	A			
54	FLY ASH HEADER VALVE/BRANCH HEADER VALVE / AIR INTAKE VALVE /EQUALISING VALVE /PLUG GATE FOR SUMP ISOLATION	I			MELCO	FARIDABAD	A			AHP
					MCNALLY SAYAJI	KUMARDHUBI	A			
					L&T	KANSBAHAL	A			
					MACAWBER BEEKAY	KESHWANA	A			
55	HYDROMIX DUST CONDITIONER/ROTARY FEEDER	I			MELCO	FARIDABAD	A			AHP
					MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A			
					MACAWBER BEEKAY	KESHWANA	A			
					L&T	KANSBAHAL	A			
					EXPONENTIAL ENGINEERING	PUNE	A			
56	JET PUMP / JETTING NOZZLE	I			MELCO	FARIDABAD	A		JET PUMP / JETTING NOZZLE	AHP
					MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A		JET PUMP / JETTING NOZZLE	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
56	JET PUMP / JETTING NOZZLE	I			L&T	KANSBAHAL	A		JET PUMP	AHP
					MACAWBER BEEKAY	KESHWANA	A		JET PUMP / JETTING NOZZLE	
57	COLLECTOR TANK / AIR WASHER / WETTING HEAD / SURGE / SETTLING TANK	I			MELCO	FARIDABAD	A			AHP
					MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A			
					MACAWBER BEEKAY	KESHWANA	A			
58	PLATE VALVE AT DYKE END	I			MELCO	FARIDABAD	A			AHP
					MCNALLY SAYAJI	ASANSOL/KUMARDHUBI	A			
					MACAWBER BEEKAY	KESHWANA	A			
59	DESSICANT TYPE AIR DRYER	I			DELAIR	GURGAON	A			AHP
					INDCON	DELHI	A			
					MELLCON	GREATER NOIDA	A			
					SUMMITS HYGRONICS	COIMBATORE	A			
					TRIDENT	COIMBATORE	A			
					MCNALLY	KUMARDHUBI / ASA	A			
					L&T	KANCHEEPURAM	A			
					THYSSENKRUPP	PUNE	A			

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)				DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
60	STACKER RECLAIMER & RECLAIMER	I			ELECON	V V NAGAR	A			CHP
					TRF	JAMSHEDPUR	A			
					SANDVIK	PUNE	A			
					PROMAC	BANGALORE	A			
					THYSSENKRUPP	HYDERABAD	A		* Hyderabad works approved for some of assemblies for Stacker Reclaimer - Counter Weight Boom, Box and Bucket	
61	WAGON TIPPLER & SIDE ARM CHARGER	I			ELECON	V V NAGAR	A			CHP
					FAMAK S.A. (IN ASSOCIATIONWITH	POLAND	A			
					L & T	KANSBAHAL	A			
					THYSSENKRUPP	PUNE	A			
					TRF	JAMSHEDPUR	A			
					PROMAC	BANGALORE	A			
62	APRON FEEDER WITH DRIBBLE CONVEYOR (	I			THYSSENKRUPP	HYDERABAD	A		UPTO 2400 TPH	CHP
					L&T	KANSBAHL	A		UPTO 2200 TPH	
					ELECON	VV NAGAR	A		UPTO 2200 TPH	
					TRF	JAMSHEDPUR	A		UPTO 2400 TPH Extended Warranty of 3 years over & above of contractual warranty on parts	
					MCNALLY SAYAJI	KUMARDHUBI	A		UPTO 2200 TPH	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
63	RING GRANULATOR	I			PENNSYLVANIA CRUSHERCORPORA	USA	A		UP TO 1760 TPH	CHP
					AMERICAN PULVERISER	USA	A		UPTO 1875 TPH	
					THYSSENKRUPP	PUNE	A		UP TO 2035 TPH	
					TRF	JAMSHEDPUR	A		UP TO 1800 TPH TRF shall give extended warranty of 5 years over & above Contractual	
					L&T	KANSBAHAL	A		UP TO 1600 TPH	
					ELECON	V V NAGAR	A		UP TO 1320 TPH	
					MCNALLY SAYAJI	KUMARDHUBI	A		UPTO 1000 TPH	
64.A	VIBRATING SCREEN FEEDER	I			TECHNO VIBRAZIONI	ITALY	A		UPTO 1875 TPH	CHP
					ELECON	V V NAGAR	A		UP TO 1320 TPH	
					GENERAL KINEMATICS	USA	A		UP TO 2000TPH	
					THYSSENKRUPP	PUNE	A		UP TO 2035 TPH	
					TRF	JAMSHEDPUR	A		UP TO 1800 TPH TRF shall give extended warranty of 5 years over & above Contractual	
					MCNALLY SAYAJI	KUMARDHUBI	A		UPTO 1210 TPH	
					TECHNO VIBRAZIONI	ITALY	A		UPTO 1875 TPH	
					ELECON	V V NAGAR	A		UP TO 1320 TPH	
					GENERAL KINEMATICS	USA	A		UP TO 2000TPH	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
64.B	VIBRATING FEEDER	I			THYSSENKRUPP	PUNE	A			CHP
					TRF	JAMSHEDPUR	A		UP TO 1800 TPH TRF shall give extended warranty of 5 years over & above Contractual	
					MCNALLY SAYAJI	KUMARDHUBI	A		UPTO 1210 TPH	
					INTERNATIONAL COMBUSTION	NAGPUR	A			
					Electro Zavod	Kolkata	A		UPTO 400TPH	
					Elektromag Joest	Vapi	A		UP TO 750 TPH	
65	TRAVELLING TRIPPER	I			BENGAL TOOLS	KOLKATA	A			CHP
					THYSSENKRUPP	PUNE / HYDERABAD	A			
					ELECON	V V NAGAR	A			
					MBE	KUMARDHUBI	A			
					TRF	JAMSHEDPUR	A			
					HMTC	KOLKATA	A			
					L & T - MACNIL	CHENNAI	A			
					L & T	KANSBAHAL	A			
					L & T - EWL	KANCHEEPURAM	A			
					PHOENIX CONVEYOR BELT	KOLKATA	A		FABRIC BELT UPTO 2200 MM WIDTH, STEEL CORD BELT (FR GRADE UPTO 2400 MM WIDTH)	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)				DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
66	FABRIC BELTING(FR GRADE) / STEEL CORD BELTING(FR GRADE)	I			IMASS S.A	GREECE	A		FABRIC BELT UPTO 2400 MM WIDTH , STEEL CORD BELT (FR GRADE UPTO 2400 MM WIDTH	CHP, LHP/GHP
					MRF	CHENNAI	A		FABRIC BELT UPTO 1600 MM WIDTH	
					SEMPELTRAN NIRLON	MUMBAI	A		FABRIC BELT UPTO 1600 MM WIDTH	
					HINDUSTAN RUBBER	SILVASA	A		FABRIC BELT UPTO 1600 MM WIDTH	
					NORTHLAND RUBBER	SONEPAT	A		FABRIC BELT UPTO 2200 MM WIDTH.	
					SOMI CONVEYOR	JODHPUR	A		FABRIC BELT UPTO 2000 MM WIDTH	
					RAVASCO TRANSMISSION LTD.	VAPI	A		FABRIC BELT UPTO 2200 MM WIDTH	
					ORIENTAL RUBBER	PUNE	A		FABRIC BELT UPTO 2200 MM WIDTH , STEEL CORD BELT (FR GRADE UPTO 2000 MM WIDTH)	
					FORECH	CHENNAI	A		FABRIC BELT UPTO 2000 MM WIDTH , STEEL CORD BELT (FR GRADE UPTO 2200 MM WIDTH)	
					CAMOPLAST	KOREA	A		STEEL CORD FR GRADE UPTO 2400 MM WIDTH	
					YOKOHAMA	JAPAN	A		FABRIC BELT UPTO 2400 MM WIDTH , STEEL CORD BELT (FR GRADE UPTO 2400 MM WIDTH)	
					ELECON	V V NAGAR	A			
					MBE	KUMARDHUBI	A			
					KALI	KUMBAKONAM	A			
					AMPS	JAMSHEDPUR	A			
					A.ADAK	HOWRAH	A			

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
67	IDLERS	I			BTL EPC	KOLKATA	A			CHP , LHP/GHP
					V V N MFG	V V NAGAR	A		Upto 150 NB Dia	
					THYSSENKRUPP	HYDERABAD / PUNE	A			
					PROMAC	BANGALORE	A			
					L & T - EWL	KANCHEEPURAM	A			
					ROLLWELL	HINDUPUR	A			
					TRF	JAMSHEDPUR	A			
68	PULLEYS	I			ELECON	V V NAGAR	A			CHP, LHP/GHP
					PROMAC	BANGALORE	A			
					MBE	KUMARDHUBI	A			
					BTL EPC	KOLKATA	A			
					TNS HEAVY	CHENNAI	A			
					KALI	THIRUBUVANAM	A			
					THYSSENKRUPP	HYDERABAD / PUNE	A			
					L & T - EWL	KANCHEEPURAM	A			
					V V N MFG	V V NAGAR	A		Upto 800 NB Dia	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
					ROLLWELL	HINDUPUR	A			
					TRF	JAMSHEDPUR	A			
69	HELICAL GEARBOX	I			SHANTI GEARS	COIMBATORE	A		Upto size 560	CHP, LHP/GHP
					ELECON	V V NAGAR	A			
					SIEMENS (FLENDER)	KHARAGPUR	A			
					PREMIUM TRANMISSION LTD	PUNE/FALTA	A		Up to size 710 / 450	
					SIEMENS (FLENDER)	GERMANY	A			
					NEW ALLENBURY WORKS	KOLKATA	A			
70	PLANETARY GEARBOX	I			ELECON	V V NAGAR	A			CHP,LHP/GHP
					SIEMENS (FLENDER)	GERMANY	A			
					MOVENTAS	GERMANY	A			
					DANA MOTION SYSTEMS ITALIA S.I	ITALY	A		(Earlier name - BREVINI)	
					MAGTORQ	HOSUR	A		Upto 11 KW	
					SEW EURODRIVE GMBH & CO.	GERMANY	A			
71	FLUID COUPLING (SCOOP AND TRACTION TY	I			FLUIDOMAT	DEWAS	A		Scoop type upto SC-1330	CHP LHP/GHP
					PTL	AURANGABAD	A		SCOOP TYPE UPTO PST 1150	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
71	FLUID COUPLING (SCOOP AND TRACTION TY	I			ELECON	V V NAGAR	A		Scoop type upto model ESC 760. 1. As part of Type test M/s Elecon will demonstrate Scoop tube in & Scoop	CHP ,LHP / GHP
					VOITH	HYDERABAD	A		SCOOP TYPE UPTO SVNL 1330	
72	SLEW RING	III			TITANUS	SOUTH AFRICA	A			CHP, LHP/GHP
					IMO	GERMANY	A			
					SKF	FRANCE	A			
					ROTHE ERDE	GERMANY	A			
					LIEBHERR	GERMANY	A			
73.A	COAL SAMPLER SYSTEM	I			EAST MAN CRUSHER	KOLKATA	A		WITH JEFFREY CRUSHER AND EASTMAN MAKE CRUSHER	CHP
					ERIEZ MAG EUROPE LTD	UK	A			
					SIEVE TECHNIK	GERMANY	A		MANUFACTURING OF PRIMARY & SECONDARY SAMPLER AN BOTLLE COLLECTOR AT MULTOTEC SA	
					THERMO RAMSAY INC	USA	A			
					ADVANCE SYSTEMS SAMPLING	KOLKATA	A		WITH JEFFREY CRUSHER AND ADVANCE MAKE CRUSHER	
73.B	LIMESTONE SAMPLING SYSTEM	I			EAST MAN CRUSHER	KOLKATA	A		WITH JEFFREY CRUSHER AND EASTMAN MAKE CRUSHER	LHP/GHP
					ERIEZ MAG EUROPE LTD	UK	A			
					SIEVE TECHNIK	GERMANY	A		MANUFACTURING OF PRIMARY & SECONDARY SAMPLER AN BOTLLE COLLECTOR AT MULTOTEC SA	
					THERMO RAMSAY INC	USA	A			

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
					ADVANCE SYSTEMS SAMPLING	KOLKATA	A		WITH JEFFREY CRUSHER AND ADVANCE MAKE CRUSHER	
74	HYDRAULIC POWER PACK	I			EATON POWER	PUNE	A			CHP, LHP/GHP
					BOSCH-REXROTH	AHMEDABAD	A			
					MAHA HYDRAULICS	CHENNAI	A			
					L & T HYDRAULICS	BANGALORE	A		EXCEPT FOR STACKER RECLAIMER	
					Hydac	COIMBATORE	A			
75	HYDRAULIC CYLINDER	I			VELJAN	HYDERABAD	A			CHP, LHP/GHP
					WIPRO	BANGALORE	A			
					EATON POWER	PUNE	A			
					L & T HYDRAULICS	BANGALORE	A			
					BOSCH-REXROTH	AHMEDABAD	A			
					Hydac	COIMBATORE	A			
76	HYDRAULIC MOTOR	I			POCLAIN HYDRAULICS	FRANCE	A			CHP , LHP/GHP
					BOSCH-REXROTH AB (FORMERLY I	SWEDEN	A			
					PARKER CALZONI	ITALY	A			
					MAHA HYDRAULICS	CHENNAI	A		UP TO 100 LITRE CAPACITY	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
					KAWASAKI	UK	A			
77	HAMMER MILL CRUSHER FOR LIME STONE HANDLING SYSTEM	I			INTERNATIONAL COMBUSTION	NAGPUR	A			LHP/GHP
					MCNALLY SAYAJI	BARODA	A			
					MCNALLY SAYAJI	KUMARDHUBI	A			
					ELECON	V V NAGAR	A			
					THYSSENKRUPP INDUSTRIES INDI	PUNE	A			
					ECOMAN	BARODA	A		UPTO 150TPH	
					INDIANA GRATINGS PVT. LTD.	PUNE	A			
					JINDAL STEEL & POWER LTD.	RAIGARH	A			
					BABY ENGG. PVT. LTD.	TRICHY	A			
					REGIONAL ENGG. WORKS	TRICHY	A			
					AJANTHA FABS	MATHURA	A			
					CAPACITE STRUCTURES LTD.	THANE	A			
					MIURA INFRASTRUCTURE PVT. LTD.	BHILAI	A			
					SHIVAM HITECH STEELS PVT. LTD	BHILAI	A			
					TECHNOFAB MANUFACTURING LTD.	CHENNAI	A			

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)				DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
78	SHOP FABRICATED STRUCTURE	I			JSW SEVERFIELD STRUCTURES LTD(JSSL)	BELLARY	A			CHP/LHP/GHP
					ALLIANCE INTEGRATED METALIKS LTD(AIML)	RAJPURA	A			
					ATMASTCO PVT LTD	DURGAPUR	A			
					APEX BUILDSYS LTD	NAGPUR	A			
					COREFAB PROJECTS PVT LTD	BHILAI	A			
					KOTHARI CHEMICALS	BHILAI	A			
					FEDDERS LLOYD CORPORATION LTD	SIKANDRABAD	A			
					ARCELOR MITTAL DHAMM PROCESSING PVT LTD	RANIPET	A			
					ARTSON ENGINEERING	NASIK	A			
					ARTSON ENGINEERING	NAGPUR	A			
					HEAVY ENGINEERING WORKS	REWA, MP	A			
					ARCELORMITTAL NIPPON STEEL INDIA LTD	CHENNAI	A			
					TRIDENT FABRICATORS PVT LTD	ROURKELA	A			
					GREAT INDIA STEEL FABRICATORS	YAMUNA NAGAR	A			
					METALFAB HITECH	NAGPUR	A			
					SUPERTECH INDIA	G.NOIDA	A			

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
					GOODLUCK STEEL	SIKANDRABAD	A			
					BTL	KOLKATA	A			
					BTL	DURGAPUR	A			
					AMIYA COMMERCE	KOLKATA	A			
					NAMDHARI INDUSTRIAL	LUDHIANA	A			
					THYSSENKRUPP INDUSTRIES INDIA	HYDERABAD	A			
79	Steel Cord Pipe Conveyor (FR Grade)	I			Phonix Cnoveyor belt	Kolkata	A		Upto 2400 MM B/w	
					Oriental Rubber	Pune	A		Upto 2000 MM B/w	
					Forech India Pvt Ltd	Cheyyar	A		Upto 2200 MM B/w	
80	PIPE-SS ASTM A 312	II			REMI	TARAPUR	A		ERW UPTO 400 NB,SEAMLESS UP TO 200NB	
					RATNAMANI	MEHSANA	A		ERW UPTO 500 NB, SEAMLESS UPTO 50 NB ONLY	
					RATNAMANI	KUTCH	A		ERW UPTO 400 NB, SEAMLESS UPTO 50 NB ONLY, ARC WELDED UP TO 450NB	
					BHANDARI FOILS & TUBES LIMITED	DEWAS	A		ERW UP TO 300NB	
					APEX	BEHRORE	A		ERW UPTO 400 NB, SEAMLESS UPTO 50 NB.	
					PRAKASH STEELAGE	SILVASA	A		ERW UP TO 203NB	
					SHUBHLAXMI METALS AND TUBES	UMBERGAON	A		SEAMLESS UP TO 150MM and ERW UP to 250 NB Sch 40S	

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
81	PIPE-CS SEAMLESS ASTM A 106	II			ISMT	AHMADNAGAR	A		UPTO 273 MM OD	
					ISMT	BARAMATI	A		UPTO 273 MM OD	
					REMI	BHARUCH	A		UPTO 177.8 MM OD	
					MAHARASHTRA SEAMLESS	RAIGAD	A		UPTO 500 NB	
82	HCSD PUMP	I			WEIR MINERALS	NETHERLANDS	A			
					ABEL	GERMANY	A			
					FELUWA	GERMANY	A			
ITEM WITH MAIN CONTRACTOR / BIS APPROVED SOURCES.										
1	BRANCH PIPE , COUPLING & NOZZLE (SS & GI	II			BIS APPROVED SOURCES WITH VALID BIS LICENSE					FDPS
2	FIRE EXTINGUISHER	II			BIS APPROVED SOURCES WITH VALID BIS LICENSE					FDPS
3	WATER MONITOR	II			BIS APPROVED SOURCES WITH VALID BIS LICENSE					
4	PIPES-MS- (BLACK/ GI) AS PER IS:1239 & IS:3589 UPTO 1000 NB	II			(BIS MARKED, MANUFACTURERS WITH VALID BIS LICENSE)					WTP,CW,CT,CPU,FDPS,AC&VENTILATION, CHP,LHP&GHP,AHP
5	FIRE HOSE	II			BIS APPROVED SOURCES WITH VALID BIS LICENSE					FDPS
6	HYDRANT VALVE	II			BIS APPROVED SOURCES WITH VALID BIS LICENSE					
7	PIPES FOR IDLERS IS 9295	III			BIS APPROVED SOURCES WITH VALID BIS LICENSE					FDPS
8	BLOWERS -CENTRIFUGAL >=5KW	II			MAIN CONTRACTOR APPROVED SOURCES					WTP

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)			DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
9	ClO2 GENERATOR	II			MAIN CONTRACTOR APPROVED SOURCES					WTP
10	JOINT /FITTING COATING MATERIAL(SLEEVE) FOR 3 LPE PIPES	II			MAIN CONTRACTOR TO PROPOSED VENDOR FOR NTPC APPROVAL					MUW
11	PIPING FABRICATION -HP>300PSI	II			MAIN CONTRACTOR APPROVED SOURCES					WTP,CPU
12	PUMP-METERING/DOSING	II			MAIN CONTRACTOR APPROVED SOURCES					WTP,CPU
13	PUMP - PP- ACID/ ALKALI UNLOADING	II			MAIN CONTRACTOR APPROVED SOURCES					WTP,CPU
14	PUMPS-SCREW TYPE	II			MAIN CONTRACTOR APPROVED SOURCES					WTP,CPU,FOH
15	RUBBER LINING OF TANKS/ VESSELS/ PIPES/ VALVES/FITTINGS	II			MAIN CONTRACTOR APPROVED SOURCES					WTP,CPU
16	RO PRESSURE TUBE	II			MAIN CONTRACTOR APPROVED SOURCES					WTP
17	TUBE SETTLER MEDIA	II			MAIN CONTRACTOR APPROVED SOURCES					WTP
18	WRAPPING & COATING MATERIAL -ANTI CORROSIVE TAPE	II			MAIN CONTRACTOR APPROVED SOURCES					CW,CT,LP PIPING, FDPS
19	DRIFT ELIMINATOR-PVC	II			MAIN CONTRACTOR APPROVED SOURCES					CT
20	FAN CYLINDER SEGMENTS-FRP-COOLING TOWER	II			MAIN CONTRACTOR APPROVED SOURCES					CT
21	COOLING TOWER FILLS	II			MAIN CONTRACTOR APPROVED SOURCES					CT
22	SHAFT-CARDON TYPE-CW PUMP	II			MAIN CONTRACTOR APPROVED SOURCES					CW
23	DUST EXTRACTION SYSTEM	I			MAIN CONTRACTOR's APPROVED SOURCES				BOIs SHALL BE FROM NTPC APPROVED SOURCES	CHP, LHP/GHP
24	DUST SUPPRESSION SYSTEM (PLAIN WATER)	I			MAIN CONTRACTOR's APPROVED SOURCES				BOIs SHALL BE FROM NTPC APPROVED SOURCES	CHP, LHP/GHP

	Project/ परियोजना : RAGHUNATHPUR-II Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची SUB-SYSTEM उप-प्रणाली: BOP SYSTEMS (MECHANICAL)				DOC. NO./ दस्तावेज सं.: REV. NO.: DATE/ तिथि : 18.04.2023 PAGE/ पृष्ठ :				
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी (NOTE-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण	Remarks/ टिप्पणी	Applicable Systems
25	DUST SUPPRESSION SYSTEM (DRY FOG)	I			MAIN CONTRACTOR's APPROVED SOURCES				BOIs SHALL BE FROM NTPC APPROVED SOURCES	CHP, LHP/GHP
Note-1 Items for which Sub-QR is enviisaged, vendors are accepted subject to Sub-QR clearance from NTPC Engg.										
A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list along with the condition of approval, if any./ इन मदों के लिए प्रस्तावित वेंडर एनटीपीसी को स्वीकार्य है। अनुमोदन की शर्त, , यदि कोई हो, के साथ-साथ पत्र "क" में इंगित किया जाए ।										
DR – For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list. एनटीपीसी द्वारा इन मदों की समीक्षा के लिए "विस्तृत ब्यौरे की आवश्यकता" होगी। सूची में "DR" पत्र में इंगित किया जाना चाहिए।										
QP / INSPECTION CATEGORY:										
CAT-I / श्रेणी- I: For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया जाता है और एनटीपीसी द्वारा अंतिम स्वीकृति भौतिक निरीक्षण के दौरान उपलब्ध गवाह के आधार पर दी जाएगी।										
CAT-II / श्रेणी- II: For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया जाता है। हालाँकि एनटीपीसी द्वारा कोई भौतिक निरीक्षण नहीं किया जाएगा। एनटीपीसी द्वारा अंतिम स्वीकृति अनुमोदित क्यूपी के अनुसार दस्तावेजों की समीक्षा के आधार पर दी जाएगी।										
CAT-III/ श्रेणी-III : For these items Quality control to be exercised as per Main contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of Conformance (COC) by Main Contractor.										
UNITS/WORKS इकाईयां / कार्य: Place of manufacturing/ निर्माण का स्थान Place of Main Supplier of multi units/works/बहु- इकाइयों / कार्यों के मुख्य सप्लाइर का स्थान.										
FORMAT NO./ प्रारूप सं: QS-01-QAI-P-1B/F1-R0 Engg. Div. / QA&I										

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
1	**IPBD**	I								
					BHEL	Rudrapur	A			
					C&S ELECTRIC	Haridwar	A			
2	**Power Transformers**	I								
					ABB	Sweden	A		Up to 765 KV Class	
					ABB	Vadodara	A		Up to 765 KV Class	
					Toshiba	Japan	A		Up to 765 KV Class	
					CG Power & Industrial Solutions Ltd	Mandideep	A		Up to 765 KV class	
					BHEL	Bhopal	A		Up to 400 KV Class	
					Siemens	Mumbai	A		Up to 400 KV Class	
					GE T&D India Limited	Naini	A		Up to 400 KV Class	
					GE T&D India Limited	Vadodra	A		Up to 765 KV Class	
					TELK	Angamally	A		Up to 400 KV Class	
3	**Shunt Reactor**	I								
					ABB	Sweden	A		Up to 765 KV Class	
					ABB	Vadodara	A		Up to 765 KV Class	
					Toshiba	Japan	A		Up to 765 KV Class	
					CG Power & Industrial Solutions Ltd	Mandideep	A		Up to 765 KV class	
					BHEL	Bhopal	A		Up to 400 KV Class	
					Siemens	Mumbai	A		Up to 400 KV Class	
					GE T&D India Limited	Naini	A		Up to 400 KV Class	
					GE T&D India Limited	Vadodra	A		Up to 765 KV Class	
4	**Auxiliary Oil Filled Transformers**	I								
					BHEL	Jhansi	A		Up to 220 KV Class	
					Indotech Transformers	Chennai	A		Up to 16 MVA, 11 KV Class	
					Kanohar	Meerut	A		Upto 16 MVA, 33 KV Class	
					Kirloskar Electric Company Limited	Mysore	A		Up to 16 MVA, 33 KV Class	
					Schneider	Vadodara	A		Up to 50MVA, 132 KV Class	
					Transformers & Rectifiers Ltd.	Ahmedabad	A		Upto 90 MVA, 132 KV Class	
					Voltamp	Savli	A		Up to 3.5 MVA, 33 KV Class	
					Tesla Transformers India Limited	23-A, Sector-B, Govindpura,Bhopal	A		Up to 9 MVA	
5	**LT Switchgear -Floor mounted Draw out type indoor switchgear Panel (MCC etc.)**	I								

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
					Schneider (formerly L&T)	Mumbai / Coimbatore/ Ahmednagar	A			
					C&S Electric	Noida / Haridwar	A			
					Schneider	Nasik	A		ACB from Schneider, France	
					Siemens	Kalwa	A		Conditions apply	
					Schneider	Vadodara	A			
6	**LT Switchgear - Floor mounted Fixed type indoor LT Switchgear Panel (ACDB / DCDB)**	I								
					Schneider (formerly L&T)	Mumbai / Coimbatore/ Ahmednagar	A			
					C&S Electric	Noida/ Haridwar	A			
					Schneider	Nasik	A			
					Siemens	Kalwa	A			
					Schneider	Vadodara	A			
7	**11KV/3.3KV Switchgear- (MV Switchgear Panel)**	I								
					BHEL	Bhopal	A		Upto 33KV	
					Megawin	Salem	A		Upto 33KV	
					Schneider Electric India (Formerly L&T)	Ahmednagar	A		Upto 33KV	
					Siemens	Mumbai	A		Upto 33KV	
					ABB	Nasik	A		Upto 33KV	
					Schneider (Salt lake works)	Kolkata	A		Upto 11KV	
7.1	**Fast Bus Transfer panel along with relay**	I								
					Aartech	Parwanoo	A		conditions apply	
					ABB	Vadodara	A		conditions apply	
					SEL	Delhi	A		conditions apply	
8	**HT Motor**									
8.1	**HT Motors (CW PUMP MOTOR)**	I								
					WEG	BRAZIL	A		UPTO 3405KW,11KV	
					HYOSUNG	S.KOREA	A		UPTO 2800KW,6.6KV	
					BHEL	BHOPAL	A			
8.2	**HT MOTORS (BFP Motor)**	I								
					HYOSUNG	SOUTH KOREA	A		UPTO 11KV 13.5 MW	

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
					BHEL	BHOPAL	A		RQP	
					HYUNDAI	SOUTH KOREA	A		UPTO 11KV 17 MW	
8.3	HT MOTORS (ID Fan Motors)	I								
					HYOSUNG	SOUTH KOREA	A		UPTO 11KV 13.5 MW	
					WEG	HOSUR	A		UPTO 11KV 14 MW	
					BHEL	BHOPAL	A		RQP	
					HYUNDAI	SOUTH KOREA	A		UPTO 11KV 17 MW	
					TMEIC	BENGALURU	A		UPTO 11 KV 5000 KW	
8.4	HT MOTOR FOR OTHER EQUIPMENTS	I								
					HYOSUNG	KOREA	A		UPTO 11KV 13.5 MW	
					WEG	BRAZIL	A		UPTO 11KV 2150 KW	
					WEG	HOSUR	A		UPTO 11KV 14 MW	
					BHEL	BHOPAL	A		RQP	
					HYUNDAI	KOREA	A		UPTO 11KV 17 MW	
					TECO	TAIWAN	A		UPTO 11KV 12 MW	
					TMEIC	JAPAN	A		UPTO 11KV 14 MW	
					CONVERTEAM	FRANCE	A		UPTO 11KV 18 MW (*DOCUMENTS FOR NAME CHANGE TO GE CONVERTEAM SHALL BE SUBMITTED FOR APPROVAL)	
					ABB	VADODARA	A		UPTO 6.6KV 2500 KW 11KV 2000 KW FOR PUMP/ FAN/ COMPRESSOR UPTO 6.6KV 750KW FOR MILL, UPTO 6.6 KV 1300KW FOR CRUSHER WITH SCOOP COUPLING	
					IJLIN	KOREA	A		UPTO 11KV 2900 KW, 6.6KV 2500 KW	
					JYOTI	VADODARA	A		UPTO 6.6 KV 2250 KW EXCEPT CRUSHER & MILL APPLICATION	
					MARATHON	KOLKATA	A		RQP, UPTO 6.6 KV 1300 KW FOR CRUSHER WITH SCOOP COUPLING & 11 KV 1600 KW FOR OTHER APPLICATION EXCEPT CRUSHER & MILL	

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
					CGL (D5 INDUSTRIAL AREA)	MANDIDEEP	A		UPTO 1650 KW 6.6 KV, 1350 KW 11 KV FOR PUMP, FAN, COMPRESSOR. UPTO 3.3 kV 335 kW WITH FLEXIBLE COUPLING FOR MILL APPLICATION	
					CGL(PLOT 9)	MANDIDEEP	A		UPTO 11 KV 4MW FOR PUMP/FAN/COMPRESSOR	
					CG ELECTRIC SYSTEM	HUNGARY	A		UPTO 3.3 KV 1100 KW	
					TMEIC	BENGALURU	A		UPTO 11 KV 5000 KW	
9	**H.T. CABLE upto 33KV**	**I**								
					Apar Industries	Umbergaon	A			
					Gemscab	Bhiwadi	A			
					Gupta Power	Kashipur	A			
					Havells India Ltd.	Alwar	A			
					KEC International	Vadodara	A			
					KEI Industries	Bhiwadi	A			
					Krishna Electrical Industries Ltd	Gwalior	A		Up to 11KV only	
					Polycab Wires Pvt. Ltd	Daman	A			
					Sri ram Cables	Bhiwadi	A		Up to 11KV only	
					Tirupati Plastomatics	Jaipur	A		Up to 11KV only	
					Torrent Cable Ltd	Nadaid	A			
					CMI	Baddi	A			
					Universal Cable Ltd.	Satna	A			
10	**1.1 KV LT Power Cables (Type- XLPE Insulated, PVC sheathed (incl FRLS)**	**I**							Refer Note-5 for category of inspection	
					Advance Cable	Bengaluru	A			
					Apar Industries Ltd	Umbergaon	A			
					Cords Cables	Bhiwadi	A			
					CMI	Baddi	A			
					Delton Cable Ltd	Faridabad	A			
					Dynamic Cables	Jaipur	A			
					Gemscabs Industries	Bhiwadi	A			
					Gupta Power Cables	Khurda	A			
					Havells India Ltd.	Alwar	A			
					KEC International	Silvassa , Mysore	A			
					KEI Industries	Bhiwadi	A			
					Paramount Cable	Khushkhera	A			
					Polycab Wires Pvt. Ltd	Daman	A			

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
					Ravin Cables	Pune	A			
					Special Cables	Rudrapur	A			
					Suyog Cables	Vadodara	A			
					Thermocables	Hyderabad	A			
					Tirupati Plastomatics	Jaipur	A			
					Torrent Cable Ltd	Nadiad	A			
					Universal Cable Ltd.	Satna	A			
11	**LT Control Cable 1.1 KV, Type - PVC (incl FRLS)**	II							For cable total quantity less than 10 km per size / type is CAT-III	
					Advance Cable	Bengaluru	A			
					Apar Industries Ltd	Umbergaon	A			
					Cords Cables	Bhiwadi	A			
					CMI	Faridabad	A			
					CMI	Baddi	A			
					Delton Cable Ltd	Faridabad	A			
					Elkay Telelink	Faridabad	A			
					Gemscabs Industries	Bhiwadi	A			
					Goyoline Fibres (I) Ltd	Daman	A			
					Gupta Power Cables	Khurda	A			
					Havells India Ltd.	Alwar	A			
					KEC International	Silvassa , Mysore	A			
					KEI Industries	Bhiwadi	A			
					Paramount Cable	Khushkhera	A			
					Polycab Wires Pvt. Ltd	Daman	A			
					Ravin Cables	Pune	A			
					Special Cables	Rudrapur	A			
					Suyog Cables	Vadodara	A			
					Thermocables	Hyderabad	A			
					Tirupati Plastomatics	Jaipur	A			
					Torrent Cable Ltd	Nadiad	A			
					Universal Cable Ltd.	Satna	A			
12	**EHV Cables**	I								
					Iljin Electric	South Korea	A		For 132KV & 220 KV only	
					KEC International	Vadodara	A		Upto 220KV	
					KEI Industries	Bhiwadi	A		Upto 132KV , 220KV	
					Phelps Dodge	Bangkok	A		For 132 KV only	
					LS CABLE & SYSTEM LTD	South Korea	A		Up to 400 KV	
					LS CABLE & SYSTEM LTD	BHIWADI	A		Up to 132 KV	
					Universal Cable Ltd.	Satna	A		Upto 132KV only	

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
13	DG SET(ASSMEBLER & TESTING)	I								
					Kohler	Singapore	A		Up to 1500 KVA ,11KV	
					CLLS	Singapore	A		Up to 1250 KVA, 415 V,	
					Powerica	Silvasa	A		Up to 2000 KVA, 415 V & 1500 KVA, 11 KV	
					Jakson Unit-II	Kathua	A		Up to 11KV, 1500KVA	
					Jakson	Kathua	A		Up to 415 V, 2000 KVA	
					Sterling Generators Pvt Ltd	Silvasa	A		Up to 415 V 2000 KVA	
					Supernova	Rajpur	A		Up to 415 V 2000 KVA	
13.1	ALTERNATOR	I								
					Kirloskar Electric	Bangalore	A		415 V alternators	
					Cummins Generator Technology (Stamford)	U.K	A		415 V & 11 KV alternators	
					Leroy Somer	France	A		Up to 11KV alternator 3500 kW	
					Marathan	USA	A		Alternators for up to 415 V, 1500 KVA DG SET	
					Cummins Generator Technology (Stamford)	Ahmednagar	A		415 V Alternators up to 1600 KVA	
					Toyo Denki Power System	Bangalore	A		11 KV, 1500 KVA	
13.2	DG Set Control panel / Synchronising panel	I								
					L&T	Mumbai / Coimbatore / Ahmednagar	A			
					GE	Bangalore	A			
					Siemens	Mumbai	A			
					C&S Electric	Noida / HARIDWAR	A			
					Schneider	Nasik	A			
					Unilec	Gurgaon	A			
					Nitya Electrocontrols	Noida	A			
					Switching Circuits	Kolkata	A			
					Tricolite	Sahibabad / Manesar	A			
					Hindustan Control & equipment Ltd	Kolkata	A		With fabrication & painting at unit II & MP Electrical Narendrapur	
					Maktel	Vadodara	A			
					Jakson	Greater Noida	A			
					Vidyut Control	Gaziabad	A			

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
					Adlec Power	Rohad (Jhajjar)	A			
					Pyrotech	Udaipur	A			
					Anand Power Ltd.	Noida	A			
					Positronics	Vadodara	A			
					Control & Schematics	Hyderabad	A			
					Sterling Generators Pvt Ltd	Silvasa	A			
					Jackson	Kathua	A		11 KV, 1500 KVA	
					Supernova	Rajpur	A			
14	DC Batteries (Ni-Cd type BATTERY)	I								
					HBL-Power System	Hyderabad	A		Up to 990 Ah with conditions	
					Saft India	Bangalore	A		8Ah to 990Ah- KPH type	
							A		10Ah to 1365 Ah- KPM type	
							A		11Ah to 1550Ah – KPL type	
14.1	Lead Acid Battery Plates	I			EXIDE	Kolkata	A			
					HOPPECKE	Brilon, Germany	A			
15	BATTERY CHARGER (48V/110V/220V)	I								
					Amararaja	Tirupati	A			
					HBL- Power System	Hyderabad	A			
					Chhabi electrical	Jalgaon	A			
					Chloride Power	Kolkatta	A			
					Statcon	Hapur	A		Up to 220 V, 850 A	
					Dubas	Bangalore	A		Up to 220 V, 800 A	
16	Dry Type Transformer	I								
					ABB	Savli	A		Up to 8 MVA, 24 KV Class	
					Raychem	Pune	A		Up to 3.5 MVA, 33 KV Class	
					Toshiba	Hyderabad	A		Up to 2.0 MVA, 33 KV Class	
					BHEL	Jhansi	A		Up to 6.3 MVA, 33 KV Class	
					Kirloskar Electric Company Limited	Pune	A		Up to 4.0 MVA, 33 KV Class	
					Voltamp	Savli	A		Up to 3.25 MVA, 33 KV Class	
					Sudhir Power Ltd	Silvassa	A		Up to 1 MVA, 11 KV Class	
					Hammond Power Solutions	Hyderabad	A		Up to 95 KVA, 33KV Class	
17	OIP/RIP BUSHING	CAT I								
		I			BHEL	Bhopal	A		Up to 400 KV class	
					Crompton Greaves Ltd	Nasik	A		Up to 400 KV class	
					Crompton Greaves Ltd	Aurangabad	A		Up to 245 KV Class (excluding GT)	
					ABB Ltd.	Vadodara	A			

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
17.1	OIP/CONDENSER BUSHING	II			ABB Switzerland Ltd. MICAFIL Bushings	Switzerland	A		Up to 400 KV class	
					TELK	Angamaly	A		Up to 400 KV class	
					GE T&D India Limited	Hosur	A		Up to 400 KV class	
					Alstom-Passion Villa	Italy	A		Up to 400 KV class	
					ABB Power Tech.Products	Sweden	A		Up to 400 KV class	
					Trench	France	A		Up to 400 KV class	
17.2	RIP Bushing	I								
					ABB AB Components	Sweden	A		Up to 420 KV Class	
					ABB Micafil	SwitzerLand	A		Up to 420 KV Class	
					Izolytor	Rusia	A		Up to 420 KV Class	
					HSP	Germany	A		Up to 420 KV Class	
					Yash High Voltage	Vadodara	A		Up to 145 KV Class	
18	INSULATING OIL	I								
					Apar Industries	Rabale / Silvassa	A			
					Power Oil Petrolium Products	Silvassa	A			
					NYNAS NAPTHENICS AB	SWEEDEN / USA	A			
					Kanden Engg Corp Ltd	Japan	A			
					Nynas Ltd	Hongkong	A			
					Raj Petro Specialities	Chennai / Silvasa	A			
					Savita Oil Technologies	Mumbai / Silvasa	A			
19	ON LINE DGA ANALYZER	III								
					GE Kelmen Ltd	UK	A			
					GE GRID SOLUTIONS LTD	LISBURN, UK	A			
					Serveron	USA	A			
					CIC	Vadodara	A		Approval Conditions apply	
					Morgan Scehaffer	Canada	A			
20	GIS	I			GE T&D	CHENNAI	A			
					ABB	BARODA	A			
21	CAPACITIVE VOLTAGE TRANSFORMER (CVT)	I								
					ABB	VADODARA	A		UP TO 400KV	
					GE T&D	HOSUR	A		UP TO 765 KV	
					BHEL	JHANSI	A		UP TO 400KV	
					MEHRU ELECTRICALS	BHIWADI	A		UP TO 132 KV	
					CGL	NASHIK	A		UP TO 400KV	
22	CURRENT TRANSFORMER	I								
					Mehru Electrical	Bhiwadi	A		UP TO 132 KV	
					GE T&D	Hosur	A		UP TO 765 KV	

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
					ABB	Vadodara	A		UP TO 400KV	
					CGL	Nasik	A		UP TO 400KV	
					BHEL	Bhopal	A		UP TO 400KV	
					BHEL	Jhansi	A		UP TO 220 KV	
					Vishal Transformer	Meerut	A		UP TO 132 KV	
					Heptacare	Meerut	A		UP TO 33KV	
23	CIRCUIT BREAKER	I								
					GE T&D	KANCHIPURAM	A		UP TO 765 KV	
					ABB	VADODARA	A		UP TO 400 KV	
					SIEMENS	AURANGABAD	A		UP TO 400 KV	
					BHEL	Hyderabad	A		UP TO 400 KV	
					CGL	NASHIK	A		UP TO 400 KV	
24	ISOLATOR	I								
					GR POWER	HYDERABAD	A		UP TO 400KV	
					HIVELM	CHENNAI	A		UP TO 400KV	
					S&S POWER	PONDICHERRY	A		UP TO 400KV	
					SIEMENS	HYDERABAD	A		UP TO 765 KV	
					ELEKTROLITES	JAIPUR	A		UP TO 33 KV	
					SWITCHGEAR & STRUCTURALS	HYDERABAD	A		UP TO 765 KV	
25	SURGE ARRESTOR	I								
					CGL	NASIK	A		UP TO 400KV	
					ELEKTROLITES	JAIPUR	A		UP TO 33 KV	
					LAMCO	HYDERABAD	A		UP TO 400KV	
					OBLUM	HYDERABAD	A		UP TO 765 KV	
26	CLAMPS & CONNECTORS & WELDING SLEEVES	I								
					ELCTROMECH TRANSTECH	KOLKATA	A			
					EXALT	MUMBAI	A			
					KLEMMEN ENGG	CHENNAI	A			
					MEGHA ENGG	CHENNAI	A			
					MILIND	MUMBAI	A			
					EMI	MUMBAI	A			
					NOOTAN ENGG	MUMBAI	A			
					TAG CORPORATION	CHENNAI	A			
					ITPL	MUMBAI	A			
					RASHTRA UDYOG	KOLKATA	A			
					Premier Power Products	Chennai	A			
					PEE VEE ENGG	BANGALORE	A			

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
27	**ACSR CONDUCTOR**	I								
					APAR INDUSTRIES	SILVASSA	A			
					CABCON	KOLKATA	A			
					DIAMOND	VADODARA	A			
					GALAXY	SANGLI	A			
					GUPTA POWER INFRA	BHUBANESWAR	A			
					HIRA CABLES	HIRAKUD	A			
					JSK	SILVASSA	A			
					LUMINO	KOLKATA	A			
					SARAVATHY	BANGALORE	A			
					HIREN ALUMINIUM	SILVASSA	A			
					SMITA	GHAZIABAD	A			
28	**ALUMINIUM TUBE**	I								
					ALOM EXTRUSIONS UNIT-II	BALASORE	A			
					BANCO	VADODARA	A			
					CENTURY EXTRUSION	KOLKATA	A			
					HINDALCO	RENUKOOT	A			
					HINDALCO	ALUPURAM	A			
					JINDAL ALUMINIUM	BANGALORE	A			
					SUDAL	NASIK	A			
29	**SUB STATION AUTOMATION SYSTEM '(BCU, GRP, ENERGY METER, NUMERICAL RELAYS, SWITCHYARD PROTECTION)**	I								
					GE T&D	CHENNAI	A			
					ABB	PEENYA	A			
					SCHNEIDER	NOIDA	A			
					SIEMENS	KALWA/GOA	A			
					BHEL	BHOPAL	A			
30	**AB Tariff energy meter**	I								
					SEMS	Udaipur/Solan	A			
					Elster	Mumbai	A			
					L&T	Mysore	A		For Model ER300P With CMS software.	
31	**Power Conditioning Unit (PCU)**	I								
					Schneider	Bangalore	A		Conditions apply	
					ABB	Bangalore	A		Conditions apply	
					Bongfiglioli	Germany	A		Conditions apply	
					Fecon	Germany	A			
					AEG	Bangalore	A		Conditions apply	

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
					Hitachi-Hirel	Gandhinagar	A		Conditions apply	
					Hitachi-Hirel	Sananad	A		Conditions apply	
					Vacon	Bangalore	A		Conditions apply	
32	**String Monitoring Box (SMB)**	**II**								
					Trinity Touch	Palwal	A		Conditions apply	
					Hensel	Sriperumbudur	A		Conditions apply	
					AEG	Bangalore	A		Conditions apply	
					Statcon	Pilkhuwa	A		Conditions apply	
					Weidmuller	Spain	A		Conditions apply	
33	**SPV module**	**I**								
					BHEL	Bangalore	A			
					Warree	Surat	A			
					Emmvee	Bangalore	A			
					Vikram Solar	Parganas	A			
					Lanco Solar	Chattisgarh	A			
					Tata Power Solar	Bangalore	A			
					Alpex	Solan	A			
					Synergy	Durgapur	A			
					Photonix	Satara	A			
					HHV Solar	Bangalore	A			
33.1	**DC Cables**	**I**			Apar	Khtalwada	A			
					Siechem	Puduchery	A			
					Leoni Cable Solutions India Pvt. Ltd	Pune	A			
					Leoni Studer AG	Switzerland	A			
34	**Lighting mast with raise & lower type lantern carriage/ Lighting poles polygonal type**	**I**								
					Bajaj	Pune	A			
					BP Projects	Hoogly	A			
					Skipper	Howrah	A			
					Transrail	Silvasa	A			
35	**132 KV cable termination & straight through jointing kits**	**I**								
					Iljin	South Korea	A			
					ABB Kabeldon	Sweden	A			
					Pfisterer AG	Switzerland	A			
					Tyco Electronics Raychem GmbH	Germany	A			
36	**Air Insulated Non Segregated phase type LT busduct**	**I**								
					C&S Electric	G.Noida	A			

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
					C&S Electric	HARIDWAR	A			
					Unilec	Gurgaon	A		Upto 3200 A	
					Stardrive	Chennai	A			
					Spaceage Swgr Ltd	Bawal	A			
					REEP	Chennai	A			
					Enpro	Chennai	A			
					Nitya Electrocontrols	Noida	A			
37	**Sandwitched type LT Busduct**	**I**								
					Henikwon	Malaysia	A			
					Godrej	Banglore	A			
					C&S	HARIDWAR	A			
38	**SPBD**	**I**								
					BHEL	Rudrapur	A			
					C&S	Greater Noida	A			
					C&S	Haridwar	A			
					GODREJ & BOYCE MANUFACTURING COMPANY LTD	Bangalore	A			
					Powergear	Hindupur	A			
					Powergear	Chennai / Bangalore	A			
					KGS Engg.	Chennai	A			
39	**LT MOTOR**	**I**								
					ABB	FARIDABAD	A		UPTO 55KW	
					ABB	BANGALORE	A			
					JYOTI LTD.	VADODARA	A			
					TIPM	JAPAN	A		UPTO 15 KW (NON FLAME PROOF)	
					HYOSUNG	SOUTH KOREA	A			
					WEG	BRAZIL	A			
					HYUNDAI	SOUTH KOREA	A			
					LHP	SOLAPUR	A			
					CGL	AHMEDNAGAR	A		RQP, FOR FLAME PROOF MOTOR	
		Refer Note 7			TMEIC	JAPAN (NAGASAKHI)	A			
					NGEF	BANGALORE	A		UPTO 15 KW	
					BHARAT BIJLEE	MUMBAI	A		RQP, FOR FLAME PROOF ALSO	
					KEC	BANGALORE/ HUBLI*	A		*UPTO 90KW, RQP, FOR FLAME PROOF ALSO	

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
					MARATHON	KOLKATA	A		RQP (UPTO 690V & 600 KW) FOR FLAME PROOF ALSO	
					ABB	SWEDEN	A		UPTO 55KW	
					HAVELL	NEEMRANA	A		UP TO 90KW	
					KAWAMATA	JAPAN	A		UP TO 75 KW	
					TIPS	JAPAN	A		UP TO 45KW	
39.1	**DC Motor**	**I**								
					CGL	MANDIDEEP	A			
40	**LT VFD Control Panel**	**I**								
					Powertech	Sonepat	A		Upto 55 KW with following conditions: i) VFD from Schneider- France, upto 415V, 50KW. ii) Enclosure & bought out items shall be from NTPC acceptable makes & iii) Engineering support for integration will be provided by Schneider / Authorized integrator of Schneider	
					DANFOSS	Oragadam	A		(upto 690V, 1200kW), VFD drives with VFD sourced from Danfoss-Denmark / USA and Panel sourced from Rittal	
					YASAKAWA	Japan	A		VFD from Yasakawa- Japan, Upto 415V, 132KW	
					ROCKWELL AUTOMATION	SAHIBABAD	A		VFD from Rockwell(Allen Bradley)- USA, (Upto 415 V, 600 KW)	
					ABB	BANGALURU	A		VFD from ABB-Finland, Upto 690V, 750 KW	
					SIEMENS	NASIK	A		VFD from SIEMENS- Germany, Upto 690V,900KW	
					VACON	BANGALORE	A		VFD(NXP model) from VACON Finland, upto 400KW,415V and upto 900KW, 690V	
41	**MV VFD Control Panel**	**I**								
					HITACHI HI REL POWER ELECTRONICS PVT. LTD.	SANAND	A		11 kV, 1550 kW	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
					TMEIC INDUSTRIAL SYSTEMS INDIA PRIVATE LIMITED	TUMKUR	A		3.3KV, 6.6KV and 11 KV	
42	**Elevator (GEAR TYPE)**	I								
					ECE INDUSTRIES,	Ghaziabad	A			
					TECHNO INDUSTRIES LTD.,	AHMEDABAD	A			
					BHARAT ELEVATORS ENGG. PVT. LTD.,	KOLKATA	A			
					OTIS	MUMBAI	A			
					KONE ELEVATORS INDIA PVT. LTD.,	CHENNAI	A			
					OMEGA ELEVATORS	AHMEDABAD	A			
					SAMIL ELTEC CO LTD.	SOUTH KOREA	A			
					ORBIS ELEVATOR CO. LTD.,	AHMEDABAD	A			
43	**HVR Transformer & EC Panel**	I								
					ADOR Powertron	Pune	A			
					HIND RECTIFER PVT LTD	Nashik	A			
					BHEL	Jhansi	A			
44	**Panel Type Hopper Heater**	I								
					HTD	USA	A			
					Hotfoil EHS	USA	A			
					HTD HEAT TRACE(I) Pvt Ltd	Hyderabad	A			
					Thermon	USA	A			
					Thermopads(Unit-II)	Jeedimetla	A			
					Thermon	Pune	A			
45	**Neutral Grounding Transformer**	II								
					Pragati Electrical Pvt. Ltd.	Mumbai	A			
					Bharat Bijlee Ltd.	Navi Mumbai	A			
					Prayog Electrical Ltd.	Pune	A			
					Andrew Yule	Chennai	A			
46	**LT Switchgear - Floor mounted Fixed type indoor LT Switchgear Panel (MLDB)**	I								
					Switching Circuits	Kolkata	A			
					Hindustan Control & equipment Ltd	Kolkata	A		With fabrication & painting at unit II & MP Electrical Narendrapur	
					Maktel	Vadodara	A		Prior Type Testing	

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
					Jakson	Greater Noida	A			
					Vidyut Control	Gaziabad	A			
					Adlec Power	Rohad (Jhajjar)	A			
					Conquerent Control System	Manesar	A		Condition apply ,upto 1250A	
					Control & Schematics	Hyderabad	A			
					Positronics	Vadodara	A			
					Schneider (formerly L&T)	Mumbai / Coimbatore / Ahmednagar	A			
					GE	Bangalore	A			
					C&S Electric	Noida/ Haridwar	A			
					Schneider	Nasik	A			
					Pyrotech	Udaipur	A			
					Siemens	Kalwa	A			
					Tricolite	Sahibabad / Manesar	A			
					Schneider	Vadodara	A			
					Nitya Electrocontrols	Noida	A			
47	**Rectifier Panel For Hydrogen Generation Plant**	I								
					RUTTONSHA INTERNATIONAL RECTIFIERS LTD	HALOL, GUJRAT	A			
					Hind Rectifier	MUMBAI / NASIK	A			
48	**N2 INJECTION FIRE PROTECTION SYSTEM**	II			**TO BE PROPOSED BY MAIN CONTRACTOR DURING DETAILED ENGG. FOR NTPC/OWNER CONSIDERATION**					
	Items Identified as Main Contractor approved sources									
MC 1	**Tubular Type Heater**	III								
MC 2	**Interlocks for ESP**	III								
MC 3	**Porcelain Bushing Insulators**	III								
MC 4	**Continous Cast Copper Rod**	III								
MC 5	**Unimpregnated Densified Wood**	III								
MC 6	**Marshalling Box Components**	III								
MC 8	**Air Cell**	III								
MC 9	**Terminal Connector**	III								
MC 10	**Oil Flow Indicator**	III								
MC 11	**Pressure Relief Valve**	III								

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
MC 12	Magnetic Oil Level Gauge	III								
MC 13	OTI/WTI (RTD Type)	III								
MC 14	Off-Circuit Tap Changer	III								
MC 15	Cooling Fan & Motor Assembly	III								
MC 16	Silica Gel Breather	III								
MC 17	Bushing Metal Parts	III								
MC 18	Copper Conductor Bus Bar	III								
MC 19	Copper Foil/Sheet for Dry Type Transformer	III								
MC 20	Core cheese assembly for Bus Reactor	III								
MC 21	Core Clamps & OLTC Bracket, Core/Tie Bolt, Rods & Nuts	III								
MC 22	Epoxy Casting Material for Dry Type Transformer	III								
MC 23	Fibre Glass Covered Copper Conductor for Dry Type Transformer	III								
MC 24	Fibre Glass Sheet for Dry Type Transformer	III								
MC 25	Gaskets	III								
MC 26	Hardwares	III								
MC 27	Motor for OLTC	III								
MC 28	Sheet Metal Enclosure for Dry Type Transformer	III								
MC 29	Steel Plate & Pipe	III								
MC 30	Tank Fabrication up to 5 MVA	III								
MC 31	Temperature Surveillance Unit for Dry Type Transformer	III								
MC 32	Valves (for Radiator/Gun Metal/CI valves,etc.)	III								
MC 33	Gas Collecting Device	III								
MC 34	Networking of Numerical Relay	*(with Switchgear MQP)								
MC 35	Paint	III								
MC 36	Copper for Copper Flats & Copper strips/flexibles	III								
MC 37	OIL PURIFYING EQUIPMENT	III								
MC 38	VACUUM PUMP WITH MOTOR	III								
MC 39	ON LINE MOISTURE REMOVAL SYSTEM	III								
MC 40	Oil Tanker (wheel mounted),10 kL capacity	III								

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
MC 41	POST INSULATOR	II								
MC 42	DISC INSULATOR/ PIN INSULATOR	II								
MC 43	FIBRE OPTIC CABLE	I								
MC 44	EVENT LOGGER	III								
MC 45	GPS TIME SYNCHRONISATION EQUIPMENT	III								
MC 46	RELAY TEST KIT	III								
MC 47	DISTURBANCE RECORDER	III								
MC 48	OPERATIONAL ANALYSER WITH DCRM KIT	III								
MC 49	FOTE	II								
MC 50	OPGW	II								
MC 51	LARGE VIDEO SCREEN (LVS)	III								
MC 52	BELT WEIGHER	II								
MC 53	WEIGH BRIDGE	I								
MC 54	IN LINE MAGNETIC SEPARATOR / SUSPENDED MAGNET	II								
MC 55	METAL DETECTOR	II								
MC 56	CABLE REELING DRUMS	II								
MC 57	PIANO SWITCHES	III								
MC 58	PULL CORD / BELTSWAY / INDICATION SYSTEM	II								
MC 59	ELECTRONIC SPEED SWITCH, ZSS, TILT SWITCH, MAGNETIC SWEITCH, PROXIMITY SWITCH	II								
MC 60	HEAVY DUTY LIMIT SWITCHES	II								
MC 61	UNDER BELT SWITCH	II								
MC 62	GI CABLE TRAYS AND ACCESSORIES (LADDER & PERFORATED TYPE), fitting & accessories including bends	II								
MC 63	GI FLEXIBLE CABLE TRAY SUPPORT SYSTEM	II								
MC 64	Cable termination kits & straight through jointing kit	II								
MC 65	Lighting fixtures with accessories (Filament type)	II								
MC 66	Lighting fixtures with accessories (LED type)	II								
MC 67	HFTR SET (Power Plus)	I								
MC 68	Insulators for ESP (Bushing, Support , Shaft)	III								

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
MC 69	Fire sealing system - Type A Material supplier	II								
MC 70	Fire sealing system - Type B Material supplier	III								
MC 71	Executing Agency for Fire sealing system	I								
MC 72	Porcelain Insulator	III								
MC 73	Lighting & Welding Transformer	III								
MC 74	Industrial /welding receptacles & boxes	III								
MC 75	LT Switchgear - Wall mounted fixed type indoor / outdoor LT Switchgear non compartmentalized Panel (Lighting panels / AC / DC Fuse boards etc.)	II								
	L2 LIST OF MAJOR EQUIPMENT(POWER TRANSFORMER)	SOURCES FOR THESE ITEMS SHALL BE FINALIZED DURING DETAILED ENGINEERING AND MQP FINALIZATION								
1	CRGO STEEL	II								
2	TANK FABRICATION	II								
3	CRGO PROCESSORS	II								
4	CONTINUOUSLY TRANSPOSED CONDUCTOR	II								
5	PAPER INSULATED COPPER CONDUCTOR	II								
6	INSULATING PAPER for PICC	III								
7	MOULDED INSULATION COMPONENTS	III								
8	PRE-COMPRESSED BOARDS & INSULATION COMPONENTS	III								
9	OIL PUMP AND MOTOR SET	II								
10	BUCHOLZ RELAY	III								
11	ON LOAD TAP CHANGER	III								
12	OFAF COOLER	III								
13	RADIATORS	II								
14	REGNENERATIVE MAINTENANCE FREE BREATHER	III								
15	CMS System	I								
16	CMS PANEL	II								

		Project/ परियोजना : RAGHUNATHPUR THERMAL POWER PROJECT PHASE- II (2X660 MW)				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.:	
		Package/ पैकेज: EPC PACKAGE (EXCLUDING STG PKG)							REVISION NO : 00	
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 18.05.2023	
		Contract No./ अनुबंध सं.:							SUB-SYSTEM उप-प्रणाली: QA-ELEC	
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
17	TRANSFORMER TESTING & MAINTENANCE EQUIPMENTS	III								
	L2 LIST OF BUS DUCTS									
1	Air Pressurisation Equipment	II								
2	Hot Air Blower	II								
3	LAVT Cubicle / NG Cubicle/ Marshalling Box	II								
4	CT for IPBD	II								
5	Epoxy Seal off bushing / Insulators	II								
NOTE	**L2 LIST OF SWITCH GEAR**								SOURCES FOR THESE ITEMS SHALL BE FINALIZED DURING DETAILED ENGINEERING AND MQP FINALIZATION	
1	Numerical Relays	I							SUB-QR CLEARED VENDORS ARE ACCEPTABLE FOR NUMERICAL RELAYS	
2	Silver Plating	III								
3	LV Air Circuit Breaker	I								
4	LT CT/PT/CBCT/ Control Transformer	II								
5	MV Vacuum Type Circuit Breaker	I								
6	MV CT / PT & CBCT	I								
7	MCBs	III								
8	ENERGY METER	III								
9	H.V. Fuse	III								
10	Terminal Blocks (Control)	III								
11	Surge Capacitors	II								

NOTES:

Note - 1 : **Vendors to submit project specific documents as per Sub-QR requirements in case the Vendor is approved under collaboration agreement.**

Note - 2: Vendors under 'A' are approved and accepted by NTPC with / without conditions in the past. Similar conditions as the case may be for the vendor shall be applicable for this project and tied up in the quality plan.

Note - 3: Main contractor approved sub vendors are acceptable those are evaluated / assesesed as per Main contractor Quality Management System for vendor approval. Main contractor to inform the finally selected vendor to NTPC as soon as PO is placed for these items. In case of sub-QR Note-1 is also applicable.

Note - 4 **:** BOI shall be reviewed and finalised during MQP approval for items / systems where ever applicable.

Note - 5: Category of inspection for LT Cables:

	For Total Contract Quantity per Size	***Category Of Inspection***
	For cable total quantity ≤ 2.5 KM	Cat-III - submission of TC & Certificate of Conformance by Main Contractor for the manufacturers having successfully supplied to any NTPC project-site through Corporate contracts for atleast 2 years
	For cable total quantity above 2.5 km & up to ≤ 10 km per size/type	Cat-II for the manufacturers having successfully supplied to any NTPC project-site through Corporate contracts for atleast 2 years

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)
	For cable total quantity above 10 km per size / type					Cat-I				
Note - 6: Category of inspection for Cable Trays & Cable Tray Flexible Support System:										
	For Total Contract Quantity per Size					***Category of Inspection***				
	For cable total quantity ≤ 2.5 KM					Cat-III - submission of TC & Certificate of Conformance by Main Contractor for the manufacturers having successfully supplied to any NTPC project-site through Corporate contracts for atleast 2 years				
	For cable total quantity above 2.5 km & up to ≤ 10 km per size/type					Cat-II for the manufacturers having successfully supplied to any NTPC project-site through Corporate contracts for atleast 2 years				
	For cable total quantity above 10 km per size / type					Cat-I				
Note - 7:	i) For Motors less than 50 KW: CAT-III. Acceptance of Motor less than 50 KW is based on COC of the Manufacturer and the Main Contractor confirming as follows: "It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate and tested in accordance with approved drawing /data sheets". ii) For Motors 50 KW and less than 75 KW : CAT- II. Acceptance of Motor is based on NTPC review of Routine Test inspection report as per IS: 12615 / applicable standards duly witnessed by main contractor along with COC of the Manufacturer and the Main Contractor confirming as follows: "It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing /data sheets". iii) For Motors 75 KW & above : CAT- I . AS PER NTPC APPROVED QUALITY PLAN (To be submitted seperately for NTPC review & approval).									
Note - 8:	NTPC approved Galvanizers:									
	1. M / s M J Engg,Delhi			7. M / s National Galvanizer, Kolkata		13. M / s Gurpreet Galvanizer, Hyderabad			19. Unitech Fabricators & Galvanizers-Hoogly	
	2. M / s A.V. Engg, Kolkata			8. M / s Unistar Galvanizer, Kolkata		14. M / s Sigma, Mumbai				
	3. M / s Inar Profiles, Vishakapatnam			9. M / s B.P. Project. Kolkata		15. M / s Radhakrishnan Shetty, Chennai				
	4. M / s Anand Udyog, Mumbai			10. M / s Bajaj Pune		16. Karamtara Mumbai				
	5. M / s Techno Engg,Chandigarh			11. M / s Electrocare Industries, Mumbai		17. Poona Galvanizers Pune				
	6. M / S Steelite Engg, Mumbai			12. M / s B.G. Shirke, Pune		18. Neha Galvanizer- Kolkata				
Note - 9:	Relevant certificates shall be submitted for NTPC approval.Approval conditions attached to above identified vendors, as applicable shall be adhered to.									
Note - 10:	Indigenous sub-vendors for Annexure-I items are acceptable subject to meeting the MLC (Minimum Local Content} in line with latest MOP order.									
	LEGENDS / संकेतिका SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY /प्रणाली आपूर्तिकर्ता / सब –वेंडर की स्वीकृति की स्थिति की श्रेणी (SHALL BE FILLED BY NTPC एनटीपीसी द्वारा भरा जाएगा) A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list along with the condition of approval, if any./ इन मदों के लिए प्रस्तावित वेंडर एनटीपीसी को स्वीकार्य है। अनुमोदन की शर्त, , यदि कोई हो, के साथ-साथ पत्र "क" में इंगित किया जाए । DR – For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list. एनटीपीसी द्वारा इन मदों की समीक्षा के लिए "विस्तृत ब्यौरे की आवश्यकता" होगी। सूची में "DR" पत्र में इंगित किया जाना चाहिए। QP/INSPN CATEGORY: क्यूपी / निरीक्षण की श्रेणी: CAT-I / श्रेणी- I: For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया जाता है और एनटीपीसी द्वारा अंतिम स्वीकृति भौतिक निरीक्षण के दौरान उपलब्ध गवाह के आधार पर दी जाएगी। CAT-II / श्रेणी- II: For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP. इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया जाता है। हालाँकि एनटीपीसी द्वारा कोई भौतिक निरीक्षण नहीं किया जाएगा। एनटीपीसी द्वारा अंतिम स्वीकृति अनुमोदित क्यूपी के अनुसार दस्तावेजों की समीक्षा के आधार पर दी जाएगी। CAT-III/ श्रेणी-III : For these items Quality control to be exercised as per Main contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of Conformance (COC) by Main Contractor. UNITS/WORKS इकाईयां / कार्य: Place of manufacturing/ निर्माण का स्थान Place of Main Supplier of multi units/works/बहु- इकाइयों / कार्यों के मुख्य सप्लाइर का स्थान. : Control measure of item covered in quality plan of main item.									

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
1	AAQMS System									
		I			ACOEM Ecotech Industries Pvt Ltd	Pithampur	A		1. So2 ,Nox,CO,CO2 ,Ozone ,PM-10,PM-2.5 & multipoint calibrator will be from Ecotech Australia 2.Metrological sensor from Dynalab 3. Mercury analyser from LOA agreed sources 4.Pl refer Note-07	
		I			Horiba India Pvt ltd	Pune	A		1. So2 ,Nox,CO,CO2 ,Ozone & multipoint calibrator will be from Horiba Japan 2.PM-10,PM-2.5 ,TSP will be from Met One USA & metrological sensor from Spectrum USA 3. Mercury analyser from LOA agreed sources	
		I			Envirorment SA India Pvt. Ltd.	Mumbai	A		1.Analysers SO2,Nox,CO2 & SPM from Environment SA France, 2-Multipoint Calibrator From envoirenment SA France 3-Metrological Sensor with interface unit from M/s LSI Lastem SRL, Italy	
		I			Thermo Fisher Scientific India Pvt. Ltd	Mumbai	A		1) Analysers (Sox,Nox,CO,SPM,RSPM ,Ozone) ,multi gas calibrator shall be sourced from their principle Thermo Environmental ,USA (Division of M/S Thermo fisher Scientific ,USA) 2)Metrological sensors shall be sourced from M/S Metone Instruments USA	
		I			Chemtrol Engineering Ltd	Goa	A		1. Analysers from M/S Teledyne USA except Mercury analyser . 2.Metrological sensors & SPM analysers from Met one Instruments Inc USA 3.Pl refer note-07	
2	Acoustic pyrometer System									

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		I			Lucent Marcons Pvt Ltd (As a system Integrator of M/S Scientific Environmental Instruments, Inc. (SEI) USA)	Noida	A		1.Boiler watch processor control unit, acoustic sensor (Pizeo/Microphone with prefab cable) , Preamplifier , mapping software & analog output cards shall be from M/S SEI USA . 2. Enclousure ,OWS ,Waveguide ,Transition cone with flange , venturi , Tube box etc shall be from M/S SEI USA approved sources to be tiedup in MQP. 3. Pl refer Note-07	
		I			Hi-Tech Systems & Services Ltd (As a system Integrator of M/S Bonnenberg + Drescher GmbH, Germany)	Kolkata	A		1.All critical components are to be procured from M/S Bonnenberg + Drescher GmbH, Germany 2.Standard indiginious components like Solenoid valve (Asco make) ,matching flange ,printer & monitor table shall be supplied by M/S Hi- Tech	
		II			Scientific Environment Instrument Inc (SEI)	USA	A		1.PCU ,Acoustic sensor ,Preamplifier mapping software shall be from SEI USA . 2. Enclousure ,OWS ,Waveguide ,Tube box etc shall be from SEI approved sources to be tiedup in MQP. 3.Pl refer Note-07	
		II			Bonnenberg + Drescher GmbH,	Germany	A			
		II			STOCK Equipment Co	USA	A			
3	Addressable Detector (Multisensor , Photo & Heat Detectors Type), Interface units & Manual call points									
		II			Honeywell Life Safety-HIIPL	Gurugram	A		Notifier Brand (Detector, Interface Module only)	
		II			Schrack	Austria	A			
		II			Autronica	Norway	A			
		II			Edwards	Mexico	A			
		II			Notifier	USA	A			
		II			Sheld Fire safety	UK	A			
		II			Jhonson Controls	USA	A		Simplex Brand	
4	Battery for 24VDC charger & UPS									
		Note-4			Hoppecke Batterien GmbH & Co Kg	Germany	A		For Lead Acid- Plante	
		Note-4			Exide	Kolkata	A		For Lead Acid- Plante	
		Note-4			SAFT India Ltd	Bengaluru	A		For Ni-Cd	
		Note-4			HBL Power	Hyderabad	A		For Ni-Cd ,Upto 990AH (H type)	

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		Note-4			SAFT	France/Sweeden	A		For Ni-Cd	
		Note-4			Hoppecke Batterien GmbH & Co Kg	Germany	A		For Ni-Cd	
5	Blank Panels / Cabinets									
		III			Pyrotech Electronics Pvt. Ltd	Udaipur	A			
		III			Rittal India Private Ltd	Bengaluru	A			
		III			Hoffman	Bengaluru	A			
		III			BHEL	Bengaluru	A			
6	Boiler tube leak detection system (ASLD)									
		III			HI Tech System & services Ltd (System Integrator of Acoustic Monitoring International Inc. USA)	Kolkata	A		1.M/S Acoustic Monitoring International Inc. USA Make system Conditional as per approval letter 01/CQA/9573-102/Hi-tech-AMI dated 11.04.2013 2.Pl refer Note-07	
		III			Raman Instruments (System Integrator of M/S Procon UK)	Delhi	A		1.M/S Procon UK Make system 2.Pl refer Note-07	
		III			BHEL Ltd	Trichurapalli	A			
		III			Instrotech (PTY) Ltd	South Africa	A			
		III			Rectuson Co. Ltd	S.Korea	A			
		III			Procon Engineering	UK	A			
		III			Acoustic Monitoring International Inc. (AMI)	USA	A			
7	CCTV System (IP Based)									
		III			Axis	Sweden	A		1-CCTV components will be of Axis communication AB,Sweden make & Video Management Software will be of Milestone Brand. 2.Other BOI items shall be from LOA approved sources & will be tied up during the finaliztion MQP.	

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		III			Bosch	Bengaluru	A		1.CCTV components will be of M/S Bosch make, and supplied through M/s Bosch, Bengaluru. 2.Other BOI items shall be from LOA approved sources & will be tied up during the finaliztion MQP.	
		III			Pelco	USA	A		1.CCTV components will be of M/S Pelco, USA make 2.Other BOI items shall be from LOA approved sources & will be tied up during the finaliztion MQP.	
7A	CCTV System (IP Based) /System Integrators									
		I			Jonson Control India Pvt Ltd	Mumbai	A		M/S Pelco Make CCTV system	
		I			Toshniwal Industrial Pvt Ltd	Ajmer	A		M/S Axis Make CCTV system	
		I			L&T TECHNOLOGY SERVICES	Bengaluru	A		M/S Bosch Make CCTV system	
		I			Score Information Technologies Limited	Kolkata	A		M/S Bosch Make CCTV system	
8	Control Desk									
		I			Pyrotech Workspace Solutions Pvt Ltd	Udaipur	A		BOI items like Mosaic tiles /Console items shall be as per LOA approved sources	
		I			Cosmos Media Products Pvt Ltd	Greater Noida	A		1.BOI items like Mosaic tiles /Console items shall be as per LOA approved sources 2. H block should be from knurr Germany .Solid acrylic surface should be procured from Du Pont/NTPC approved sources 3.Extruded Al profile structure should be procured from Hindalco (With Knurr design)	
		I			Adarsha Control system Pvt Ltd	Bengaluru	A		1.BOI items like Mosaic tiles /Console items shall be as per LOA approved sources 2. Acrylic solid surface (ASS) should be procured from Du Pont /NTPC approved sources 3.wood works are to be done by M/S C K Furn Bangaluru	
9	Control Valves									
9-A	Control Valves for Aux PRDS system including desuperheater									
		I			Instrumentation Limited	Palakkad (Kerala)	A		Up to A182F92 material with conditions as per approval letter	

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		I			Koso India Pvt limited	Nasik	A		Up to A182F92 material with conditions as per approval letter	
		I			Bomafa Special Valve solutions Pvt ltd	Ahmedabad	A		Up to A182F92 material with conditions as per approval letter	
		I			KSB MIL Controls Ltd	Thrissur (Kerala)	A		As per approval Ref: 02/CQA/SG/Tanda/MIL Dated 30.09.2015	
		I			Control Component India PVT Ltd	Sricity (Andhra Pradesh)	A		1.MQP shall be vetted by M/S CCI -USA 2.Sources of major components like casting /forging and actuators shall be tied up during finalization of MQP	
		II			Parcol SPA	Italy	A			
		II			Daume	Germany	A			
		II			HOLTER	Germany	A			
9-B	Control Valve for Start Up System									
		I			Control Component India PVT Ltd	Sricity (Andhra Pradesh)	A		1.The critical components of control valve i.e. Disk Stack (Drag technology) shall be sourced from CCI, USA/CCI S. Korea . 2.The positioner from NTPC approved sources & pneumatic actuators are sourced from CCI S.Korea 3.Control valve to be manufactured as per CCI USA design & drawing.	
		I			KOSO India Pvt Ltd	Nasik	A			
		I			Emerson Process Management Ltd	Chennai	A			
		II			Dresser Produits industriels Industriels S.A.S	France	A			
		II			SEMPELL AG	Germany	A		Up To size 20 Inches & 2500 ANSI Class	
		II			Nihon Koso Co Ltd	Japan	A			
		II			HORA	Germany	A			
		II			CCI	S.Korea	A			
		II			Emerson (Fisher)	USA/ France/ Japan	A			
9-C	Control Valve for BFP Recirculation.									
		I			Control Component India PVT Ltd	Sricity (Andhra Pradesh)	A		1.The critical components of control valve i.e. Disk Stack (Drag technology) shall be sourced from CCI, USA/CCI S. Korea . 2.The positioner from NTPC approved sources & pneumatic actuators are sourced from CCI S.Korea 3.Control valve to be manufactured as per CCI USA design & drawing.	
		I			KOSO India Pvt Ltd	Nasik	A			
		I			KSB MIL Controls Ltd	Thrissur (Kerala)	A		Up to 10 Inches & 3400 ANSI class	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		II			Dresser Produits industriels Industriels S.A.S	France	A			
		II			Nihon Koso Co Ltd	Japan	A			
		II			CCI	USA	A			
		II			Emerson (Fisher)	USA/ France/ Japan	A			
9-D	Control valve for feedwater flow Control									
		I			Control Component India PVT Ltd	Sricity (Andhra Pradesh)	A		1.The critical components of control valve i.e. Disk Stack (Drag technology) shall be sourced from CCI, USA/CCI S. Korea . 2.The positioner from NTPC approved sources & pneumatic actuators are sourced from CCI S.Korea 3.Control valve to be manufactured as per CCI USA design & drawing.	
		I			KOSO India Pvt Ltd	Nasik	A			
		I			Emerson Process Management Ltd	Chennai	A		Control valve body assembly will be from Nippon Fisher ,Japan with IBR form III C certificates .	
		I			KSB MIL Controls Ltd	Thrissur (Kerala)	A		1.Provision of straight type of brackets for linkage mechanism .2.Factory fitted strainer /diffuser type seat ring . 3.AFR with T connector for pneumatic connection to volume booster	
		II			Dresser Produits industriels Industriels S.A.S	France	A			
		II			Nihon Koso Co Ltd	Japan	A		CONDITIONAL	
		II			CCI	USA / Austria / S.Korea / Switzerland	A			
		II			Emerson (Fisher)	USA/France/Japan	A			
9-E	Control valves for Soot blower pressure reducing ,SH/ RH Attemperation.									
		I			Control Component India PVT Ltd	Sricity (Andhra Pradesh)	A		1.The critical components of control valve i.e. Disk Stack (Drag technology) shall be sourced from CCI, USA/CCI S. Korea . 2.The positioner from NTPC approved sources & pneumatic actuators are sourced from CCI S.Korea 3.Control valve to be manufactured as per CCI USA design & drawing.	
		I			KOSO India Pvt Ltd	Nasik	A			
		I			Emerson Process Management Ltd	Chennai	A			

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		I			KSB MIL Controls Ltd	Thrissur (Kerala)	A			
		I			GE Oil & Gas India Pvt Limited	Coimbatore	A		up to 2500 ANSI Class	
		I			Flow Serve India Controls Pvt Ltd	Bengaluru	A			
		I			Instrumentation Limited	Palakkad (Kerala)	A		only for SH / RH	
		II			Nihon Koso Co Ltd	Japan	A			
		II			Dressor Masoneilan	USA	A		only for SH / RH/ up to 2500 class	
		II			Dresser Produits industriels Industriels S.A.S	France	A			
		II			SPX Flow Technology	USA	A		only for SH / RH	
		II			Leslie Controls Inc	USA	A		only for SH / RH	
		II			Sempell AG (Tyco group)	Germany	A		only for SH / RH	
		II			CCI	USA/Sweden /S.Korea	A			
		II			Emerson (Fisher)	USA/France /Japan	A			
9-F	Control valve(Other application)									
		I			Mascot Valves Pvt Ltd	Ahmedabad	A		Up to size 12 inches & 900 ANSI class	
		I			Control Component India PVT Ltd	Sricity (Andhra Pradesh)	A		Up to 2500 ANSI class	
		I			KOSO India Pvt Ltd	Nasik	A			
		I			KSB MIL Controls Ltd	Thrissur (Kerala)	A		Up to 2500 ANSI class	
		I			Emerson Process Management Ltd	Chennai	A		Up to 2500 ANSI class	
		I			GE Oil & Gas India Pvt Ltd	Coimbatore	A		Up to size 10 inches & 900 ANSI class /Up to size 24 inches & 600 ANSI class	
		I			Flow Serve India Controls Pvt Ltd	Bengaluru	A		Up to size 14 inches & 600 ANSI class	
		I			Forbes Marshal Arca Pvt. Ltd.	Pune	A		Up to size 16 inches & 900 ANSI class	
		I			Instrumentation Limited	Palakkad (Kerala)	A		Up to 2500 ANSI class	
		I			Severn Glocon India Pvt Ltd	Chennai	A		Up to size 14 inches & 300 ANSI class	
		I			Circor Flow	Coimbatore	A			
		II			CCI	USA/Sweden /S.Korea	A			
		II			Nihon Koso Co Ltd	Japan	A			
		II			Emerson (Fisher)	USA/France /Japan	A			
		II			Leslie Controls Inc	USA	A			
		II			PARCOL S.P.A	Italy	A			
		II			Dresser Produits industriels Industriels S.A.S	France	A			
		II			HORA	Germany	A			
		II			Wellend & Tuxhorn	Germany	A			

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		II			SPX Flow Technology	USA	A			
		II			Sempell AG (Tyco group)	Germany	A			
9-G	Control Valve (Ceramic lined)									
		I			Samson Controls Pvt Ltd	Pune	A		1. For M/S Samson Cera Germany make valve Up to 10 inches size & 150 ANSI class 2. BOI shall be tied up at the time of finalisation of MQP	
10	DDCMIS									
		I			ABB	Germany	A			
		I			SIEMENS AG	Germany	A			
		I			Emerson Process Management Asia Pacific Pvt Ltd	Singapore	A			
		I			Hitachi nest control system Pvt Ltd	Bengaluru	A			
		I			Honeywell Automation India Ltd	Pune	A			
		I			GE	France	A			
		I			SIEMENS	Gurugram	A			
		I			BHEL	Bengaluru	A		For MAX DNA System	
		I			Yokogawa	Bengaluru	A			
		I			GE Power India Ltd	Noida	A			
		I			Toshiba	Japan	A			
		I			ABB	Bengaluru	A			
		I			Emerson Process Management Ltd	Pawane	A			
11	Dust Emision Monitor									
		III			Durag India Instrumentation Pvt Ltd	Bengaluru	A		1. For Durag Germany Make Extractive Type Dust density analyser 2. Other components shall be as per approval letter CQA/NTPC BARH STPP-I / D-263 / Durag India Instrumentation Pvt Ltd Bengaluru Dated 28.08.2019	
		III			Sick India Pvt ltd	Mumbai	A		1.For SICK AG Make Extractive Type Dust density analyser 2. Other components shall be as per approval letter CQA/NTPC BARH-I /S-907/M/S SICK India Pvt Ltd dated 28.08.2019	
		III			Environment SA India Pvt Ltd	Navi Mumbai	A		1.For ENEVA UK Make Extractive Type Dust density analyser 2. Other components shall be as per approval letter No.: CQA/NTPC BARH-I / E-335 / M/S Environment SA India Pvt Ltd Dated 16.09.2019	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		III			Land Instruments International	UK	A		For In Situ type /Optical Transreceiver type	
		III			Codel	UK	A		For In Situ type /Optical Transreceiver type	
		III			Durag Industrie Elektronik GmbH & Co KG	Germany	A		For In Situ type /Optical Transreceiver type & Extractive Type	
		III			Emerson Process Management	Ireland	A		For In Situ type /Optical Transreceiver type	
		III			SICK AG	Germany	A		For In Situ type /Optical Transreceiver type & Extractive Type	
		III			ENEVA	UK	A		For Extractive Type Dust density analyser	
12	Electrical Actuators									
12-A	Electrical Actuator (With gear box if applicable)									
		II			Antrieb Technik Pvt Ltd	Chennai	A		For low torque applications only	
		II			Auma	Bengaluru	A			
		II			Limitorque	Faridabad	A		Model no L120,SMB,LY series, Gear Box T, HBC Series	
		II			Rotork	Bengaluru	A		For low torque app (Up to 1000 Nm)	
		II			Rotork Controls (India) Private Ltd	Chennai	A		For low torque app (Up to 1000 Nm) & High torque 4000 to 7000 Nm With integral starter for non critical applications	
		III			Auma	Germany	A			
		III			Limitorque	USA	A			
		III			Rotork	UK	A		For low torque app (Up to 1000 Nm)	
		III			Nippon gear	Japan	A			
		III			Drehmo GMBH	Germany	A		C Matic Series (DMC/DMCR)	
12-B	Electrical Actuator- Non-Intrusive (With gear box if applicable)									
		I			Auma India Pvt Ltd	Bengaluru	A		Also acceptable for Field Bus based applicable	
		I			Rotork Control	Chennai	A		upto 630Nm	
		III			Flowserve	USA	A		Also acceptable for Field Bus based applicable	
		III			Bernard Controls	France	A			
12-C	Electrical actuator for ID/FD/PA Blade pitch ,IGV &SCOOP									
		III			Harold Beck & Sons Inc	USA	A			
		III			SIPOS Aktrorik GmbH	Germany	A			
13	Electronics Transmitter (Pressure , DP and DP based Flow/Level)									
13-A	Electronics Transmitter (Pressure , DP and DP based Flow/Level)									

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		III			ABB Ltd	Bengaluru	A		2600T & critical item from ABB Italy/ Their approved source;	
		III			Emerson Process Management Ltd	Pawane	A			
		III			Siemens Ltd	Thane	A		Model:-SITRANS P	
		III			Honeywell Automation India Ltd	Pune	A			
		III			Baldota Control and Equipment Pvt Ltd	Navi Mumbai	A		PT & DPT of LD 301 Series (SMAR)	
		III			Yokogawa India Limited	Bengaluru	A		EJA-E 110,430,530 SERIES & all raw material and BOI under knocked down condotion (sensor assembly as a single unit) shall be sourced from M/S Yokogawa Japan	
		III			M/s Endress + Hauser India Automation Instrument Pvt Ltd	Aurangabad	A			
		III			Emerson (Rosemount)	USA	A			
		III			Yokogawa	Japan	A			
		III			ABB	Germany / Italy	A		2600T & critical item from ABB Italy/ Their approved source;	
		III			Siemens	France	A		Sitrans P DSIII Series	
		III			Fuji Electric	France	A		FCX -AIII SERIES	
		III			Fuji	Japan	A			
13-B	Electronics Transmitter -Field Bus Based (Pressure , DP and DP based Flow/Level)									
		I			ABB India Ltd	Bengaluru	A		One no of Transmitter will be sent at DDCMIS supplier for function testing of field bus communication with DDCMIS during FAT	
		I			Yokogawa India Limited	Bengaluru	A		EJA-E 110,430,530 SERIES & all raw material and BOI under knocked down condotion (sensor assembly as a single unit) shall be sourced from M/S Yokogawa Japan One no of Transmitter will be sent at DDCMIS supplier for function testing of field bus communication with DDCMIS during FAT	
14	EQMS									

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		I			SWAN	Hyderabad	A		1. Conductivity analyser, pH analyser and Temperature Transmitter will be of M/s ABB, UK make . 2. TSS analyser will be of M/s Daeyoon, South Korea make . 3. Oil in water analyser will be of M/s TriOs, Germany make. 4. Online BOD/COD analyser will be of M/s Shimadzu, Japan make . 5. Flow meter will be of M/s Khrone Marshall, Maharashtra make. 6. Data Aquisition System will be procured from Knowledge Lens, Karnataka.	
15	Fiber optic cable									
		Note-3			U M Cables Ltd	Silvassa (Daman)	A			
		Note-3			KEC International Ltd	Mysore	A			
		Note-3			Apar Industries Limited	Valsad (Gujrat)	A			
		Note-3			HFCL	Goa	A			
		Note-3			Aksh Fibre	Bhiwadi (Raj)	A			
		Note-3			Finolex Cable Ltd	Goa	A			
		Note-3			Birla Cable Limited	Rewa	A			
		Note-3			R&M	Switzerland	A			
		Note-3			Molex	UK	A			
		Note-3			Corning	USA	A			
16	Fire alarm Panel									
		II			Toshniwal Industrial Pvt Ltd	Ajmer	A		1.M/S Notifier Make Fire alarm Panel 2.Pl Refer Note-07	
		II			Bosch Security system	Bengaluru	A		1.Detector , Hooter, MCP, Modules, Panel shall be M/s Bosch Make	
		II			Notifier	USA	A			
		II			Autronica	Norway	A			
		II			Schrack	Austria	A			
		II			Edwards	Mexico	A			
		II			Shield Fire safety and security Ltd	UK	A			
		II			Jhonson Controls	USA	A		Simplex Brand	
17	Flame Monitoring System (Scanner)									

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		I			Lucent Marcons Pvt Ltd (System Integrator of M/S Forney Corporation USA)	Noida	A		1.Flame detector, amplifier ,light guide fiber optic , smart display programming unit , test kit & simulator will be supplied from M/S Forney Corporation USA 2.Other components like outer carrier ,IDD cable with connector , expander , Y connector with adapter gasket , fastners & signal isolators will be supplied from M/S Forney Corporation USA approved sources . 3.Pl Refer Note-7	
		I			HI Tech System & services Ltd (System Integrator of BFI Germany)	Kolkata	A		1.For BFI Germany make system 2. Pl Refer Note-7	
		II			Durag India Instrumentation Pvt Ltd	Bengaluru	A		For Durag Germany make system	
		II			Forney Corporation	USA	A			
		II			BFI	Germany	A			
		II			Durag GmbH	Germany	A			
		II			Emerson (COEN)	USA	A			
		II			BHEL	Trichurapalli	A			
18	Flow nozzle assembly									
		I			Microprecision Product Pvt Ltd	Palwal	A		Up to Alloy steel material grade P-92 & other conditions as per approval letter	
		I			Minco India Flow Elements Pvt. Ltd.	Goa	A		Up to size 26 Inches for Alloy steel/ Stainless steel pipe SA335 P-11, P -22 and SA 335 P-91 & other conditions as per approval letter	
		I			Instrumentation Limited	Palakkad (Kerala)	A		Up to alloy steel grade P-92 subject to qualified WPS & other conditions as per approval letter	
		I			Starmech controls (India) Pvt Ltd	Pune	A		Up to alloy steel grade P-92 subject to qualified WPS & other conditions as per approval letter	
		II			SEIKO	Czech Republic	A			
		II			WISE Control	S.Korea	A			
		II			Technomatic	Italy	A			
19	Flue Gas Analyser (CO)									
		III			Forbes Marshall Pvt Ltd	Pune	A		For In situ type CO analyser	

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		III			ICE (Asia) Pvt Ltd	Mumbai	A		For In situ type CO analyser 1. CO analyser from Protea UK 2. Other components like, Mounting Flanges, tubing, fittings ,junction boxes, air purging system , calibration cylinders & cables will be supplied by ICE (Asia) Pvt Ltd 3.Pl refer Note-7	
		III			Sick India Pvt Ltd	Mumbai	A		For In Situ Type / CO analyser from SICK AG & Other components like ,Protection tube ,Flanges ,tubing ,fittings ,junction boxes, solenoid valves & calibration cylinders will be supplied by M/S Sick India Pvt Ltd .	
		III			Emerson Process Management Ltd	Pawane	A		For M/S Emerson Germany/ USA make Analyser	
		III			Codel	UK	A			
		III			Land Instruments International	UK	A			
		III			Sick AG	Germany	A		For In Situ Type	
		III			Envoirenment SA	France	A		For Hot Extractive	
		III			Fuji Electric	Japan	A			
		III			Servo max Group	UK	A			
		III			Siemens	Germany	A			
20	Flue Gas Analyser (CO2,SO2 and Nox)									
		III			Sick India Pvt Ltd	Mumbai	A		For In Situ Type SO2 analyser 1. Analyser will be from Sick AG Germany 2. Other components like ,Whether proof covers ,flanges ,purge air unit ,junction boxes ,cables ,PC ,remote display ,gas cylinders shall be supplied by M/s Sick India Pvt Ltd	
		III			Emerson Process Management Ltd	Pawane	A		For M/s Emerson Germany/ USA make Hot Extractive SO2, NOx Analyser	
		III			Envoirenment SA	France	A		For Hot Extractive	
		III			Fuji Electric	Japan	A		Hot Extractive Type For SO2 & Nox	
		III			Siemens	Germany	A		Hot Extractive Type For SO2 & Nox	
		III			Yokogawa Electric Corporation	Japan	A		IR-400 Series (Hot Extractive Type For CO2, SO2 & NOx)	
		III			Servo max Group	UK	A		Hot Extractive Type For SO2 & Nox	
		III			Sick AG	Germany	A		Hot Extractive Type For CO2, SO2 & NOx and In situ type for SO2 analyser	
21	Flue Gas Analyser O2 Analyser (HT)									
		III			SECO	Chennai	A			
		III			Marathon Monitor	USA	A			

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		III			Servo max Group	UK	A			
22	Flue Gas Analyser {O2 Analyser (LT)}									
		III			Sick India Pvt Ltd	Mumbai	A		For In Situ Type 1. Analyser will be from Sick AG Germany 2. Other components like ,Whether proof covers ,flanges ,purge air unit ,junction boxes ,cables ,PC ,remote display ,gas cylinders shall be supplied by M/s Sick India Pvt Ltd	
		III			Analyser Instruments Co Pvt Ltd	Kota	A		For In Situ Type 1.Main parts like Sample probe & Analyser will be supplied by M/s Enotec Germany. 2. Other components like auto calibration unit ,probe protector ,enclosure panel & calibration kit will be supplied & integrated M/s AIC kota. 3.Pl refer Note-07	
		III			Emerson Process Management Ltd	Pawane	A		For In Situ Type For M/s Emerson USA make Analyser	
		III			ABB	Bengaluru	A		For In Situ Type For M/s ABB UK make Analyser	
		III			Yokogawa India	Bengaluru	A		For In Situ Type For M/s Yokogawa Japan make Analyser	
		III			Enotech GmbH	Germany	A		For In Situ Type	
		III			Ametek	USA	A		For In Situ Type	
		III			Yokogawa Electric Corporation	Japan	A		For In Situ Type	
		III			Servo max Group	UK	A		For In Situ Type	
		III			Sick AG	Germany	A		For In Situ Type	
23	Continous Emisson Monitoring system									
		I			Horiba India Pvt ltd	Pune	A		Approval conditions as per approval letter no - CQA/NTPC Mauda-II / H-321 / M/S Horiba India Pvt Ltd Dated 03.10.2019	
		I			Yokogawa India Ltd	Bengaluru	A		1. SO2,NOx & CO2 Analyser will be from M/S Yokogawa Electric Corporation Japan . 2.Other Conditional as per approval letter no Ref. No.:-CQA/BARH-I / Y-023/ M/s Yokogawa India Ltd dated 21.05.2020	
		I			Adage Automation Pvt Ltd.	Goa	A		For M/s Siemens Germany make SO2,NOx & CO2 Analysers	

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		I			Thermo Fisher Scientific India Pvt. Ltd	Pune	A		Approved only for Dilution Extractive Technique 1)Analyser (SO2,NOx,CO,CO2,Mercury), sampling probe ,sample handling system ,umbical cord etc to be supplied from M/S Thermo Fisher USA . 2) Other BOI shall be as per LOA approved sources	
		I			Emerson Process Management India Pvt Ltd	Pawane	A		For M/s Emerson Germany make SO2,NOx & CO2 Analysers other conditions as per approval letter.	
		I			Analyser Instruments Co Pvt Ltd	Kota	A		Analysers from Fuji Japan & other BOI shall be as per LOA approved sources .	
		I			Envoirenment SA India Pvt Ltd	Navi Mumbai	A		Hot Extractive Type / 1.Multipoint gas Analyzers MIR-9000 for SO2, NOx,CO2 & CO ,Probe ,Nafyon drier & heater for drier will be of M/S Environment SA France make. 2. Other components shall be as per the approval letter ref no CQA/NTPC Telangana/E-335/M/SEnvoirenment SA India dated 12.02.2019	
24	Furnace Flame viewing system (High Temperature CCTV Components)									
		III			Sertel Electronics Pvt. Ltd.	Chennai	A		Approved for Visible type only	
		III			Hi Tech System and Service (System Integrator of M/S Lenox USA)	Kolkata	A		1.M/S Lenox USA Make System 2.Pl refer Note-07	
		III			Durag India Instrumentation Pvt Ltd	Bengaluru	A		1.Complete Camera Assembly, IRIS Control etc. from Durag Germany 2.Other Component like chiller, vedio monitor, OFC ,Panel from M/S Durag Approved sources	
		III			TLT Engg Pvt. Ltd. (System Integrator of M/S Diamond Power USA/ Sweden make system)	Kolkata	A		1.M/S Diamond Power USA/ Sweden make system 2.Pl refre Note-07	
		III			Toshniwal Industries (System Integrator of M/S Mirion UK make system)	Ajmer	A		1. M/S Mirion UK make system 2.Pl refer Note-07	
		III			Diamond Power	USA / Sweden	A			
		III			Durag GmbH	Germany	A		D-VTA-201	
		III			Lenox	USA	A			
		III			Mirion	UK	A			
		III			Piper GmbH	Germany	A			

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		III			Sabota GmbH	Germany	A			
25	H2 Gas Analyser									
		I			ABB India Ltd	Bengaluru	A		M/s ABB Germany /UK Make analyser	
		I			Adage Automation Pvt. ltd	Goa	A		1.M/s Siemens, Garmany (Calomat 6) Make analyser 2. Pl refer Note-07	
		I			Yokogawa India ltd	Bengaluru	A		M/s Yokogawa Japan (Gas Densitybased) Make analyser	
		I			SIEMENS	Gurugram	A		M/s Siemens, Garmany (Calomat 6) Make analyser	
		III			GE Sensing EMEA	Ireland	A		Conductivity based	
		III			ABB	UK	A			
		III			Emerson (Rosemount)	USA	A			
		III			Environment One Corporation	USA	A		Conductivity based	
26	HEA ignitor									
		I			Durag India Instrumentation Pvt Ltd	Bengaluru	A		M/S Durag Germany make HEA Ignitor	
		I			Hindustan Thermometers	Ambala	A		Condtional as per approval ref no 01/CQA/0270-102 dated 17.09.2012.Spark tip of their own make is also acceptable	
		I			Fives combustion System Pvt Ltd	Vadodara	A			
		I			Boiler control Pvt Ltd	Puddukottai (Tamilnadu)	A		Approved for Aux Boiler package only	
		III			Unison Industries	USA	A			
		III			Durag GmbH	Germany	A			
		III			Ignition system INC	USA	A			
		III			Tesi SPA	Italy	A			
27	High Temp. cable (PTFE/FEP)									
		II			Thermocables	Hyderabad	A			
		II			Tempsens	Udaipur	A			
		II			Habia cables	Sweden	A			
		II			Thermo Electrica BV	Netherland	A			
		II			Lapp cables	Germany	A			
		II			Kerpen cables	Germany	A			
		II			TEW & C	USA	A			
28	Impulse Pipes/Tubes									
		II			Mahrashtra Seamless	Raigarh	A		For CS Pipes only	
		II			Ratnamani Metals and Tubes	Gandhinagar	A		For SS only.	
		II			Heavy Metals and Tubes	Gandhinagar	A		For SS & CS only.	
		II			ISMT	Ahamadnagar	A		For CS/ AS upto Gr 22 Pipes only	
		II			Nippon Steel & Sumitomo Metals corporation	Japan	A			

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		II			TPS Tecnitube	Germany	A			
		II			Veluric & Manessmann	Germany	A			
		II			Trouvay and Cauvin	France	A			
		II			Sandvik	Sweden	A		For SS only	
		II			REMI Edelstahl Tubulars Ltd	Palghar	A			
29	Instrument Cables (F,G & T/C Cables)									
		Note-2			Goyolene Fibers (India) Pvt Ltd	Silvassa	A		F&G Type Cable	
		Note-2			Temsens Instruments Ind Pvt Ltd	Udaipur	A			
		Note-2			Havells India	Alwar	A		F Type Cable	
		Note-2			Paramount Communication Ltd	Khuskhera	A			
		Note-2			Polycab	Daman	A			
		Note-2			Delton	Faridabad	A			
		Note-2			KEI	Bhiwadi (Raj)	A			
		Note-2			Elkey Telelinks	Faridabad	A			
		Note-2			CORDS	Kaharani	A			
		Note-2			CORDS	Bhiwadi	A			
		Note-2			Nicco	Kolkata	A			
		Note-2			Universal Cable	Satna	A			
		Note-2			Thermocables	Hyderabad /Mahboobnagar	A			
		Note-2			Gupta Power Inftrastructure Ltd.	Khurdha	A			
		Note-2			CMI	Faridabad	A			
		Note-2			Advance Cables Pvt Ltd	Bengaluru	A		F&G Type Cable	
		Note-2			Gemscab Industries Ltd	Bhiwadi (Raj)	A		F&G Type Cable	
		Note-2			Apar Industries Limited	Valsad	A		F&G Type Cable	
		Note-2			Suyog Electricals Ltd	Halol (Gujrat)	A			
		Note-2			Special Cables Pvt Ltd	Rudrapur	A			
		Note-2			T C Communication	Ghaziabad	A			
		Note-2			TEW & C	USA	A			
		Note-2			Habia cables	Sweden	A			
		Note-2			Kerpen cables	Germany	A			
		Note-2			Lapp cables	Germany	A			
		Note-2			Thermo elecrta Bv	Netherland	A			
30	Intelligent Battery charger 24V DC / DCDB/BHMS									
		II			Chabbi Electricals	Jalgaon	A		Rectifier module, Controller module and Battery Health monitoring system shall be of M/s Vertiv make	
		II			Eltek SGS Pvt Ltd	Gurugram	A			
		II			Vertiv Energy Pvt ltd	Pune	A			
31	Large Video Screen (LED Based)									
		I			Pyrotech Electronics Pvt Ltd	Udaipur	A			
		I			Delta India Electronics Pvt Ltd	Gurugram	A			

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		I			Barco Electronics system (P) Ltd	Noida	A			
		I			Planner System Inc	USA	A			
32	Level switch- Conductivity type									
		II			Raman Instruments (System integrator of Delta Morbey/ Emerson Mobrey /Solartron -Mobrey)	Delhi	A		1.M/S Emerson (Morbey) UK system 2.Pl refer Note-07	
		II			HI Tech System & services Ltd (System Integrator of Levelstate systems Ltd ,UK)	Kolkata	A		1. M/S Levekstate UK System .Vessel from M/s Hi Tech 2.Pl refer Note-07	
		II			BHEL	Trichurapalli	A			
		III			Emerson -Mobrey (Solartron mobrey)	UK	A			
		III			Levelstate Systems Ltd	UK	A			
		III			Yarway	USA	A			
33	Local Instrument Enclosure/Rack									
		I			Pyrotech Electronics Pvt. Ltd	Udaipur	A		BOI from LOA approved sources	
		I			Sajas electrical	Trichurapalli (Tamilnadu)	A		BOI from LOA approved sources	
		I			Prammen	Puddukottai (Tamilnadu)	A		BOI from LOA approved sources	
		I			Chemin C&I Pvt Limited	Puducherry	A		1- BOI from LOA approved sources 2.Fabrication at M/s LUFT tech India 3- Painting at M/s Supreame Coater & Fabricator	
34	Master Slave Clock System									
		I			Signals and Systems Pvt. Ltd. (SANDS)	Chennai	A			
		I			Masibus	Gandhinagar	A			
		I			Sertel Electronics Pvt. Ltd.	Chennai	A			
		II			Hopf Electronik GmbH	Germany	A			
		II			Hathway	USA	A			
		II			Mein Berg	Germany	A			
		II			Moser Baer AG	Switzerland	A			
35	Mercury Analyser									

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		I			Analyser Instrument Co. Pvt Ltd (AIC)	Kota	A		1. Mercury Analyzer from PS Analytical UK 2.System integration & supply of components like, Enclosure with AC, calibration cylinders, PC will be done by M/s Analyser Instrument Co. Pvt Ltd (AIC) Kota . 3.Pl refer Note-07	
		III			Environment SA India Pvt Ltd	Navi Mumbai	A		1-Mercury analyzer with accessories will be from Mercury instruments GmbH Germany . 2- Other components like, sample line between probe to mercury analyzer will be supplied by M/s Environment SA India Pvt Ltd .	
		III			Thermo Fisher Scientific India Pvt Ltd	Pune	A		1. Mercury Analyser shall be from Thermofisher USA 2. Other approval conditions are as per approved letter ref no 01/CQA/9578-001/Thermofisher dated 09/12/2016	
		III			Durag India Instrumentation Pvt Ltd	Bengaluru	A		Analyser from M/s Verewa Umwelt Germany	
		III			Mercury Instruments GmbH	Germany	A			
		III			SICK AG	Germany	A			
		III			Themofisher	USA	A			
		III			Lumax	Russia	A		For AAQMS System	
36	PA System (IP Based)									
		III			BNA Technology Consulting Ltd.	Bengaluru	A		BOI shall be from LOA approved sources.	
		III			Armtel	Russia	A			
		III			Zenitel	Norway	A		1.PA system active component , Proprietary item will be Zenitel Norway make 2.Other components & BOI shall be from LOA approved sources	
		III			Commend International GMBH	Austria	A			
36A	PA System (IP Based)/System Integrators								note-7	
		III			Willstrong Solutions Pvt. Ltd	Greater Noida	A		For M/s Armtel Russia system Approval conditions as per applval letter no Patratu-QA/9585-001-102/VA-Willstrong Dated: 21.12.20	
		III			Toshniwal Industries Pvt ltd	Ajmer	A		For M/s Commend Austria make system	
		III			Aishan Technologies Pvt Ltd	Bengaluru	A		For M/s Zenitel Norway make system	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		III			Haritasa Checkmate Electronics Pvt Ltd	Bengaluru	A		For M/s Commend Austria make system	
		III			Netware Computer Pvt Ltd	New Delhi	A		For M/s Commend Austria make system	
37	PLC System									
		I			Emerson Automation solution Intellegent plateforms Pvt Ltd	Bengaluru	A		PLC modules from M/s Emerson USA & BOI shall be from LOA approved sources	
		I			ABB India Ltd	Bengaluru	A			
		I			Schneider Electric system india Pvt Ltd	Chennai	A		PLC modules from M/s Schneider France & BOI shall be from LOA approved sources	
		I			Rockwell	Sahibabad	A			
		I			Siemens	Nasik	A			
		I			Honeywell	Pune	A		PLC modules from M/s Honeywell ,S.Korea & BOI shall be from LOA approved sources	
		I			Schneider Electric India Pvt Ltd	Bengaluru	A		PLC modules from M/s Schneider France & BOI shall be from LOA approved sources	
37-A	PLC System Integrators								Note-11 and note-7	
		I			Ladder Automation Solution Pvt Ltd	Gurugram	A		For M/s Honeywell make system	
		I			Virtual Automation	Ranga Reddy (Telangana)	A		For M/s Schneider make system	
		I			Cotmac Electronics Pvt Ltd	Pune	A		For M/s SIEMENS make system	
		I			Tech-Masters	Hyderabad	A		For M/s Emerson make system	
		I			Powertech Switchgear (I) Pvt Ltd	Sonepat	A		For M/s Schneider make system	
		I			Unity Industrial Automation Pvt Ltd	Delhi	A		For M/s Rockwell make system	
		I			EMCONS	Ranchi	A		For M/s Rockwell make system	
		I			Divya Engineers	Chennai	A		For M/s SIEMENS make system	
		I			M D Industries	Vadodara	A		For M/s Emerson make system	
		I			Velox automation	Surat	A		For M/s SIEMENS make system	
		I			Vision Comptel	Kolkata	A		For M/s Emerson make system	
		I			Adaptive Engineering Private Limited	Ahmedabad	A		For M/s Schneider make system	

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		I			Greenwave Solutions Private Limited	Kolkata	A		For M/s Rockwell make system	
		I			Dreamz Automation	Ghaziabad	A		For M/s SIEMENS make system	
		I			Creative Robotics	Ghaziabad	A		For M/s Honeywell make system	
		I			Kruti Techno Engineer Pvt Ltd	Chhapraula (GB Nagar	A		For M/s SIEMENS make system	
		I			EDS Instruments & Systems Pvt Ltd	Chennai	A		For M/s Honeywell make system	
		I			Delsys Automation Technologies Pvt Ltd	Chennai	A		For M/s Emerson make system	
		I			Hindustan Controols and Equipment Ltd	Kolkata	A		For M/s Emerson make system	
		I			Vollkraft Engineering And Consultant (P) Ltd	Kolkata	A		For M/s Emerson make system	
		I			SSM Infotech Solutions Pvt Ltd	Surat	A		For M/s Schneider make system	
		I			Sun Industrial Automation & Solutions	CHENNAI	A		For M/s Schneider make system	
		I			ARTEE FLOW CONTROL PVT LTD	ANKLESHWAR	A		For M/s Honeywell make system	
		I			CSS AUTOMATION PVT. LTD	KOLKATA	A		For M/s Emerson make system	
		I			ARMAX AUTOMATION PVT LTD	BANGALORE	A		For M/s ABB make system	
		I			KAIZEN AUTOMATION	AHEMDABAD	A		For M/s Schneider make system	
		I			ELECON PERIPHERALS LIMITED	ANAND	A		For M/s ABB make system	
38	Pneumatic Actuator Regulating (Power Cylinder HAD,CAD SADC & Burner Tilt)									
		I			Instrumentation Limited	Palakkad (Kerala)	A			
		I			Kelton	Cochin (Alleppy)	A			
		I			SMC Corporation India Private Ltd	Noida	A		Up to Bore size 12 inches	
		I			IMI Norgren Herion Pvt ltd	Noida	A			
		I			NELES INDIA PRIVATE LIMITED	DOMBIVLI	A			
		II			Dong Woo Valve Control Co. Ltd	S.Korea	A			
		II			Shin Hwa Engineering Co. Ltd	S.Korea	A			
39	Radar type level transmitter									
		III			Limaco	Russia	A		High Frequency Type	

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		III			Emerson Process Management Ltd	Pawane	A		For M/s Emerson Singapore make	
		III			Endress & Houser	Aurangabad	A			
		III			SIEMENS	Canada	A			
		III			B M Technology	Italy	A		For Non Contact type	
		III			Magnetrol	Belgium	A			
		III			ABB	USA	A		K-Tech Brand	
		III			Endress & Houser	Germany	A			
		III			Saab Rosemeount	Sweden	A			
		III			Emerson Process Management	Singapore	A		Rosemount 3300 series for GW Radar & 5600 Series for Non-Contact type	
		III			Endress & Houser	Germany	A			
		III			Vega Grieshaber KG	Germany	A			
40	Short Term Fire Proof cable									
		III			nVent Solutions limited	UK	A			
		III			Wrexham Mineral	UK	A			
		III			KME	Italy	A			
41	SWAS (Sampling Handling System and Dry Panel)									
		I			Emerson Process Management Ltd	Navi Mumbai	A		Analysers and Other BOI Componets from LOA agreed source	
		I			Forbes Marshall	Pune	A		Analysers and Other BOI Componets from LOA agreed source	
		I			SEPL	Pune	A		Analysers and Other BOI Componets from LOA agreed source	
		I			YOKOGAWA INDIA LTD	Bangalore	A		Analysers and Other BOI Componets from LOA agreed source	
42	Water Analyser (Chloride, Conductivity, Dissolved Oxygen,pH, Hydrazine, Concentration , Phosphate, Silica, Soldium,Turbidity, Total Iron, Degassed Cation Conductivity)									
		III			Emerson Process Management Pvt Ltd	Pawane	A		For Conductivity,pH, Dissloved Oxygen, Turbidity	
		III			Mettlet Toledo India Pvt Ltd	Vasai	A		For pH Analyser (1. PH analyser from M/S Mettler Toledo GmbH Switzerland 2. Other components like, Housing, Panel mounting kit, Tubing's & easy clean mechanism will be supplied by M/s Mettler Toledo India Pvt Ltd)	

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		III			Endress Hauser India Pvt. Limited	Mumbai	A		For pH Analyser (1. pH sensor with cable , analyser ,retract & cleaning assembly , electrolyte reservoir (As applicable) will be supplied from Principals of M/S Endress Hauser India Pvt. Limited. 2. Other components like, Flow through assembly shall be supplied from M/S Endress Hauser India Pvt. Limited approved sources.)	
		III			Thermo Fisher Scientific	USA	A		For Chloride,Dissloved Oxygen,Hydrazine	
		III			ABB	UK	A		For Chloride,Dissloved Oxygen,Hydrazine, Phosphate, Silica,Sodium,Turbidity For 4 wire Conductivity, pH	
		III			Hach	USA	A		For Conductivity, pH,Concentration, Phosphate, Silica,Turbidity	
		III			ABB	USA	A		For 2 wire Conductivity, pH	
		III			Yokogawa	Japan	A		For Conductivity	
		III			Hach	Switzerland	A		For Dissloved oxygen, Hydrazine, Silica,Sodium	
		III			Yokogawa	Japan	A		For pH	
		III			Eutech Instrument PTE Ltd	Singapore	A		For Silica	
		III			Orion	USA	A		For Sodium	
43	Temp Transmitter									
43-A	Temp Transmitter									
		III			Endress & Houser	Aurangabad	A			
		III			Emerson Process Management Ltd	Pawane	A		For M/s Emerson Singapore make	
		III			Yokogawa	Bengaluru	A		Make Yokogawa japan and caliberation at Yokogawa Banglore	
		III			ABB	Bengaluru	A		For M/s ABB Germany make	
		III			WIKA Instruments India Pvt Ltd	Pune	A		For M/s WIKA Germany make Model no T-32	
		III			Honeywell Automation India Ltd	Pune	A			
		III			Yokogawa	Japan	A			
		III			Moore	USA	A			
		III			M System co Ltd	Japan	A		Model No-B3HU-0	
		III			Emerson	U.S.A/Singapore/ Germany	A			
		III			ABB	Germany	A			
		III			Emerson Process Management	Germany	A			
43-B	Temp Transmitter -Field Bus based Single/Dual Input									

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		I			ABB India Ltd	Bengaluru	A		One no of TT will be available at DCS supplier for function testing of field bus communication with DCS during FAT	
44	Ultrasonic Type Flow Meter (for Stack)									
		III			Sick India Pvt ltd	Mumbai	A		For Sick AG Germany make	
		III			Sick AG	Germany	A			
		III			Durag	Germany	A			
		III			Teledyne	USA	A			
45	Ultrasonic type level Transmitter									
		III			EIP Enviro	Noida	A		1-Ultrasonic level Tx shall be BM Technology Italy make 2-Required mounting arrangement , Testing, Calibration shall be carried out at M/s EIP Works.	
		III			E & H	Aurangabad	A			
		III			Emerson Process Management Ltd	Pawane	A		Complete Intrument Transmitter & Probe to be procured from Mobrey UK , only intergration & configuration at Pawane works	
		III			BM Technology	Italy	A			
		III			Siemens Miltronics	Canada	A			
		III			Nivelco Process Control	Hungary	A			
		III			E & H	Germany	A			
		III			HAWK Measurement PTY Ltd	Australia	A			
46	UPS With ACDB									
		Note-5			Vertive Energy Pvt Ltd	Pune	A		Upto 125 KVA for 1 phase and 300 KVA for 3 Phase	
		Note-5			Vertive Energy Pvt Ltd	Mumbai	A		Upto 160 KVA	
		Note-5			Hitachi Hirel Power Electronics Pvt Ltd	Gandhinagar	A		Upto 200 KVA,	
		Note-5			Fuji Electric Consul Neowatt Private Limited	Pune	A		Up to 100 KVA single phase	
		Note-5			KELTRON	Trivendrum	A			
		Note-5			Merlin & Gerin	France	A			
		Note-5			Gutor	Switzerland	A			
		Note-5			AEG	Germany	A			
		Note-5			Fuji Electric	Japan	A			
47	Vibration Monitoring System									
		II			Sensonics Technology India	Kundli	A		For Sensonic UK system	

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		II			BHEL	Bengaluru	A		1. Imported items like Vibration Monitors, Cross Connection Cables, Buffered Output Modules, and Piezoelectric Vibration Sensors, Eddy Current type Proximity Probe, Extension Cable and Signal Conditioner will be procured from Valmet Automation, Finland. 2.Indigenous items like Communication cables, networking components, blank panels, TB, OWS will be procured from NTPC approved sources.	
		II			IRD Mechanlysis Ltd	Thane	A		Vibration sensors will be sourced from M/s Hansford UK ,however brand name of IRD and its logo is acceptable with suitable tracebility of M/s Hansford ,UK.	
		II			Forbes Marshall Pvt Limited	Pune	A		VMS hardware , Sensors ,extention cables shall be shinkawa Japan make .2. All other BOI shall be from LOA agreed sources	
		II			GE	Pune	A		For GE Bentley , USA Make	
		II			Rockwell Automation	Sahibabad	A		For Rockwell USA make	
		II			SKF	Pune	A		For SKF USA make	
		II			Imageneous Engineering Pvt Ltd	Vadodara	A		1-For Meggitt Switzerland make 2- Refer note 7	
		II			Shinkawa	Japan	A			
		II			GE	USA	A		Bentley Niveda brand	
		II			Meggitt	Switzerland	A			
		II			Sensonic Limited	UK	A			
48	Wireless Solution (Microwave Tower Communication)									
		I			L&T Technology Services (LTTS)	Bengaluru	A		1- Wireless Product (Access Point, Antenna) shall be M/s Cambium UK Make 2- Other Item like Switch, Cat-6 Cable can be supplied from M/s LTTS approved sources meeting technical requirements.	
		I			Lotus wireless technologies India Pvt Ltd	Visakhapatnam	A			
		I			Sheetal Wireless Technologies Pvt Ltd	Pune	A			
		III			Proxim Wireless Corporation	USA	A		BOI shall be as per approval letter	
49	Field Bus Cable/ Profibus Cable- PA & DP type									

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
		I			LAPP India Pvt Ltd	Bangalore	A			
50	Field bus components (Field bus modules ,segment protector ,surge protector & SS JB)									
		III			Phoenix Contact Inc	USA	A		Materiall will be allowed to dispatch from the vendor works as CAT-III item ,however all material except SS junction box will be available at DDCMIS supplier works for functional testing .	
		III			Pepperl + Fuchs Pte Ltd	Singapore	A		Materiall will be allowed to dispatch from the vendor works as CAT-III item ,however all material will be available at DDCMIS supplier works for functional testing .	
51	Stockyard Management System(Including 3D profiling scanner ,Thermal Imaging Camera, RTK GPS)									
		III			TSA	Brazil	A		For 3D profiling / Tripple-IN Germany make	
		I			EIP Enviro	Noida	A		For 3D profiling / 1-Tripple-IN Germany make Laser Scanner and RPU along with software from TSA Brazil inline with the M/s TSA Letter. 2- Other item like ethernet cable, Ethernet Switch, Junction Box required for execution of 3D stockpile managemment system can be supplied by EIP Enviro	
52	Perimeter Intrusion Detection System									
		III			Senstar	Canada	A			
53	Radar based Perimeter Surveillance System									
		III			Magos System Ltd	Israel	A		Third Party “Cyber Penetration report “ shall be provided along with material TC/COC	
54	Thermal Camera (PTZ)									
		III			FLIR Commercial Systems INC	USA	A			
	Main Contractor approved sources (Note-12)									
MC-1	Amonia Analyser	III			Main Contractor Approved Sources					
MC-2	Amonia leak detector	III			Main Contractor Approved Sources					
MC-3	Air Filter Regulator	III			Main Contractor Approved Sources					
MC-4	Anemometer	III			Main Contractor Approved Sources					
MC-5	Annunciator	III			Main Contractor Approved Sources					
MC-6	Battery Health Monitoring System	III			Main Contractor Approved Sources					

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
MC-7	Biofouling/ Deposit Monitor	III			Main Contractor Approved Sources					
MC-8	Coal bunker Level monitor	III			Main Contractor Approved Sources					
MC-9	Compression Fittings(SS)	III			Main Contractor Approved Sources					
MC-10	Condensing Pots	III			Main Contractor Approved Sources					
MC-11	Conduits /Pipe (GI)	III			Main Contractor Approved Sources					
MC-12	Conduits lead coated (Flexible)	III			Main Contractor Approved Sources					
MC-13	Copper tubing/Brass connectors	III			Main Contractor Approved Sources					
MC-14	Coriolios Type Mass Flow meter	III			Main Contractor Approved Sources					
MC-15	Coupling /Interposing Relays	III			Main Contractor Approved Sources					
MC-16	Density Indicator	III			Main Contractor Approved Sources					
MC-17	Desk for OWS/EWS/Printer/Server	III			Main Contractor Approved Sources					
MC-18	Digital Indicators	III			Main Contractor Approved Sources					
MC-19	Dust Sensor	III			Main Contractor Approved Sources					
MC-20	Dew point sensor/meter (H2)	III			Main Contractor Approved Sources					
MC-21	Flow Gauge	III			Main Contractor Approved Sources					
MC-22	Flow Indicator cum Totaliser	III			Main Contractor Approved Sources					
MC-23	Flow Switch	III			Main Contractor Approved Sources					
MC-24	FRP Junction Box	III			Main Contractor Approved Sources					
MC-25	Furniture for control Room(Chair, Almira, Lock)	III			Main Contractor Approved Sources					
MC-26	Furnace exit gas temp probe	III			Main Contractor Approved Sources					
MC-27	Graphic Interface Unit	III			Main Contractor Approved Sources					
MC-28	Hand Held Calibrator	III			Main Contractor Approved Sources					
MC-29	Hart Management System	III			Main Contractor Approved Sources					
MC-30	Humidistat / Thermostat / Gyserstat / Airstat	III			Main Contractor Approved Sources					
MC-31	Instant Corrosion Rate Monitor & Portable Corrosion Meter	III			Main Contractor Approved Sources					
MC-32	Impact head type flow element	III			Main Contractor Approved Sources					
MC-33	Instrument Tube Fittings (Air)	III			Main Contractor Approved Sources					
MC-34	Instrument Valve	III			Main Contractor Approved Sources					
MC-35	IR Detector	III			Main Contractor Approved Sources					
MC-36	KVM Switch/Matrix KVM Switch	III			Main Contractor Approved Sources					
MC-37	Level gauge (Transperent & Reflex, Tubular type)	III			Main Contractor Approved Sources					
MC-38	Level Indicator (Float & Board type)	III			Main Contractor Approved Sources					
MC-39	Level switch - Float/Displacer Type	III			Main Contractor Approved Sources					
MC-40	Level Switch (RF Type)	III			Main Contractor Approved Sources					
MC-41	Level switch capacitance type	III			Main Contractor Approved Sources					
MC-42	Limit Switch	III			Main Contractor Approved Sources					
MC-43	Maintenance and Calibration Equpiment	III			Main Contractor Approved Sources					
MC-44	Mini UPS-Type C configuration	III			Main Contractor Approved Sources					
MC-45	Orifice plate assembly	III			Main Contractor Approved Sources					
MC-46	On line carbon in Ash analyser	III			Main Contractor Approved Sources					
MC-47	Pitot Tube	III			Main Contractor Approved Sources					

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
MC-48	Pr./Vaccum./DP Gauges	III			Main Contractor Approved Sources					
MC-49	Press, DP, Vaccum Switch	III			Main Contractor Approved Sources					
MC-50	Printer (Dot Matrix/Inkjet / Laser)	III			Main Contractor Approved Sources					
MC-51	Psycrometer	III			Main Contractor Approved Sources					
MC-52	Pulse jet Controller	III			Main Contractor Approved Sources					
MC-53	Pulse Valve	III			Main Contractor Approved Sources					
MC-54	Residual Chlorine Analyser	III			Main Contractor Approved Sources					
MC-55	Rotameter	III			Main Contractor Approved Sources					
MC-56	Reverse Rotation Indicator	III			Main Contractor Approved Sources					
MC-57	Synchronising Relay	III			Main Contractor Approved Sources					
MC-58	Synchroscope	III			Main Contractor Approved Sources					
MC-59	Semaphore Indicators	III			Main Contractor Approved Sources					
MC-60	Sight Flow Indicator	III			Main Contractor Approved Sources					
MC-61	Smart Positioner	III			Main Contractor Approved Sources					
MC-62	Socket Weld Fittings	III			Main Contractor Approved Sources					
MC-63	Solenoid Valve	III			Main Contractor Approved Sources					
MC-64	Solid Mass Flow Meter	III			Main Contractor Approved Sources					
MC-65	Terminal Block (Cage and Clamp type)	III			Main Contractor Approved Sources					
MC-66	Temperature cum Humidity Indicator	III			Main Contractor Approved Sources					
MC-67	Temperature Element(Thermocouple , RTD & Thermowell)	III			Main Contractor Approved Sources					
MC-68	Temperature Gauge(With Thermowell)	III			Main Contractor Approved Sources					
MC-69	Temperature Switch	III			Main Contractor Approved Sources					
MC-70	Transducer	III			Main Contractor Approved Sources					
MC-71	Tube thicknes Meter	III			Main Contractor Approved Sources					
MC-72	Voltmeter/ Watterhour Meter	III			Main Contractor Approved Sources					
MC-73	Valve manifolds	III			Main Contractor Approved Sources					
MC-74	Electric to Pneumatic Converter	III			Main Contractor Approved Sources					
MC-75	Network components	III			Main Contractor Approved Sources					
MC-76	Isolator	III			Main Contractor Approved Sources					
MC-77	ORP Monitor /Analyser	III			Main Contractor Approved Sources					
MC-78	Ultrasonic Type Flow Transmitter	III			Main Contractor Approved Sources					
MC-79	Chlorine Leak detector	III			Main Contractor Approved Sources					
MC-80	Density Meter	III			Main Contractor Approved Sources					
MC-81	Electro Magenetic Flow meter	III			Main Contractor Approved Sources					
MC-82	Postive dispalcement Type Flow Meter	III			Main Contractor Approved Sources					
MC-83	Level Scanner (3 D)for Solid Application	III			Main Contractor Approved Sources					
MC-84	Mosaic tiles /Console items	III			Main Contractor Approved Sources					
MC-85	Electrical Control Panel (UCP/Backup)	III			Main Contractor Approved Sources					
MC-86	Electrical Indicating Instruments (Mosaic Compatible)	III			Main Contractor Approved Sources					
MC-87	OWS/EWS/Server	III			Main Contractor Approved Sources					
MC-88	Bio Matrix Reader	III			Main Contractor Approved Sources					

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
MC-89	ANPR	III			Main Contractor Approved Sources					
MC-90	UVSS	III			Main Contractor Approved Sources					
MC-91	Comd & Control System	III			Main Contractor Approved Sources					
MC-92	Access & Controller Software	III			Main Contractor Approved Sources					
MC-93	IR LED based Illuminator	III			Main Contractor Approved Sources					
MC-94	ATB Bolloard	III			Main Contractor Approved Sources					
MC-95	Boom Barrier	III			Main Contractor Approved Sources					
MC-96	Touchless biomatric recorder	III			Main Contractor Approved Sources					
MC-97	GPS Sensor based Vehicle Monitoring system	III			Main Contractor Approved Sources					
MC-98	10mp digital camera with tripod for photo capture	III			Main Contractor Approved Sources					
MC-99	2D GIS map application	III			Main Contractor Approved Sources					
MC-100	Audible alarm device	III			Main Contractor Approved Sources					
MC-101	CameraPoles	III			Main Contractor Approved Sources					
MC-102	Card Reader	III			Main Contractor Approved Sources					
MC-103	Door Frame Metal Detector -DFMD	III			Main Contractor Approved Sources					
MC-104	Door sensor	III			Main Contractor Approved Sources					
MC-105	Egress Switch	III			Main Contractor Approved Sources					
MC-106	EM LOCK	III			Main Contractor Approved Sources					
MC-107	Emergency exit / door override switch	III			Main Contractor Approved Sources					
MC-108	Emergency Siren /Hooter	III			Main Contractor Approved Sources					
MC-109	Flap barrier	III			Main Contractor Approved Sources					
MC-110	Flash Lights for covering perimeter area for clear view from PTZ in night time	III			Main Contractor Approved Sources					
MC-111	Geo fencing	III			Main Contractor Approved Sources					
MC-112	Glass Break switch at Emergency Exit	III			Main Contractor Approved Sources					
MC-113	Guard tour	III			Main Contractor Approved Sources					
MC-114	Half Height Turnstile	III			Main Contractor Approved Sources					
MC-115	Handheld Walkie - Talkie	III			Main Contractor Approved Sources					
MC-116	HHMD	III			Main Contractor Approved Sources					
MC-117	Long Range RFID Reader	III			Main Contractor Approved Sources					
MC-118	Monitors 24 Inch Full HD	III			Main Contractor Approved Sources					
MC-119	Network Panel	III			Main Contractor Approved Sources					
MC-120	Optical Time Domain Reflector-meter (OTDR) with all accessories	III			Main Contractor Approved Sources					
MC-121	Panic Button with Audible Alarm	III			Main Contractor Approved Sources					
MC-122	Panic button/SOS button supportin SIP protocol	III			Main Contractor Approved Sources					
MC-123	RFID based Stickers	III			Main Contractor Approved Sources					
MC-124	Sliding Gate	III			Main Contractor Approved Sources					
MC-125	SMS gateway	III			Main Contractor Approved Sources					
MC-126	Storage Device (SAN/NAS/DAS) of 100 TB each	III			Main Contractor Approved Sources					

एनटीपीसी NTPC	Project/ परियोजना : RAGHUNATHPUR TPS PHASE-II(2X660MW) Package/ पैकेज: EPC PACKAGES (EXCLUDING STG PKG.) Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध स.:	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 25.05.2023 SUB-SYSTEM उप-प्रणाली: QA-C&I

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी(Note-1)	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause
MC-127	Traffic Light	III			Main Contractor Approved Sources					
MC-128	Turnstile - half height	III			Main Contractor Approved Sources					
MC-129	SPIKE BARRIER	III			Main Contractor Approved Sources					
MC-130	CHAIN LINK FENCE	III			Main Contractor Approved Sources					
MC-131	X-ray Baggage Scanner	III			Main Contractor Approved Sources					
MC-132	Static Radio Set	III			Main Contractor Approved Sources					
MC-133	EPABX equipments	III			Main Contractor Approved Sources					

LEGENDS :

1.0 SYSTEM SUPPLIER / SUB SUPPLIER APPROVAL STATUS CATEGORY

A - For those items proposed vendor is acceptable to Customer. To be indicated with letter "A" in the list alognwith the condition of approval, if any.

2.0 QP INSPECTION CATEGORY :

CAT - I : For those items the Quality Plans are approved by Customer and final acceptance will be on physical inspection witness by Customer

CAT - II : For those items the Quality Plans are approved by Customer. However no physical inspection shall be done by Customer. The final acceptance by Customer shall be on the basis of review of documents.

CAT - III :For these items Quality control to be exercised as per Main contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of Conformance (COC) by Main Contractor.

UNITS/WORKS : Place of manufacturing- Place of main supplier of multi units/works.

NOTE-1 : A: Vendors to submit project specific documents as per Sub-QR requirements in case the Vendor is approved under collaboration agreement.
B: In case approved sub vendor is offering product with latest model/series apart from earlier approved, vendors to submit project specific documents as per Sub-QR requirements.

NOTE-2 : For Insrument cable <= 1 KM inspection category CAT - III, For > 1 KM to <= 10 KM Inspecton category CAT - II COC & FOR> 10 KM Inspection category CAT-I

NOTE-3 : For Fiber Optic cable <=10KM inspection category CAT - III & for > 10KM Inspection category CAT-II

NOTE-4 : Batteries for UPS <= 10 KVA and batteries for intelligent battery charger 24 V DC <= 40 Amp inspection category CAT-III & for Batteries for UPS> 10KVA and batteries for intelligent battery charger 24 V DC > 40 Amp rating inspection category CAT-I

NOTE-5 : UPS <= 10 KVA rating inspection category CAT-III & for > 10KVA rating inspection category CAT-I

NOTE-7 : Empty cabinets, Computers, Signal isolator/multiplier and TB shall also be acceptable from owner accepted in QP. If the total integrated panel and fat is conducted indigenously.

NOTE-8 : For the C & I instrumnts mounted on the skid of the main item or supplied as a integral part of the main item, instrument to be supplied as per proven practice of the manufacturer meeting the Customer technical specification requirement.

NOTE-9 : This item is a bought out componenet of main equipments like DDCMIS ,PLC,TSI,CCTV ,PA system etc

NOTE-10 : For these controlled items, vendor shall be proposed for owner accpetance with-in the agreed contract schedule of the package

NOTE-11 : Major Bought-Out-Items are to be procured from LOA approved sources & the same shall be finalized during the finalization of Manufacturing Quality Plan . MQP shall be duly vetted by OEM with their project specific authorisation letter .

NOTE-12 : Main contractor apporved sub vendors are acceptable those are evaluated / assesesed as per Main contractor Quality Management System for vendor approval. Main contractor to inform the finaly selected vendor to NTPC as soon as PO is placed for these items. In case of sub-QR Note-1 is also applicable.

	PROJECT: RAGHUNATHPURI THERMAL POWER PROJECT PHASE-II (2X660 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL		DOC NO		
	PACKAGE: EPC PACKAGE (EXCLUSING STG PKG)			REV. NO.		
	Main supplier:	SUB SYSTEM: CIVIL WORKS		DATE	11.04.2023	
	Contract No.:					

SL. NO.	ITEM	QAP / INSP. CAT	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
1.	GALVANIZED STEEL STRUCTURES (LATTICE & PIPE) FOR SWITCHYARD AND TRANSMISION LINE	I	VIJAY TRANSMISSION LTD	RAIPUR	A	
			UNITECH POWER TRANSMISSION LTD	NAGPUR	A	
			ASSOCIATED POWER STRUCTURES	VADODARA	A	
			R.S. INFRAPROJECTS PVT. LTD	SURAJPUR	A	
			NEW MODERN TECHNOMECH	MAYURBHANJ (ORRISA)	A	
			GOOD LUCK STEEL TUBES	SIKANDRABAD	A	
			UNIQUE STRUCTURES & TOWERS LTD.	RAIPUR	A	
			VATCO ELEC-POWER PVT. LTD.	NAVIMUMBAI	A	GALVANISING AT SIGMA GALVANISER NAVI MUMBAI
			R.S. INFRAPROJECTS PVT. LTD	SIKANDRABAD	A	
			ADVANCE STEEL TUBE	SAHIBABAD	A	
			SANGAM STRUCTURES LTD.	ALLAHABAD	A	
			RELIABLE SPONGE PVT LTD UNIT III	KALUNGA	A	
			VSP ENTERPRISES PVT. LTD	SONEPAT	A	
			SKIPPER LIMITED	UNIT-I: JANGALPUR, Howrah. Unit-II: ULUBERIA UNIT, Howrah. UNIT- III: BCTL, Howrah.	A	Proto type inspection at Unit-Bagnan, Howrah

	PROJECT: RAGHUNATHPURI THERMAL POWER PROJECT PHASE-II (2X660 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL		DOC NO		
	PACKAGE: EPC PACKAGE (EXCLUSING STG PKG)			REV. NO.		
	Main supplier:	SUB SYSTEM: CIVIL WORKS		DATE	11.04.2023	
	Contract No.:					

SL. NO.	ITEM	QAP / INSP. CAT	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
			RUKMANI ELECTRICAL & COMPONENT PVT. LTD	RAIPUR	A	
			RICHARDSON & CRUDDAS (1972) LTD	NAGPUR	A	
2.	COLOUR COATED METAL DECK & CLADDING/ROOFING SHEET (COIL)	I	TATA STEEL LIMITED	RAIGAD	A	
			TATA STEEL BSL LIMITED	SAHIBABAD	A	
			TATA BLUESCOPE STEEL LTD	JAMSHEDPUR	A	AL-ZN COIL FOR CLADDING
			ESSAR STEEL LTD	PUNE	A	
			NATIONAL STEEL & AGRO INDUSTRIES LTD	DHAR	A	
			JSW STEEL COATED PRODUCTS LTD	KALMESHWAR (NAGPUR)	A	
			JSW STEEL LTD	TARAPUR, BOISAR	A	
			BHUSHAN POWER & STEEL LTD	SAMBALPUR (ODISHA)	A	
3.	CHIMNEY ELEVATOR (RACK AND PINION)	I	MEKASTER ENGG. & EQUIPMENT(P) LTD.	HALOL, GUJARAT	A	
			ALIKRAFT ENGINEERS PVT. LTD.	SAVIL (VADODARA)	A	
			AVON CRANES	GURGAON	A	
			UNIVERSAL CONSTRUCTION MACHINARY & EQUIPMENT LTD.	PUNE	A	
4.	ELECTROFORGED GRATING	II	INDIANA GRATINGS PVT. LTD	PUNE	A	
			KANADE ANAND UDYOG	THANE	A	

	PROJECT: RAGHUNATHPURI THERMAL POWER PROJECT PHASE-II (2X660 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL		DOC NO		
	PACKAGE: EPC PACKAGE (EXCLUSING STG PKG)			REV. NO.		
	Main supplier:	SUB SYSTEM: CIVIL WORKS		DATE	11.04.2023	
	Contract No.:					

SL. NO.	ITEM	QAP / INSP. CAT	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
			PREMIER POWER PRODUCTS LTD	HOWRAH	A	
			BHOLA RAM STEEL PVT. LTD	PATNA	A	
			PINAX STEEL INDUSTRIES PVT LTD	PATNA	A	
			GREATWELD STEEL GRATING PVT. LTD	PUNE	A	
			ANKIT ELECTROGRATING	RAIPUR	A	
			SUTTATTI ENTERPRISES LTD.	PUNE	A	
			RATAN PROJECTS & ENGINEERING CO. PVT. LTD.	HOWRAH	A	
			VINFAB ENGINEERS INDIA PVT LTD. (For Galvanising) VINFAB GRATINGS (For Fabrication)	THANE	A	
5.	PROFILERS FOR COLOUR COATED METAL DECK & CLADDING/ROOFING SHEETS	II	MAIN CONTRACTOR APPROVED SOURCE	-	-	
6.	FABRIC EXPANSION COMPENSATOR (FOR CHIMNEY)	II	MAIN CONTRACTOR APPROVED SOURCE	-	-	
7.	MINERAL WOOL FOR THERMAL INSULATION (FOR CHIMNEY)	II	MAIN CONTRACTOR APPROVED SOURCE	-	-	
8.	STOP LOG GATES, TRASH RACK AND LIFTING BEAM	II	MAIN CONTRACTOR APPROVED SOURCE	-	-	
9.	HIGH PERFORMANCE MOISTURE COMPATIBLE CORROSION RESISTANT COATING SYSTEM	III	CECRI LICENSED SOURCES	-	-	
10.	BITUMEN	III	ALL GOVERNMENT REFIINARIES	-	-	

	PROJECT: RAGHUNATHPURI THERMAL POWER PROJECT PHASE-II (2X660 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL		DOC NO		
	PACKAGE: EPC PACKAGE (EXCLUSING STG PKG)			REV. NO.		
	Main supplier:	SUB SYSTEM: CIVIL WORKS		DATE	11.04.2023	
	Contract No.:					

SL. NO.	ITEM	QAP / INSP. CAT	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
11.	PTFE BEARING / ELASTOMERIC BEARING	III	MORTH / RDSO APPROVED VENDORS	-	-	
12.	CEMENT	III	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
13.	CI PIPES	III	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
14.	RCC PIPES	III	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
15.	CPVC/UPVC PIPES	III	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
16.	PVC WATER STOP	III	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
17.	POLYTHENE WATER STORAGE TANKS	III	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
18.	CERAMIC / VITRIFIED TILES	III	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
19.	PARTICLE BOARDS, PLYWOOD, MDF	III	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-	
20.	FIRE PROOF DOORS	III	MAIN CONTRACTOR APPROVED SOURCES WITH VALID PROTOTYPE TEST REPORT FROM CBRI/CPRI/GOV. LAB.)	-	-	
21.	CONSTRUCTION CHEMICALS/ADMIXTURE, WATER PROOFING COMPOUNDS AND GROUTS	III	MAIN CONTRACTOR APPROVED SOURCE	-	-	
22.	PAINT AND PAINTING SYSTEM	III	MAIN CONTRACTOR APPROVED SOURCE	-	-	
23.	HIGH SOLID CONTENT LIQUID APPLIED URETHANE BASED ELASTOMERIC MEMBRANE FOR WATER PROOFING	III	MAIN CONTRACTOR APPROVED SOURCE	-	-	

	PROJECT: RAGHUNATHPURI THERMAL POWER PROJECT PHASE-II (2X660 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL			DOC NO	
	PACKAGE: EPC PACKAGE (EXCLUSING STG PKG)				REV. NO.	
	Main supplier:	SUB SYSTEM: CIVIL WORKS			DATE	11.04.2023
	Contract No.:					

SL. NO.	ITEM	QAP / INSP. CAT	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
24.	FOUNDATION BOLTS	III	MAIN CONTRACTOR APPROVED SOURCE	-	-	

LEGENDS:

1. SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)
A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list along with the condition of approval, if any.
DR – For these items "Details required" for NTPC review. To be identified with letter "DR" in the list.

2. QP/INSPN CATEGORY:
CAT-I: For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.
CAT-II: For these items the Quality Plans approved by NTPC. However, no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved quality plan.
CAT-III: For these items the Quality control to be exercised as per Main Contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of conformance (COC) by Main Contractor.
UNITS/ WORKS: Place of manufacturing Place of Main Supplier of multi units/works.

NOTE 1: For the items placed in CAT-III for Civil Works, the review and final acceptance shall be done by NTPC-EIC/ FQA on the basis of MTC / certificate of conformance in line with Technical Specifications/FQP.

ANNEXURE – III

FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES
(COMMON FOR TG & SG)

PERFORMANCE GUARANTEES

FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES FOR SHORTFALL IN PERFORMANCE AND GUARANTEE TESTS

(The term "Performance Guarantees" wherever appears in this Sub-Section shall have the same meaning and shall be synonymous to "Functional Guarantees". Similarly, the term "Performance Tests" wherever appears in this Sub-Section shall have the same meaning and shall be synonymous to "Guarantee Test(s)". The term "TMCR" (Turbine maximum continuous rating) appearing in the Technical Specification shall mean 660 MW electrical power output at generator terminals (power at generator terminals as per clause indicated in this sub-section) under rated steam parameters, 0% cycle make-up and 77 mm Hg (abs) condenser pressure unless used in conjunction with a different cycle make-up and/or a different condenser pressure.

1.00.00 PERFORMANCE GUARANTEES

1.00.01 General Requirements

a) The bidder shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment covered in these specifications.
b) The guaranteed performance parameters furnished by the Bidder in his offer, shall be without any tolerance values and all margins required for instrument inaccuracies and other uncertainties shall be deemed to have been included in the guaranteed figures.
c) The bidder shall conduct performance test and demonstrate all the guarantees covered herein during functional guarantee / acceptance test. The various tests which are to be carried out during performance guarantee/acceptance test are listed in this Sub-section. The guarantee tests shall be conducted by the bidder at site in presence of Employer on each unit individually.
d) All costs associated with the tests including cost associated with the calibration of instruments shall be in bidder's scope.
e) It is the responsibility of the bidder to perform the Performance Guarantee/Acceptance test as specified in this subsection. The performance tests will be performed using only the normal number of Employer supplied operating staff. Bidder/ vendor or other subcontractor personnel shall only be used for instructional purposes or data collection. At all times during the Performance Tests the emissions and effluents if any as per scope from the Plant shall not exceed the Guaranteed Emission and Effluent Limits.
f) The Bidder shall make their system ready for the performance guarantee tests before start of initial operation.
g) All instruments required for performance testing shall be of the type and accuracy required by the code and prior to the test, the bidder shall get these instruments calibrated in an independent test Institute approved by the Employer. All test instrumentation required for performance tests shall be supplied by the bidder and shall be retained by him upon satisfactory completion of all such tests at site. All costs associated with the supply, calibration, installation and removal of the test instrumentation shall be included in the bid price. All calibration procedures and standards shall be subjected to the approval of the Employer. The protecting tubes, pressure connections and other test connections required for conducting guarantee test shall conform to the relevant codes.
h) Tools and tackles, thermowells (both screwed and welded) instruments/devices including flow devices, matching flanges, impulse piping & valves etc. and any special equipment, required for the successful completion of the tests, shall be provided by the bidder free of cost.
i) The Performance / Acceptance test shall be carried out as per the agreed procedure. The PG test procedure including demonstration tests shall be submitted within 90 days of the date of Notification of Award and finalization of the PG test procedure shall be done within 180 days from the date of Notification of Award. After the conductance of Performance test, the bidder shall submit the test evaluation report of Performance test results to Employer promptly but not later than one months from the date of conductance of Performance test. In case post test calibration takes longer time then modalities for submission of PG test report by the bidder shall be mutually agreed upon during the test. However, test data shall be submitted to the employer after completing each test run.
j) The PG test procedures shall be submitted for equipment/ system & subsystem under bidder's scope for all Guarantees under category I, II & III as per latest International codes / standard meeting the specification requirements. The procedure shall also include correction curves, detailed activity plan of conductance of test and sample calculations.

k) The bidder shall submit for Employer's approval the detailed Performance Test procedure containing the following:
   a) Object of the test.
   b) Various guaranteed parameters & tests as per contract.
   c) Method of conductance of test and test code.
   d) Duration of test, frequency of readings & number of test runs.
   e) Method of calculation.
   f) Correction curves and respective equations for graphs to be fed for the online computation
   g) Instrument list consisting of range, accuracy, least count, and location of instruments along with reference approved P&IDs.
   h) Scheme showing measurement points.
   i) Sample calculation.
   j) Acceptance criteria.
   k) Any other information required for conducting the test.

l) In the event of a test interruption resulting from an event of force majeure or Employer-Caused-Delay, bidder shall be entitled to relief as provided in the contract, provided that, the interrupted performance test must be started again and test data that were collected during the interrupted test must be ignored.

m) In case during performance guarantee tests it is found that the equipment/system has failed to meet the guarantees, the bidder shall carry out all necessary modifications and/or replacements to make the equipment/system comply with the guaranteed requirements at no extra cost to the Employer and re-conduct the performance guarantee test(s) with Employer's consent. However, if the specified performance guarantee(s) are still not met but are achieved within the Acceptable Shortfall Limit specified at clause 1.01.02 of this subsection, Employer will accept the equipment/system/plant after levying liquidated damages as per clause 1.01.02 of this sub-section. If, however, the demonstrated guarantee(s) continue to be more than the stipulated Acceptable Shortfall Limit, even after the above modifications/replacements within ninety (90) days or a reasonable period allowed by the Employer, after the tests have been completed, the Employer will have the right to either of the following:

(i) For Category-I Guarantees

Reject the equipment / system / plant and recover from the bidder payments already made

OR

Accept the equipment /system/ plant after levying Liquidated Damages as specified hereunder. The liquidated damages for shortfall in performance indicated in clause 1.01.02 of this sub-section shall be levied separately for each unit. The rates indicated
in clause 1.01.02 of this sub-section are on per unit basis. The liquidated damages shall be prorated for the fractional parts of deficiencies. The performance guarantees coming under this category are called 'Category-I' Guarantees.

(ii) For Category-II Guarantees

Reject the equipment / system/ plant and recover from the bidder payments already made. The performance guarantees under this category shall be called 'Category-II' Guarantees. Conformance to the performance requirements under Category-II is mandatory.

(iii) For Category-III Guarantees

Reject the equipment /system / plant and recover from the bidder payments already made.

OR

Accept the equipment/system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by the Employer. Such damages shall, however be limited to the cost of replacement of the equipment(s) / system(s), replacement of which shall remove the deficiency so as

to achieve the guaranteed performance. These parameters/capacities shall be termed as Category-III Guarantees.

1.01.00 GUARANTEES UNDER CATEGORY I

NIL

1.02.00 GUARANTEES UNDER CATEGORY II

NIL

1.03.00 GUARANTEES UNDER CATEGORY III

1.03.01 CONDENSATE POLISHING PLANT

1.03.01.01 Following shall be guaranteed by the Bidder in the relevant Guarantee Schedule of the Bid Document and falls under "GUARANTEE UNDER CATEGORY –III":

1.0 Effluent quality at outlet of each vessel at its rated design flow and design service length between two regenerations (as defined elsewhere in this technical specification).

2.0 Pressure drop across the polisher service vessel (as defined elsewhere in this technical specification) in clean and dirty condition of resin at rated design flow.

1.03.01.02 **Noise**

All the CPU plant, equipment (Pumps & blowers etc.) covered under this specification shall perform continuously without exceeding the noise level over the entire range of output and operating frequency as specified in the technical specifications.

Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 651 or BS 5969 or IS 9779.

Sound pressure shall be measured all around the equipment at a distance of 1.0 m horizontally from the nearest surface of any equipment/ machine and at a height of 1.5 m above the floor level in elevation. A minimum of 6 points around each equipment shall be covered for measurement.
Additional measurement points shall be considered based on the applicable standards and the size of the equipment. The measurement shall be done with slow response on the A - weighting scale. The average of A-weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 microbar shall not exceed the guaranteed value. Corrections for background noise shall be considered in line with the applicable standards. All the necessary data for determining these corrections, in line with the applicable standards, shall be collected during the tests.

1.03.02 SEWAGE TREATMENT PLANT

Minimum outlet quality parameters to be demonstrated by bidder have been included below. However, in case the guaranteed parameters as per the latest MOEF, State pollution control board norms and Local authority requirement, are more stringent than the specified parameters given below, then more stringent outlet parameters must be followed and guaranteed by bidder. The treated sewage quality standards shall be achieved at average sewage flow rates as well as peak sewage flow rates. Duration of PG Test for Sewage Treatmnet Plant (STP) shall be 72 Hrs. During the operation of the plant, the below parameters shall be demonstrated by bidder:

S. No	Description	Value
a.	BOD_5	Less than 10 mg/l
b.	COD	Less than 50 mg/l
c.	TSS	Less than 10 mg/l
d.	pH	7-8
e.	Coliform count	100 counts/ 100 ml
f.	NH4-N	Less than 5 mg/l
g.	N Total	Less than 10 mg/l
h.	Residual chlorine	Not exceeding 0.5 mg/l
i.	Temperature	Ambient

AThe parameters/capabilities to be demonstrated for following systems/ equipment's shall be:

i. EOT Cranes: Over load tests, travel and hoist speed checks as per relevant Indian standards IS (latest edition).
ii. Butterfly valves: - The functioning of various Butterfly valves, opening and closing operation as per control logic, accumulator capacity of hydraulic operated valves etc. shall be demonstrated as per the approved design document.

1.03.03 PUMPS (FOR ALL WATER TREATMENT PACKAGES)

a. Capacity, head, and power consumption of all the pumps at the rated duty point (to be demonstrated and proved at shop with the respective job motors) and to operate in accordance with the approved pump characteristic curves. During the shop test no negative tolerance in the guaranteed capacity, head and efficiency of the pump shall be allowed.

b. Current, Voltage, Motor input Power, Frequency, Speed, Bearing/ Motor winding Temperature, Vibration and noise level of pumps and drives and parallel operation (as applicable) without hunting & abnormal noise and with load sharing within 10% of each other at the rated duty point of pumps shall be demonstrated at site as a part of Performance & Guarantee test.

ANNEXURE -IV

DRAWING/ DOCUMENTS REQUIREMENT & DISTRIBUTION SCHEDULE

(COMMON FOR TG & SG)

After award of LOI, The drawing documents listed in MDL are minimum drawing/documents, which shall be submitted by the bidder for BHEL and Customer approval. However, any additional drawing/document if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial & delivery implication to BHEL.

The bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and customer comments or observations. Without compliance sheet the submission of the drawings/ documents will not be considered and the delay on this account will be solely on bidder's side only. Bidder to comply with the observations of the BHEL and CUSTOMER without price & delivery implication.

Every revised submission incorporating BHEL/Customer comments shall be resubmitted within 7 day by bidder.

BHEL shall provide observation / approval within 21 days from the date of document submission by bidder. Bidder to further note that the submitted drawings/ revised drawing, should be complete in all respects. Any incomplete drawing submitted shall be treated as non-submission and delay in approval/ comments shall be attributable to bidder's account. For any clarification/ discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL's/ Customer's office for across the table discussions/ finalizations/ submissions of drawings.

- (a) List and schedule of drawings/documents to be submitted after award of contract shall be as per MDL.

- Bidder to note that drawings/documents submission shall be through web-based Document Management System. Bidder would be provided access to the DMS for drawings/documents approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.
  - Internet explorer version – Minimum Internet Explorer 7
  - Internet speed – 2 mbps (Minimum preferred)
  - Pop ups from our external DMS IP (124.124.36.198) should not be blocked
  - Vendor's internal proxy setting should not block DMS application's link
    - (http://124.124.36.198/wrenchwebaccess/login.aspx)
  - DMS user manuals to be used by BHEL PEM vendors for uploading, viewing, revising, commenting and tracking documents on PEM's DMS have been uploaded on PEM internet website (www.bhelpem.com) under the Vendor session.
  - For quick access bidder may refer the link http://bhelpem.com/DMSManuals/DMSManuals.html

- Bidder shall submit soft copy/hard copy/CD ROMs of all the finally approved drawings and O&M Manuals as required by Customer/Customer consultant/BHEL-site/BHEL-PEM. The exact number of hard copies/CD ROMs of these documents to be submitted shall be notified to the bidder at the time of detailed engineering and bidder shall submit the same without any commercial/ delivery implications to BHEL/Customer.

- All the drawing documents along with the O&M manual (of all the revisions) are necessarily to be submitted in soft copies in addition to hard copies.

- Bidder to submit soft copies of all the drawing and document along with quality plans for BHEL review and approval.

- Editable copy of all the drawings and documents shall be provided.

- All the drawings shall be prepared on computer Auto Cad and other documents (like Data Sheet etc.) on MS office software. Bidder not complying to the requirement shall not be considered. For the execution of the contract regular meeting (generally once in 15 days or as per project requirement) is required.

- Vendor to come for meeting with the concerned dealing persons as per BHEL or customer requirement in a short notice.

- Bidder to submit instrument schedule, cable schedule and valve schedule in MS- Excel format during detailed engineering.

- Bidder to also furnish the Auto Cad copy/ MS-Excel/ MS-word (as applicable) of the following documents after award of contract. However, any other Auto Cad copy/ MS-Excel/ MS-word of any other document as per the insistence of BHEL and customer will also be submitted by the bidder without any delivery and commercial implication to BHEL and customer.

  - P&IDs.
  - Equipment layouts.
  - Equipment Cable tray layouts.
  - Civil assignment drawings.
  - Piping lay out drawings.

- The engineering for packages will essentially be done using Intelligent 3D modelling. Preparation of 3 D modelling drawing shall be in bidder's scope for bidder's supplied and design engineered items/ structures for turn key water treatment packages. AVEVA E3D is being used at BHEL's end for BHEL scope items hence bidder has to use same software for preparation of 3D drawings. Bidder has to submit 3D drawings in editable format for integration with BHEL's 3D drawings. Further detailing shall be shared by BHEL during detailed engineering.

MASTER DRAWING LIST

MASTER DRAWING LIST OF CHEMICAL DOSING SYSTEM (COMMON FOR TG AND SG)

SL. NO.	BHEL DRG NO	DRG TITLE	SCHEDULE OF SUBMISSION FROM LOI IN WEEKS	DRG/ DOC SIZE
1.	PE-V0-528-154-W001*	P&I DIAGRAM FOR CHEMICAL DOSING SYSTEM	2	A3
2.	PE-V0-528-154-W002*	TECHNICAL DATA SHEET-CHEMICAL DOSING SYSTEM	4	A4
3.	PE-V0-528-154-W003*	GA DRAWING & FOUNDATION DETAILS	2	A4
4.	PE-V0-528-154-W004*	LOCAL CONTROL PANEL (INCLUDING WIRING DIAGRAM, LOGIC DIAGRAM AND FIELD TERMINATION DETAILS) - CDS	4	A4
5.	PE-V0-528-154-W005*	QAP FOR CHEMICAL DOSING SYSTEM	2	A4
6.	PE-V0-528-154-W006	O&M MANUAL FOR CHEMICAL DOSING SYSTEM	16	A4

(*) Basic engineering documents

MASTER DRAWING LIST OF CONDENSATE POLISHING UNIT (CPU)

SR. NO.	VENDOR DRAWING NO	DRAWING TITLE	SCHEDULE OF SUBMISSION FROM LOI IN WEEKS	DRG/ DOC SIZE
1.	PE-V0-390-155-W037	CABLE TRAY/TRENCH & CONDUIT ROUTING DIAGRAM FOR CONDENSATE POLISHING UNIT (SERVICE VESSEL AREA)	14	A1
2.	PE-V0-390-155-W134	CABLE TRAY/TRENCH & CONDUIT ROUTING DIAGRAM FOR CONDENSATE POLISHING UNIT (REGENERATION AREA)	14	A1
3.	PE-V0-390-155-W128	ELECTRICAL LOAD LIST FOR CPU	12	A4
4.	PE-V0-390-155-W121	DATA SHEET OF MOTORS FOR CPP	14	A4
5.	PE-V0-390-155-W029	TECHNICAL DATASHEET ALONG WITH GA DRAWING FOR ELECTRIC HEATER FOR CPU	10	A4
6.	PE-V0-390-155-W011	CONTROL LOGICS FOR CPP	14	A4
7.	PE-V0-390-155-W017	HMI - LOGS, TRENDS AND BAR CHARTS FOR CPP	14	A4
8.	PE-V0-390-155-W130	EARTHING LAYOUT OF CPU SERVICE VESSEL AREA	12	A1
9.	PE-V0-390-155-W131	EARTHING LAYOUT OF CPU REGENERATION AREA	12	A1
10.	PE-V0-390-155-W123	I/O LIST AND DRIVE LIST	12	A4
11.	PE-V0-390-155-W008	LIST OF 230V AC UPS LOAD (FOR CPP)	10	A4
12.	PE-V0-390-155-W048	ALARM AND ANNUNCIATION LIST	10	A4
13.	PE-V0-390-155-W051	INTERCONNECTION SCHEDULE FOR CPP	14	A4
14.	PE-V0-390-155-W124	INSTRUMENTS SCHEDULE FOR CPP	14	A4
15.	PE-V0-390-155-W125	INSTRUMENTATION CABLE LIST & ICS FOR CPP	14	A4
16.	PE-V0-390-155-W012	TYPE TEST REPORT FOR ELECTRONIC TRANSMITTERS (FOR CPP)	16	A4
17.	PE-V0-390-155-W016	TYPE TEST REPORT OF JUNCTION BOX (DEGREE OF PROTECTION) FOR CPP	16	A4
18.	PE-V0-390-155-W132	TYPE TEST REPORT OF CV TEST FOR CONTROL VALVE (FOR CPP)	16	A4
19.	PE-V0-390-155-W022	DATA SHEET FOR ELECTRONIC TRANSMITTERS	16	A4

20.	PE-V0-390-155-W023	DATA SHEET FOR LEVEL TRANSMITTER - ULTRASONIC	16	A4
21.	PE-V0-390-155-W024	DATASHEET OF SOLENOID VALVES	16	A4
22.	PE-V0-390-155-W030	DATA SHEET FOR PNEUMATIC OPERATED CONTROL VALVES FOR CPP	16	A4
23.	PE-V0-390-155-W045	DATA SHEET OF MOTORIZED BUTTERFLY VALVE	16	A4
24.	PE-V0-390-155-W078	DATA SHEET AND GA FOR JUNCTION BOX / ANALYZER PANEL AND JB LAYOUT	16	A4
25.	PE-V0-390-155-W136	DATA SHEETS OF INSTRUMENTS FOR STG BALANCE TG INSTRUMENTS (FOR CPP)	16	A4
26.	PE-V0-390-155-W020	GA OF AC & DC POWER DISTRIBUTION BOARD (FOR CPP)	16	A4
27.	PE-V0-390-155-W032	GA DRAWING OF DM WATER STORAGE TANKS	10	A3
28.	PE-V0-390-155-W033	GA DRAWING OF SERVICE VESSEL	8	A3
29.	PE-V0-390-155-W034	GA DRAWING OF REGENERATION VESSELS	8	A3
30.	PE-V0-390-155-W035	GA DRAWING OF ACID STORAGE TANK	8	A3
31.	PE-V0-390-155-W036	GA DRAWING OF ALKALI STORAGE TANK	8	A3
32.	PE-V0-390-155-W037	GA DRAWING OF ACID MEASURING TANK	8	A3
33.	PE-V0-390-155-W038	GA DRAWING OF ALKALI PREPARATION TANK	8	A3
34.	PE-V0-390-155-W039	GA DRAWING OF ALKALI DAY TANK	8	A3
35.	PE-V0-390-155-W040	GA DRAWING OF AC FILTER FOR ALKALI	8	A3
36.	PE-V0-390-155-W041	GA DRAWING OF HOT WATER TANK	8	A3
37.	PE-V0-390-155-W042	GA DRAWING OF PRIMING TANK OF NEUTRALISATION PIT	8	A3
38.	PE-V0-390-155-W043	GA DRAWING OF LIME TANK OF NEUTRALISATION PIT	8	A3
39.	PE-V0-390-155-W046	GA FOR RESIN MAKE-UP HOPPER	8	A3
40.	PE-V0-390-155-W047	GA FOR RESIN TRANSFER WASTE WATER COLLECTION TANK	10	A3
41.	PE-V0-390-155-W119	CIVIL SCOPE OF SERVICE VESSEL AERA	12	A1
42.	PE-V0-390-155-W127	CIVIL SCOPE DRG FOR REGN AREA	12	A1
43.	PE-V0-390-155-W002*	EQUPMENT LAYOUT OF CONDENSATE POLISHING UNIT (SERVICE VESSEL AREA)	6	A1
44.	PE-V0-390-155-W003*	EQUIPMENT LAYOUT OF CONDENSATE POLISHING UNIT (REGENERATION AREA)	6	A1
45.	PE-V0-390-155-W052	EXTERNAL PIPING LAYOUT FROM CPP SERVICE VESSELS TO REGENERATION AREA	18	A1
46.	PE-V0-390-155-W053	PIPING LAYOUT IN REGENERATON AREA	18	A1
47.	PE-V0-390-155-W054	PIPING LAYOUT AROUND SERVICE VESSELS	18	A1
48.	PE-V0-390-155-W056	YARD PIPING FROM N-PIT TO ASH SLURRY SUMP	18	A0
49.	PE-V0-390-155-W049	PIPING SCHEDULE (LINE LIST) FOR CPP	8	A4
50.	PE-V0-390-155-W050	VALVE SCHEDULE (VALVE LIST) FOR CPP	8	A4
51.	PE-V0-390-155-W122	PAINTING SCHEDULE FOR CPU	8	A4
52.	PE-V0-390-155-W001*	P& I DIAGRAM OF CONDENSATE POLISHING UNIT (LEGENDS)	4	A1
53.	PE-V0-390-155-W001-1*	P & I DIAGRAM OF CONDENSATE POLISHING PLANT (CPP)	4	A1
54.	PE-V0-390-155-W001-2*	P & I DIAGRAM OF CONDENSATE POLISHING PLANT (CPP)	4	A1
55.	PE-V0-390-155-W001-3*	P & I DIAGRAM OF REGENERATION SYSTEM OF CPP	4	A1
56.	PE-V0-390-155-W133	TYPE TEST REPORT FOR FLOW NOZZLES & ORIFICE PLATES (FOR CPP)	16	A1
57.	PE-V0-390-155-W004*	PROCESS CALCULATION AND EQUIPMENT SIZING FOR CPP	4	A4
58.	PE-V0-390-155-W004-1*	THICKNESS CALCULATION FOR PRESSURE	4	A4

		VESSEL FOR CPP		
59.	PE-V0-390-155-W004-2*	PRESSURE DROP CALCULATION FOR CPP	4	A4
60.	PE-V0-390-155-W006*	OPERATION & CONTROL PHILOSOPHY FOR CPU	4	A4
61.	PE-V0-390-155-W057	PERFORMANCE & GUARANTEE TEST PROCEDURE FOR CONDENSATE POLISHING PLANT	18	A4
62.	PE-V0-390-155-W058	O&M MANUAL OF CPP	20	A4
63.	PE-V0-390-155-W004-3	DATASHEET OF RESIN	4	A4
64.	PE-V0-390-155-W021	DATASHEET AND GA OF ANALYSER RACK/PANEL	12	A4
65.	PE-V0-390-155-W026	DATA SHEET FOR PH ANALYSER	14	A4
66.	PE-V0-390-155-W027	DATA SHEET FOR SODIUM ANALYSER	14	A4
67.	PE-V0-390-155-W028	DATA SHEET FOR CONDUCTIVITY ANALYSER	14	A4
68.	PE-V0-390-155-W059	DATA SHEET OF AC FILTER MEDIA	12	A4
69.	PE-V0-390-155-W061	DATA SHEET ALONG WITH GA OF DUAL PLATE VALVE	14	A4
70.	PE-V0-390-155-W063	DATA SHEET ALONG WITH GA OF BALL VALVE (MANUAL)	14	A4
71.	PE-V0-390-155-W064	DATA SHEET ALONG WITH GA OF BALL VALVE (AUTO)	14	A4
72.	PE-V0-390-155-W065	DATA SHEET ALONG WITH GA OF HIGH PR BALL VALVE (MANUAL)	14	A4
73.	PE-V0-390-155-W066	DATA SHEET ALONG WITH GA OF HIGH PR BALL VALVE (AUTO)	14	A4
74.	PE-V0-390-155-W068	DATA SHEET ALONG WITH GA, C/S AND CH. CURVE OF REGENERATION PUMPS	14	A4
75.	PE-V0-390-155-W069	DATA SHEET ALONG WITH GA, C/S AND CH. CURVE OF ACID UNLOADING PUMPS	14	A4
76.	PE-V0-390-155-W070	DATA SHEET ALONG WITH GA, C/S AND CH. CURVE OF ALKALI UNLOADING PUMPS	14	A4
77.	PE-V0-390-155-W071	DATA SHEET ALONGWITH GA, C/S AND CH. CURVE OF EFFLUENT DISPOSAL PUMPS	14	A4
78.	PE-V0-390-155-W072	DATA SHEET ALONG WITH GA, C/S AND CH. CURVE OF METERING PUMPS (ALKALI)	14	A4
79.	PE-V0-390-155-W073	DATA SHEET ALONG WITH GA, C/S AND CH. CURVE OF METERING PUMPS (ACID)	14	A4
80.	PE-V0-390-155-W074	DATA SHEET ALONG WITH GA, C/S OF BLOWERS OF SERVICE AREA	14	A4
81.	PE-V0-390-155-W075	DATA SHEET ALONG WITH GA, C/S OF BLOWERS OF REGENERATION AREA	14	A4
82.	PE-V0-390-155-W076	DATA SHEET OF SAFETY SHOWERS	14	A4
83.	PE-V0-390-155-W077	DATA SHEET OF AGITATORS FOR ALKALI PREPARATION AND ALKALI DAY TANK	14	A4
84.	PE-V0-390-155-W079	DATA SHEET ALONG WITH GA OF DIAPHRAGM VALVE (MANUAL)	14	A4
85.	PE-V0-390-155-W080	DATA SHEET ALONG WITH GA OF DIAPHRAGM VALVE (AUTO)	14	A4
86.	PE-V0-390-155-W081	DATA SHEET ALONG WITH GA OF BUTTERFLY VALVE (MANUAL)	14	A4
87.	PE-V0-390-155-W082	DATA SHEET ALONG WITH GA OF BUTTERFLY VALVE (AUTO)	14	A4
88.	PE-V0-390-155-W083	DATA SHEET ALONG WITH GA OF HIGH PR BUTTERFLY VALVE (MANUAL)	14	A4
89.	PE-V0-390-155-W084	DATA SHEET ALONG WITH GA OF HIGH PR BUTTERFLY VALVE (AUTO)	14	A4
90.	PE-V0-390-155-W085	DATA SHEET ALONG WITH GA, C/S AND CH. CURVE OF ALKALI TRANSFER PUMPS	14	A4
91.	PE-V0-390-155-W086	DATA SHEET ALONG WITH GA, C/S AND CH. CURVE OF DM WATER PUMPS FOR RESIN TRANSFER	14	A4
92.	PE-V0-390-155-W087	DATA SHEET ALONG WITH GA, C/S AND CH.	14	A4

		CURVE OF RESIN TRANSFER WASTE WATER RECYCLE PUMPS		
93.	PE-V0-390-155-W139	DATA SHEET FOR INSTRUMENTATION CABLE F & G TYPE (FOR CPP)	14	A4
94.	PE-V0-390-155-W142	DATA SHEET ALONG WITH GA OF NON-RETURN VALVE	14	A4
95.	PE-V0-390-155-W086A	MOTOR DATASHEET FOR DM WATER PUMPS FOR RESIN TRANSFER FOR CPU	12	A4
96.	PE-V0-390-155-W089	MQP FOR ELECTRIC ACTUATOR (WITH GEAR BOX)	14	A4
97.	PE-V0-390-155-W143	MQP FOR SERVICE VESSEL	12	A4
98.	PE-V0-390-155-W096	MQP FOR HORIZONTAL CENTRIFUGAL PUMPS	14	A4
99.	PE-V0-390-155-W100	MQP FOR METERING PUMPS (DIAPHRAGM TYPE)	14	A4
100.	PE-V0-390-155-W101	MQP FOR AIR BLOWER (LOBE TYPE)	14	A4
101.	PE-V0-390-155-W102	MQP FOR RUBBER LINING	12	A4
102.	PE-V0-390-155-W103	MQP FOR FABRICATION OF HIGH-PRESSURE PIPES & FITTINGS	14	A4
103.	PE-V0-390-155-W105	MQP FOR BUTTERFLY VALVES (MANUAL & PNEU/ELEC) UPTO 300# CLASS	14	A4
104.	PE-V0-390-155-W107	MQP FOR DIAPHGRAM VALVE (MANUAL/PNEU.)	14	A4
105.	PE-V0-390-155-W109	MQP FOR DUAL PLATE TYPE VALVES (SS & CI CLASS 150)	14	A4
106.	PE-V0-390-155-W111	MQP FOR BALL VALVE (UPTO PN 10) (CAT III ITEM- QP IS NOT APPLICABLE)	14	A4
107.	PE-V0-390-155-W007-1	HOOK UP & INSTALLATION DRAWING FOR INSTRUMENTS FOR CPP	16	A4
108.	PE-V0-390-155-W116	MQP FOR SS PIPES (ERW/SEAMLESS)	14	A4
109.	PE-V0-390-155-W014	MQP FOR BUTTERFLY VALVE (MANUAL/PNEUMATIC/MOTOR OPERATED)	14	A4
110.	PE-V0-390-155-W019	WPS FOR MS PIPE (IS: 1239/3589) AT SITE FOR CPU	14	A4
111.	PE-V0-390-155-W044	WPS FOR SS PIPES AT SITE FOR CPU	14	A4
112.	PE-V0-390-155-W009	MQP FOR PRESSURE VESSEL (OTHER THAN SERVICE VESSEL)	12	A4

(*) Basic engineering documents

MASTER DRAWING LIST OF OXYGEN DOSING SYSTEM (ODS)

SL. NO.	BHEL DRG NO	DRG TITLE	SCHEDULE OF SUBMISSION FROM LOI IN WEEKS	DRG/ DOC SIZE
1	PE-V0-528-154-W101*	P&ID for Oxygen Dosing System	2	A3
2	PE-V0-528-154-W102*	GA drawing and foundation detail for Oxygen Dosing System	2	A4
3	PE-V0-528-154-W103*	Technical Data sheet for Oxygen Dosing System	4	A4
4	PE-V0-528-154-W104*	Junction Box Termination Dwgs. for Oxygen Dosing System	4	A4
5	PE-V0-528-154-W105*	QAP for Oxygen Dosing System	2	A4
6	PE-V0-528-154-W106	O&M Manual for Oxygen Dosing System	2	A4

(*) Basic engineering documents

MASTER DRAWING LIST OF EFFLUENT TRANSFER SYSTEM (ETS)

S. NO.	VENDOR DRAWING NO	DRAWING TITLE	SCHEDULE OF SUBMISSION FROM LOI IN WEEKS	DRG/ DOC SIZE
1	PE-V0-528-164-A001*	P&ID FOR EFFLUENT TRANSFER SYSTEM	4	A1
2	PE-V0-528-164-A002*	LAYOUT OF EFFLUENT TRANSFER SYSTEM	4	A1
3	PE-V0-528-164-A003*	PROCESS DESIGN & SIZING CALCULATIONS, PRESSURE DROP CALCULATIONS AND WATER BALANCE DIAGRAM OR ETS	4	A4
4	PE-V0-528-164-A004*	SYSTEM DESCRIPTION & CONTROL WRITE UP	4	A4
5	PE-V0-528-164-A005	SUB VENDOR LIST AND INSPECTION CRITERIA FOR EFFULENT TRANSFER SYSTEM	4	A4
6	PE-V0-528-164-A006	TECHNICAL DATA SHEET AND GA DRG OF PUMPS ALONG WITH MOTOR	10	A4
7	PE-V0-528-164-A007	DATASHEET AND GA DRG OF VALVE	10	A4
8	PE-V0-528-164-A008	YARD PIPING LAYOUT ALONG WITH DETAILS OF SUPPORTS	16	A1
9	PE-V0-528-164-A009	O& M MANUAL	20	A4
10	PE-V0-528-164-A0010	PG TEST PROCEDURE	20	A4
11	PE-V0-528-164-A018	MECHANICAL GA DRG OF EFFLUENT RCC SUMPS	10	A4
12	PE-V0-528-164-A101	POWER & CONTROL CABLE SCHEDULE AND INTERCONNECTION DIAGRAM FOR Effluent Transfer System	16	A4
13	PE-V0-528-164-A102	ELECTRICAL LOAD LIST OF ETS	14	A4
14	PE-V0-528-164-A103	CABLE TRAY/TRENCH & CONDUIT ROUTING DIAGRAM INCLUDING JB LOCATION OF ETS	16	A1
15	PE-V0-528-164-A202	DATASHEET OF LOCAL INSTRUMENTS	12	A4
16	PE-V0-528-164-A301	POWER & CONTROL CABLE SCHEDULE AND INTERCONNECTION DIAGRAM FOR ETS	10	A4
17	PE-V0-528-164-A302	QAP FOR PUMP	10	A4
18	PE-V0-528-164-A304	QAP FOR VALVE	10	A4
19	PE-V0-528-164-A305	QAP FOR MCC/SWITCH GEAR	10	A4
20	PE-V0-528-164-A305	QAP FOR CABLE	10	A4

(*) Basic engineering documents

MASTER DRAWING LIST OF SEWAGE TREATMENT PALNT (STP)

S. NO.	VENDOR DRAWING NO	DRAWING TITLE	SCHEDULE OF SUBMISSION FROM LOI IN WEEKS	DRG/ DOC SIZE
1.	PE-V0-528-673-A001*	P&I Diagram for Sewage Treatment Plant	4	A1
2.	PE-V0-528-673-A002*	Layout of Sewage Treatment Plant	4	A1
3.	PE-V0-528-673-A003*	PIPING LAYOUT OF STP (INSIDE AREA)	4	A1
4.	PE-V0-528-673-A004	YARD PIPING LAYOUT OF STP	16	A1
5.	PE-V0-528-673-A005	MECH. GA DRAWINGS OF ALL SEWAGE SUMPS AND TANKS FOR SEWAGE TREATMENT PLANT	8	A1

6.	PE-V0-528-673-A008	PROCESS DESIGN AND SIZING CALCULATION INCLUDING PRESSURE DROP CALCULATIONS (STP)	4	A4
7.	PE-V0-528-673-A010	DATA SHEET OF VALVES SEWAGE TREATMENT PLANT	10	A4
8.	PE-V0-528-673-A011	TECHNICAL DATA SHEET OF SUBMERSIBLE PUMPS SEWAGE TREATMENT PLANT	12	A4
9.	PE-V0-528-673-A012	TECHNICAL DATA SHEET OF SCREW AND HORIZONTAL CENTRIFUGAL PUMPS FORSEWAGE TREATMENT PLANT	12	A4
10.	PE-V0-528-673-A013	TECHNICAL DATA SHEET- INSTRUMENTS SEWAGE TREATMENT PLANT	10	A4
11.	PE-V0-528-673-A014	TECHNICAL DATA SHEET OF BLOWERS SEWAGE TREATMENT PLANT	10	A4
12.	PE-V0-528-673-A015	TECHNICAL DATA SHEET FOR METERING PUMPS FOR SEWAGE TREATMENT PLANT	10	A4
13.	PE-V0-528-673-A016	Data Sheet of Agitator FOR SEWAGE TREATMENT PLANT	10	A4
14.	PE-V0-528-673-A017	Instrument Schedule SEWAGE TREATMENT PLANT	10	A4
15.	PE-V0-528-673-A019	ELECTRICAL LOAD DATA SEWAGE TREATMENT PLANT	10	A4
16.	PE-V0-528-673-A020*	Operation & Control Philosophy SEWAGE TREATMENT PLANT	4	A4
17.	PE-V0-528-673-A021	Valve Schedule SEWAGE TREATMENT PLANT	10	A4
18.	PE-V0-528-673-A022	O & M Mannual FOR SEWAGE TREATMENT PLANT	20	A4
19.	PE-V0-528-673-A023	Painting Schedule FOR SEWAGE TREATMENT PLANT	10	A4
20.	PE-V0-528-673-A025	SUB VENDOR LIST & INSPECTION CRITERIA FOR SEWAGE TREATMENT PLANT	6	A4
21.	PE-V0-528-673-A026	QAP FOR SUBMERSIBLE WITH MOTOR SEWAGE TREATMENT PLANT	10	A4
22.	PE-V0-528-673-A027	QAP FOR METERING PUMPS WITH MOTOR FOR SEWAGE TREATMENT PLANT	10	A4
23.	PE-V0-528-673-A028	QAP FOR BLOWERS WITH MOTOR FOR SEWAGE TREATMENT PLANT	10	A4
24.	PE-V0-528-673-A029	QAP FOR LCP SEWAGE TREATMENT PLANT	10	A4
25.	PE-V0-528-673-A031	PG TEST FOR SEWAGE TREATMENT PLANT	20	A4
26.	PE-V0-528-673-A033	QAP FOR LAMELLA CLARIFIER TUBE SETTLER FOR SEWAGE TREATMENT PLANT	10	A4
27.	PE-V0-528-673-A034	MECH. GA OF LAMELLA TUBE SETTLER CLARIFIER FOR SEWAGE TREATMENT PLANT	10	A1
28.	PE-V0-528-673-A035	QAP FOR VALVES SEWAGE TREATMENT PLANT	10	A4
29.	PE-V0-528-673-A036	TECHNICAL DATA SHEET OF MOTORs for STP	10	A4
30.	PE-V0-528-673-A037	CABLE TRAY/ TRENCH & CONDUIT ROUTING DIAGRAM OF STP	10	A1
31.	PE-V0-528-673-A038	GA and Data sheet of MCC/Switch gear of STP	10	A4
32.	PE-V0-528-673-A043	DATASHEET AND GA OF MBR	12	A4

(*) Basic engineering documents

ANNEXURE - V

SURFACE PREPARATION & PAINTING
(COMMON FOR TG & SG)

1.00.00 **Specification of surface preparation & painting**

1.01.00 Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.

1.02.00 All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labelled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.

1.03.00 Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.

1.04.00 All pipelines shall be Colour coded for identification as per the DVC Colour-coding scheme, which will be furnished to the contractor during detailed engineering.

1.05.00 **SURFACE PREPARATION**

1.05.01 All surfaces to be painted shall be thoroughly cleaned of oil. Grease and other foreign material. Surfaces shall be free of moisture and contamination from chemicals and solvents.

1.05.02 The following surface preparation schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer.

SP1	Solvent cleaning
SP2	Application of rust converter (Ruskil or equivalent grade)
SP3	Power tool cleaning
SP4	Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer)
SP4*	Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns
SP5	Shot blasting/ abrasive blasting.
SP6	Emery sheet cleaning/Manual wire brush cleaning.

1.06.00 **APPLICATION OF PRIMER/PAINT**

1.06.01 The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.

1.06.02 Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.

1.06.03 Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.

1.06.04 Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.

1.06.05 Following are the Primer/painting schemes envisaged herein:

PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104.

PS3* - Zinc Chrome primer (Alkyd base) by dip coat.

PS4 - Synthetic Enamel (long oil alkyd) to IS2932.

PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744

PS9 - Aluminum paint to IS 2339.

PS9* - Heat resistant Aluminum paint to IS-13183 Gr.-I (for temperature 400 degC – 600 degC), IS-13183 Gr.-II (for temperature 200 degC- 400 degC and IS-13183 Gr.-III (for temperature upto 200 degC)

PS13 - Rust preventive fluid by spray, dip or brush.

PS14 - Weldable primer-Deoxaluminate or equivalent.

PS16 - High Build Epoxy CDC mastic `15'.

PS17 - Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.)

PS18 - Epoxy based TiO2 pigmented coat

PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=35.0(min.)

PS-20 - Epoxy based finish paint

1.06.06 All weld edge preparation for site welding shall be applied with one coat of wieldable primer.

1.06.07 For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.

1.06.08 SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.

1.06.09 a) All un-insulated equipments, pipes, valves etc covered in sub-section A-08 (Steam Turbine & Auxiliary system) shall be painted with paint not inferior to Epoxy resin based paints with minimum DFT of 150 micron.

The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner:

- Primer coat – Epoxy based zinc phosphate
- Intermediate - Epoxy based TiO2 pigmented coat
- Finish coat - Epoxy based finish coat/Two pack polyurethane coat

b) Equipment, pipes etc. with high temperature shall be painted with heat resistant aluminum paint (to be selected based on the service condition of component as per IS-13183). Two coats of paint shall be applied with total DFT 40 micron.

c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard

1.06.10 A) Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows:

Primer : One coat of unmodified epoxy resin along with polymide hardener.

Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct

hardener.

Total thickness of primer and paint should not be less than 400 microns.

B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows:

i) For Indoor vessel, tanks, piping, valves & other equipments:

(a) Surface preparation shall be done either manually or by any other approved method.

(b) Primer coat shall consist of one coat of chlorinated rubber based zinc phosphate primer having minimum DFT of 50 microns.

(c) Intermediate coat (or under coat) shall consist of one coat of chlorinated rubber based paint pigmented with Titanium dioxide with minimum DFT of 50 microns.

(d) Top coat shall consist of one coat of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 50 microns.

Total DFT of paint system shall not be less than 150 microns.

ii) For Outdoor vessel, tanks, piping, valves & other equipments:

(a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard.

(b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.

(c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.

(d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided.

The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied.

Total DFT shall not be less than 300 microns.

1.06.11 Primer/Painting Schedule

Sl. No	Description		Surface Preparation	Primer Coat			Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade
				Type of Primer	No. of Coats	Min. DFT / coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)		
A) Power Cycle Piping														As per DVC Colour shade/ coding scheme
1.	All insulated Pipings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.		SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
2.	All un-insulated Pipings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipment etc.	Design temperature < or equal to 60^0C	SP3/SP4	PS 5	2	25	-	-	-	PS 4	3 **$**	35 **$**	155 **$**	
		Design temperature above 60^0C-200^0C	SP3/SP4	PS 9*	1	20	-	-	-	PS9*	1	20	40	
		Design temperature > 200^0C	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
3	Constant Load Hanger (CLH) and Variable Load Hanger (VLH)		SP4*	PS19	1	40	-	-	-	PS17	1	30	70	

4	Piping hangers / supports (other than (3) above. (un-insulated)		SP3/SP5	PS5	2	25	-	-	-	PS4	2	25	100
	Valves												
5.	Cast/Forged	Design temperature < or equal to 60 degC #	SP3/SP5	PS5	2	35	-	-	-	PS4	2	25	120
		Design temperature above 60 degC	SP3/SP5	PS9*	1	20	-	-	-	PS9*	1	20	40
6.	All auxiliary Structural Steel components for pipe supports	Outside TG building and in SG envelope	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a) Epoxy coat b) Final coat of paint PS17	2 1	35 30	250
		Within TG building	SP4*	-do-	1	35	PS18	1	35	a) Epoxy coat b) Final coat of paint PS17	2 1	25 30	150

7.	Weld Edges	SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	25

1. **$ -** The first 2 finished coats (total min.DFT of 70 microns) shall be done at shop and the 3rd finish coat (min.DFT 35 Microns) shall be applied at site.
2. For valves below 65NB and temperature upto and including 540 DegC, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint.
3. For corrosion protection of threaded hanger rods and variable spring cages, electro galvanizing in full compliance to minimum Corrosion category C3 as per EN ISO12944 is also acceptable.
4. For spring cages, 2 coats of 30 µm (min) zinc-rich epoxy resin primer with zinc content> 80 weight% in dry film followed by 2 coats of 30 µm (min) top coat of Acrylic resin Co-polymerisate with a total combined minimum DFT of 120µm is also acceptable in lieu of above specified paint scheme.
5. For corrosion protection, all inner parts of the hangers (CLH/VLH) shall be at least in full compliance to Corrosion category C3 as per EN ISO12944.
6. # - For Cast/forged valves upto & including design temperature 60Deg.C, Aluminium painting as per IS-13183 Gr-3 or better with total DFT 40Micron is also acceptable.

B) Steam Generator & Auxiliaries:

1	All surfaces with temperature 95°C or less and which are insulated	SP3/SP4	PS 5	2	30	-	-	-	PS 4	2 **$**	20 **$**	100 **$**
2	All surfaces with temperature above 95°C and which are insulated	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40

Note: **1)** SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.

2) Painting specification for all other exposed steel surfaces not covered above shall be same as that given in Civil Sub-section, Part-B, Section VI for corrosion protection of steel structures.

C) LOW PRESSURE PIPING

1	All Piping, fittings / components, valves, Equipments etc.	SP3/SP5	PS3/ PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per DVC Color shade/ coding scheme.
2	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting											
3	On the internal surface for pipes 1000 Nb and above	A coat of primer followed by hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.											

D) Fire Detection & Protection System, Compressed air system and Air-conditioning & Ventilation System

For Fire Detection & Protection System, Surface preparation and painting of Fire Water Storage Tanks, all Steel Surfaces (external) exposed to atmosphere (outdoor & indoor installation), Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc. should be as per the Part-B, Sub Section-A-18, Fire Detection & Protection System

For Air Conditioning System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Air Conditioning System.

For Ventilation System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Ventilation System.

For compressed air system, Surface preparation and painting of all the steel surfaces should be as per the Part-B, Sub Section--A-16 compressed air system.

E) ESP												
1	All surfaces with surface temperature 95°C or less (with or without insulation)	SP3/SP4	PS3/ PS3*	1	25	-	-	-	PS 4	1	30	55
2	All surfaces with surface temperature above 95°C (with or without insulation)	SP3/SP4	PS5	2	30	-	-	-	-	-	-	60

General Notes (Applicable for all above points A to E)

i) Painting specification for all surfaces with surface temperature 95°C or less (un-insulated) that are not covered above shall be same as that given in Civil Sub-section, Part-B, Section-VI for corrosion protection of steel structures.

ii) Painting specification for inside surfaces (such as inner surfaces of ducts/ tanks/ mills/ dampers/ ESP etc.) that are not covered specifically in above clauses, shall be provided with 2 coats of suitable primer i.e. PS5/ PS9 (Total DFT 60/40 micron) based on the temperature.

F) FGD System

(i) Surface preparation shall be blast cleaned conforming *to* Sa *2-1/2* Swiss Standard.

(ii) Primer coat shall consist of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.

(iii) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.

(iv) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat *of* polyurethane of minimum DFT of 25 microns shall be provided.

ANNEXURE VI

MANDATORY SPARES AND COMMISSIONING SPARES
(COMMON FOR TG & SG)

1. SPARES

The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares. The general requirements pertaining to the supply of these spares is given below:

1.1 MANDATORY SPARES

a) The list of mandatory spares considered essential by the Employer is indicated in this chapter. The bidder shall indicate the prices for each and every item in the price format whether or not he considers it necessary for the Employer to have such spares. If the bidder fails to comply with the above or fails to quote the price of any spare item, the cost of such spares shall be deemed to be included in the contract price. The bidder shall furnish the population per unit of each item in the Bid Forms and Price Schedules. Whenever the quantity is mentioned in "sets" the bidder has to give the item details and prices of each item.
b) The Employer reserves the right to buy any or all the mandatory spares parts.
c) The prices of mandatory spares indicated by the Bidder in the Bid Proposal sheets shall be used for bid evaluation purposes.
d) Spares shall not be dispatched before dispatch of corresponding main equipment.
e) Wherever quantity is specified both as a percentage and a value, the Bidder has to supply the higher quantity until and unless specified otherwise.

1.2 START-UP & COMMISSIONING SPARES

Start-up and commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/ system. All spares used till the plant is handed over to the employer shall come under this category. The Contractor shall provide for an adequate stock of such start up and commissioning spares to be brought by him to the site for the plant erection and commissioning. They must be available at site before the equipment are energized. The unused spares, if any, should be removed from there only after the issue of Taking Over certificate. All start up spares which remain unused at the time shall remain the property of the Contractor.

1.3 The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares and recommended spares and indicate these in the relevant schedules of the Bid Form and Price Schedules. The general requirements pertaining to the supply of these spars is given below.

2. The Contractor shall indicate the service expectancy period for the spares parts under normal operating conditions before replacement is necessary.
3. All spares supplied under this contract shall be strictly inter changeable with the parts for which they are intended for replacements. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic with desecrator packs as necessary.
4. All the spares shall be manufactured along with the main equipment components as a continuous operation as per same specification and quality plan.
5. The contractor will provide Employer with cross-sectional drawings, catalogues, assembly drawings and other relevant documents so as to enable the Employer to identify and finalise order for recommended spares.
6. Each spares part shall be clearly marked or labelled on the outside of the packing with its description. When more than one spares part is packed in a single case, a general description of the content shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purposes of identification.
7. All cases, containers or other packages are to be opened for such examination as may be considered necessary by the Employer.

8. The contractor will provide the Employer with all the addresses and particulars of his sub suppliers while placing the order on vendors for items/ components/ equipment covered under the contract and will further ensure with his vendors that the Employer, if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.
9. The Contractor shall warrant that all spares supplied will be new and in accordance with the contract Documents and will be free from defects in design, material and workmanship.
10. The Contractor shall guarantee the long-term availability of spares to the Employer for the full life of the equipment covered under the contract. The Contractor shall guarantee that before going out of production of spares parts of the equipment covered under the Contract, he shall give the Employer at least 2 years advance notice so that the latter may order his bulk requirement of spares, if he so desires. The same provision will also be applicable to sub-contractors. Further, in case of discontinuance of manufacture of any spares by the Contractor and/or his subcontractors, Contractor will provide the Employers, two years in advance, with full manufacturing drawings, material specifications and technical information including information on alternative equivalent makes required by the Employer for the purpose of manufacture/ procurement of such items.
11. Material Codification The bidder to provide datasheets/ assembly drawings of the manufacturer/ any other relevant document showing Bill of Material(s), Make, Model Number, Part Number etc. through which mandatory spares to be supplied can be uniquely identified. This would facilitate the Employer to assign a unique code to each of the mandatory spare as brought out in GCC. The bidder shall extend all necessary assistance in this regard.
12. Identification: Each spare shall be clearly marked and labelled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification.
13. Mandatory spares listed is bare minimum requirement. In case any additional mandatory spares requirement is covered elsewhere in the tender specification apart from specified below, same shall be deemed to have been covered in bidder’s scope of supply.
14. Unless stated otherwise, a "set" or "Lot" means items required for complete replacement in one equipment of each type/ size/ range.
15. In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the below list.
16. Any item which is quoted as “not applicable” in the above list and is found to be “applicable” at a later date shall be supplied by the Bidder without any commercial implications.

LIST OF MANDATORY SPARES FOR CHEMICAL DOSING SYSTEM (TG)

SL. NO	DESCRIPTION	QUANTITY
1.	Valves all sizes	5% of the total population of each type, size and class OR minimum 2 nos. of each type size & class whichever is more.
2.	Transmitters of all types, ranges and model no. (for the measurement of Pressure, differential pressure flow, level, etc.)	10% or 1 No. of each type, ranges and model whichever is more. (1 LOT)
3.	Other cables	5 % of each type, pair and size of actual installed quantity (1LOT)

LIST OF COMMISSIONING SPARES FOR CHEMICAL DOSING SYSTEM (TG)

SL. No.	ITEM DESCRIPTION	Quantity per skid (No.)	Total Nos.
1.0	**NaOH DOSING SYSTEM**		
a.	Oil Seals for drive end.	4	8
b.	Gaskets for drive end	4	8
c.	Guide ring for plunger.	4	8
d.	Teflon rings for valve/s.	8	16
e.	Level gauge glass	2	4
f.	Back up fuse	3	6
g.	Pilot lamp	2	4
h.	Push Button	2	4
i.	Control fuse	2	4
j.	Bulb for Annunciation	4	8

LIST OF MANDATORY SPARES FOR CONDENSATE POLISHING UNIT (CPU) (TG)

S. No.	Description	UNIT	Quantity
1.00	**MECHANICAL**		
1.01	**Screens and Nozzles for Under Drain System**		
a)	Activated Carbon filter	%	15% of Ac filter vessel
b)	Polisher Service Vessel	%	100% of one vessel
1.02	**Under Drain System screens, nozzles/headeral lateral/any other type used for**		
a)	Cation Regeneration Unit	Set	1 Set
b)	Anion Regeneration Unit	Set	1 Set
c)	Mixed Resin Storage Unit (As applicable)	Set	1 Set
1.03	**All Resins (Cation, Anion & Inert resins)**		
a)	All Resins (Cation, Anion & Inert resins)		One full charge required for one Service vessel

1.04	**CPU Service vessel area & Regen Area Valves**		
a)	Valves	Number	5% of the total population of each type and class OR minimum 2 Nos. of each type and class
	Note: Wherever valves are specified as mandatory spare, complete valve along with actuator and all other accessories which are the part of original supply shall also be supplied.		
2.00	**MEASURING INSTRUMENTS**		
2.01	**Electronic Transmitters**		
a)	Transmitters of all type, range and model o. (For the measurement of Pressure, Differential pressure, flow, level, temperature etc.)	Number	10% or 1 No. of each type, ranges and model whichever is more.
2.02	**Temperature elements**		
a)	RTD's	Number	10% or 2 nos. of each type and length, whichever is more
b)	Thermo well for above applications	Number	10% or 2 nos. of each type and length, whichever is more
2.03	**CONTROL VALVES, ACTUATORS AND ACCESSORIES**		
a)	Pneumatic and electro-hydraulic actuator assembly	Lot	10% or 2 Nos. of each type, model and rating, whichever is more. (1 LOT)
b)	Position feedback transmitter	Lot	10% or 2 Nos. of each type, whichever is more. (1 LOT)
c)	Valve trim (including cage, plug, stem, seat rings, guide bushings	Lot	1 Set for each type of control valve, whichever is more. (1 LOT)
d)	Diaphragms, O' rings, seals etc.	Lot	100% of all types, make etc. (1 LOT)
e)	Pressure Gauges of all types, make, rating etc.	Lot	10% or 2 Nos. of each type whichever is more. (1 LOT)
f)	Solenoid valves	Lot	10% or 2 Nos. of each type whichever is more. (1 LOT)
g)	Positioners unit	Lot	20% or 2 Nos. of each type whichever is more. (1 LOT)
3.00.00	**Electrical Motor**		
3.01	DM Water Regeneration pumps motor and motor bearing	Number	1 no.
3.02	Alkali Transfer cum Recirculation Pump motor and motor bearing	Number	1 no.
3.03	Waste recirculation cum Disposal Pumps motor and motor bearing	Number	1 no.
3.04	Acid Unloading Pumps motor and motor bearing	Number	1 no.

LIST OF MANDATORY SPARES FOR CHEMICAL DOSING SYSTEM (SG)

SL. NO	DESCRIPTION	QUANTITY
1.	Drive shaft cum worm	1 No. for each type of pump per unit.
2.	Drive worm wheel	3 Nos. for each type of pump per unit.
3.	Connecting rod plate	1 No. for each type of pump per unit.
4.	Cross head guide bush	3 Nos. for each type of pump per unit.
5.	Plunger	1 No. for each type of pump per unit.
6.	Plug	1 No. for each type of pump per unit.
7.	Oil seal	1 No. for each type of pump per unit.
8.	Washer	2 Nos. for each type of pump per unit.
9.	Gland nut	2 Nos. for each type of pump per unit.
10.	Motor and motor bearings	1 Set of each type.
11.	Valves all sizes	5% of the total population of each type, size and class OR minimum 2 nos. of each type size & class whichever is more.
	Process Connection Piping (for impulse piping/tubing, sampling piping / tubing and air supply piping as applicable)	
12.	2-way, 3-way, 5-way valve manifolds	10 Nos. of each type, class, size and model
13.	Fittings	100 Nos. of each type
14.	Valves of all types and models	20 Nos. of each type and model
15.	Transmitters of all types, ranges and model no. (for the measurement of Pressure, differential pressure flow, level, etc.)	10%. Or 2 nos. of each type and model whichever is more
16.	Pre-fabricated cable with connector of each type	2 nos. of each type
17.	Pressure, Differential Pressure, Flow, level and temperature gauges	20% of the total population or minimum 2 nos. of each type/rating/model.
18.	Any other instruments (If applicable)	1 no. each type and model
	Agitators	
19.	Impeller Assembly	1 no. of each type
20.	Bearing Assembly	2 no. of each type
21.	Motor*	1 no. of each type and rating
22.	Belt and Pulley (If applicable)	2 nos. of each type
23.	Gear Box Assembly (If Applicable)	1 no. of each type
24.	Agitator shaft assembly	1 no. of each type and rating

25.	Shaft Seal (If applicable)	2 nos. of each type
26.	Complete Agitator Assembly	1 no. of each type
	*In case of Geared Motor/ Motor with integrated Gear where separate Gear Box is not applicable, twice the quantity specified for Motor to be supplied by the contractor.	
	Strainers/Filters	
27.	Filter/strainer element	1 set

LIST OF COMMISSIONING SPARES FOR CHEMICAL DOSING SYSTEM (SG)

SL. No.	ITEM DESCRIPTION	Quantity per skid (No.)	Total Nos.
1.0	**HYDRAZINE DOSING SYSTEM**		
a.	Oil Seals for drive end.	4	8
b.	Gaskets for drive end	4	8
c.	Guide ring for plunger.	4	8
d.	Teflon rings for valves.	8	16
e.	Level gauge glass	2	4
f.	Back up fuse	3	6
g.	Pilot lamp	2	4
h.	Push Button	2	4
i.	Control fuse	2	4
j.	Bulb for Annunciation	4	8
2.0	**AMMONIA DOSING SYSTEM**		
a.	Oil Seals for drive end.	4	8
b.	Gaskets for drive end	4	8
c.	Guide ring for plunger.	4	8
d.	Teflon rings for valves.	8	16
e.	Level gauge glass	2	4
f.	Back up fuse	3	6
g.	Pilot lamp	2	4
h.	Push Button	2	4
i.	Control fuse	2	4
j.	Bulb for Annunciation	4	8
3.0	**NaOH DOSING SYSTEM**		
a.	Oil Seals for drive end.	4	12
b.	Gaskets for drive end	4	12
c.	Guide ring for plunger.	4	12
d.	Teflon rings for valve/s.	8	24
e.	Level gauge glass	2	6
f.	Back up fuse	3	9
g.	Pilot lamp	2	6
h.	Push Button	2	6
i.	Control fuse	2	6
j.	Bulb for Annunciation	4	12

LIST OF MANDATORY SPARES FOR OXYGEN DOSING SYSTEM (SG)

SL.NO.	DESCRIPTION	QUANTITY
1.	Valves all sizes	5% of the total population of each type, size and class OR minimum 2 nos. of each type size & class whichever is more.
	Process Connection Piping (For Impulse Piping/Tubing, Sampling Piping / Tubing and Air Supply Piping as Applicable)	
2.	2-way, 3-way, 5-way valve manifolds	10 Nos. of each type, class, size and model
3.	Fittings	100 Nos. of each type
4.	Valves of all types and models	20 Nos. of each type and model
5.	Transmitters of all types, ranges and model no. (for the measurement of Pressure, differential pressure flow, level, etc.)	10%. or 2 nos. of each type and model whichever is more
6..	Pre-fabricated cable with connector of each type	2 nos. of each type
7.	Pressure, Differential Pressure, Flow, level and temperature gauges	20% of the total population or minimum 2 nos of each type/rating/model.
8.	Solenoids, Actuator if any	2 nos. of each type
9.	Any other instruments (If applicable)	1 no. each type and model

LIST OF MANDATORY SPARES FOR EFFLUENT TRANSFER SYSTEM (ETS) (SG)

SL. NO	DESCRIPTION	QUANTITY
1.0	**Low Pressure Piping**	
1.1	Valves all sizes (Population= All Units)	5% of the total population of each type, size, and class OR minimum 2 nos. of each type size & class whichever is more
NOTE: 1. If there is one no valve only of particular type, class, and size then only one no is required 2. Wherever valves are specified as mandatory spare, complete valve along with actuator and all other accessories which are the part of original supply shall also be supplied.		
2.0	**MEASURING INSTRUMENTS**	
2.1	**1. Electronic Transmitters**	
2.1.1	Transmitters of all types, ranges and model no. (for the measurement of Pressure, differential pressure flow, level, etc.)	2 Nos. of each type and model
3.0	**MICROPROCESSOR BASED/PLC BASED CONTROL/ELECTRONIC BASED CONTRAL PANEL (IF APPLICABLE)**	
3.1	Fully programmed controller of electronic modules of each type (as applicable)	10% or 1 no. whichever is more
3.2	Power supply module (if applicable)	10% or 1 no. whichever is more

LIST OF MANDATORY SPARES FOR SEWAGE TREATMENT PLANT (STP) (SG)

SL. NO	DESCRIPTION	QUANTITY
1.0	**Low Pressure Piping**	
1.1	Valves all sizes (Population= All Units)	5% of the total population of each type, size, and class OR minimum 2 nos. Of each type size & class whichever is more
NOTE: 1. If there is one no valve only of particular type, class, and size then only one no is required 2. Wherever valves are specified as mandatory spare, complete valve along with actuator and all other accessories which are the part of original supply shall also be supplied.		
2.0	**MEASURING INSTRUMENTS**	
2.1	**1. Electronic Transmitters**	
2.1.1	Transmitters of all types, ranges and model no. (for the easurement of Pressure, differential pressure flow, level, etc.)	2 Nos. of each type and model
3.0	**MICROPROCESSOR BASED/PLC BASED CONTROL/ELECTRONIC BASED CONTRAL PANEL (IF APPLICABLE)**	
3.1	Fully programmed controller of electronic modules of each type (as applicable)	10% or 1 no. whichever is more
3.2	Power supply module (if applicable)	10% or 1 no. whichever is more

ANNEXURE-VII

FORMAT FOR OPERATION AND MAINTENANCE
(COMMON FOR TG & SG)

Project name :
Project number :
Package Name :
PO reference :
Document number :
Revision number :

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	**Cover page**				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX, email address, Emergency Contact number				
1.5	Name and sign of prepared by, checked by & approved by				
1.6	Revision history with approval Details				
2.0	**Index**				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	**Description of Plant/System**				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system, operating conditions, performance parameters under normal, start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings, Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				
4.0	**Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)**				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	**Operation Guidelines for plant personal/user/operator**				
5. 1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5. 2	Start up, normal operation and shut down procedure for equipment along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5. 3	Do's & Don't of the equipment.				
5. 4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5. 5	Parameters to be monitored with normal values and limiting				

	values				
5. 6	Trouble shooting with causes and remedial measures				
5. 7	Routine operational checks, recommended logs & records				
5. 8	Changeover schedule if more than one auxiliary for the same purpose is given				
5. 9	Painting requirement and schedule				
5. 10	Inspection, repair, Testing and calibration procedures				
6.0	**Maintenance guidelines for plant personal**				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				
6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres, Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	**Statutory and other specific requirements considerations.**				
8.0	**List of reference documents**				
9.0	**Binding as per requirement**				

ANNEXURE VIII

PACKING PROCEDURE
(COMMON FOR TG & SG)

DOMESTIC PACKING

COMMON GUIDELINES

1 GENERAL:

This standard lays down packing instructions for domestic packing of Components/ Assemblies/ Equipment to be despatched against Customer's contracts, for which there are no special instructions issued by the Engineering Departments. For Seaworthy Packing refer standard AA0490004 wherever applicable.

The Components/Assemblies need to be packed suitably to avoid physical damage & corrosion during transit & storage. For specific applications the concerned engineering department shall issue a product standard. Reference of this product standard, must appear in the Shipping list/Packing List.

2 SCOPE:

This procedure gives minimum guidelines to be complied with for domestic packing of Components /Assemblies/ Equipment. This domestic packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage of materials.

3 WOOD SPECIFICATION

Based on availability, the wood shall conform to specification AA51401 or AA51402.

4 TYPES OF PACKING:

The following 5 types of packing have been standardized for packing of General Components/ Assemblies.

1) **'OP'** - Open Type.
2) **'PP'** - Partially Packed.
3) **'CP'** – Crate/Box Packing - Components/Equipment requiring physical protection.
4) '**CQ**' - Case Packing – Machined components-Small & Medium Components/ Assemblies/ Equipment which require corrosion & physical protection.
5) '**CR**' - Case Packing – Electrical/Electronic Components/ Assemblies, which require special packing viz. Water Proof, Shock Proof etc…

5 DESCRIPTION OF TYPES OF PACKING:

The various types of packing, as standardized above, are described below.

5.1 'OP' - Open Type

In case, of components which are not affected by water & dust and do not require special protection, are generally not machined, shall be sent as open packages. However, these components may be sent in crates, wherever necessary.

5.2 'PP' - Partially Packed

Components which need special protection at selected portions only shall be despatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces should be protected with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene

COPYRIGHT AND CONFIDENTIAL
The Information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.
It must not be used directly or indirectly in any way detrimental to the Interest of the company.

Film to Specification No. AA51420. All sharp corners and edges shall be protected by rubber mats to prevent damage to the polyethylene film

5.3 'CP' - Crate Packing

Assemblies/Components which need only physical protection from the point of view of handling shall be despatched duly packed in crates.

5.4 'CQ' - Case Packing - Machined Components/Assemblies/Equipment

Small and medium sized components/assemblies/equipment due to size/weight and to avoid handling and pilferage problems shall be packed in Case/Containers. Wherever required adequate quantity of silica gel to AA55619 or VCI Powder/Tablets, packed in thin muslin cloth cotton bags shall be suitably placed. Small machines/components of less weight shall be provided with suitable cushioning by Rubberised coir. The components inside the case shall be entirely covered with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No. AA51420, wherever required. This may be prescribed for electronic parts/critical machined components/surfaces.

For mechanical product like valves where motors are separately securely wrapped in polyethylene, the requirement of individual component wrapping shall be exempted.

5.5 'CR' - Case Packing - Electrical & Electronic Components/Assemblies

Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons. Adequate quantity of Silica gel to AA55619 packed in cotton bags of 100grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No. AA51420 before being packed in the cases. VCI Powder/Tablets can be used as an alternative to Silica Gel to AA55619.

Empty space in the cartons shall be filled with rubberized coir to get proper cushioning effect. The cartons shall be manufactured from corrugated Fiber Board, meeting requirements of AA51414 .

6 PREPARATION OF PACKING CASES

6.1 DIMENSIONS:

a) Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25/20mm +2/-3 mm as per applicable drawings of the respective units.

b) Width of all planks including the tongue shall be more than 125mm and after plaining it shall be minimum 100mm.

c) Minimum number of planks shall be used for a shook.

d) Horizontal, vertical, diagonal planks shall be given for binding (number of such planks depend on the dimension of panel.

e) Width of binding planks shall be minimum 100mm.

f) Distance between any 2 binding planks shall be less than 750mm.

g) diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm

h) Distance of the outer edges of these planks from the edge of case shall be less than 250mm.

i) Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.

6.2 JOINTING OF PLANKS

Single length planks shall be used for cubicles whose overall length is less than 2400mm. For cubicles of length more than 2400mm, jointing is permitted. The jointing shall be done with one single or maximum of 2 planks of wood same as other planks of width 250 mm (minimum) with two rows of nails on either side of the joint in zigzag manner. From the joint along height side, it shall be of lap joint with overlap of at least the width of plank.

6.3 TONGUE AND GROOVE JOINTS

Two consecutive planks shall be joined by tongue and groove joint. Depth of tongue shall be 12+1 mm, thickness of tongue shall be 8 +1 mm. The groove dimensions shall be such that the tongue fits tightly into the groove to make a good joint. This type of joint can be done based on the product requirement wherever required.

6.4 PERMISSIBLE DEFECTS

Wood shall be free from knots, bows, visible sign of infection and any kind of decay caused by insects, fungus, etc.

End splits: Longest end splits at each end shall be measured and lengths added together. The added length shall not exceed 60mm per meter run of shook's. Wood pins shall be used to prevent further development of split.

Surface cracks: Surface cracks with a maximum depth of 3mm are permissible. A continuous crack of any depth all along the length is not allowed.

6.5 OTHER MATERIALS

6.5.1 NAILS

The dia. of the nails shall be 3.15mm. The length of the nails shall be 65mm wherever two planks of 25mm thickness are joined and 75mm wherever a 25mm planks is joined to a 50mm plank.

6.5.2 BLUE NAILS

These are used for nailing bituminized Kraft paper/hessian cloth to the planks. The length of the nails shall be 16mm.

6.5.3 HOOP IRON STRIPS

These are used for strapping the boxes. The width of the strips shall be 19+1mm and thickness 0.6+0.01mm. The material shall be free from rust.If sufficient nailing is done for bigger boxes, strapping need not be done.

6.5.4 CLIPS

These shall be used for strapping the hoop iron strips on the boxes.

6.5.5 BRACKETS

These brackets are used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of thickness min 2mm and width 25+1mm. The brackets shall be of "L" shape, the length of each side being 100+2mm. Two holes shall be provided towards the end of each side for screwing /nailing.

6.5.6 FASTENERS

Bolts, double nuts, spring washers will have to be used for packing of some special items like transformers, reactors, breakers, etc., to hold the job to the bottom plank of the box. The bolts, nuts, washers will be provided by the vendor. Drilling of holes will have to be done using contractor's tools.

6.5.7 MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM

100GSM (Colourless) Multi Layered Cross Laminated Polythelene Film Specification No: AA51420 are used to make covers to the jobs individually. The cross lamination gives qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays.

6.5.8 RUBBERISED COIR:

The rubberized coir is used as cushioning material. For the packing of loose items, items are to be arrested by using rubberized coir. For the packing of cubicles rubberized coir of thickness 25mm and width 75mm shall be used.

6.5.9 FOAM RUBBER / 'U' FOAM:

This is used for covering the delicate items. This material is provided by the vendor.

6.5.10 MARKING PLATE:

This shall be of anodized aluminium sheet. Size of the marking plate shall be maintained minimum of size as per the details specified in the Figure 4.

6.5.11 PACKING SLIP HOLDER:

This shall be of galvanized iron tinned sheet /Aluminium sheet

6.5.12 SILICA GEL:

This shall be of indicating type to conform to IS: 3401/AA55619.Silical gel shall be used for such products only where moisture needs to be avoided.

6.5.13 COTTON BAGS:

These are used for holding silica gel. The bags shall have the following matter indicated on them:

BHEL-UNIT NAME	PLACE-PINCODE
SILICA GEL	INDICATING TYPE
BLUE :	ACTIVE
ROSE :	REDUCED ACTIVITY
WHITE :	NO ACTIVITY. TO BE REPLACED WITH FRESH SILICA GEL

6.5.14 COTTON/ PLASTIC TAPE:

This is used for tying small items. And also to prevent vibrations of moving parts within the cubicles.

6.5.15 MARKING INK:

The ink used normally is black in color. In some special cases other color also will have to be used. The ink shall be non-fading/indelible and non-washable by water.

6.5.16 POLYETHYLENE BAGS:

These are to be used for keeping the Packing slips. The bag shall be of size 70mm X 100mm (minimum).

6.5.17 Hessian cloth, twine thread, paint will have to be used in packing certain items.

6.5.18 Mechanical Latching clamps:

For CLW Railway panels and similar Panels self-locking clamps can also be used on need basis in conjunction with or apart from regular bolt and nut fixing arrangement. For reusable boxes, these clamps provide easy locking and unlocking arrangement. These clamps will be made available from BHEL in some cases.

6.5.19 STICKERS

The following stickers to be put by the vendor on cubicles/Boxes after packing.

1) Case No sticker: 2 nos. Size 25.Cm x 0.45Cm
2) BHEL Monogram sticker: 1 no. Size 1.75Cm x 2.3Cm
3) Address sticker: 2 nos. Size 3.8Cm x 3.0Cm
4) Direction sticker “Front” & “Back” - 4 nos. Size 2.0Cm x 0.75Cm
5) Chain Mark Sticker: 4 Nos. Size – 3.0Cm x 0.75Cm
6) "Fragile” sticker: 2 Nos. Size. 2.1Cm x 1.5Cm
7) "DO NOT STACK” sticker - 2 Nos. Size 3.0Cm x 2.2Cm

In place of stickers, writing all the details legibly with paint shall be allowed & respective units may take decision accordingly.

7 PACKING OF CUBICLES:

7.1 The packing is to be done as per clause 5 in all respects.

7.2 The cubicles are already fixed on wooden pallets. Hence the contractor need not arrange the bottom pallets normally.

7.3 The cubicles will be of different sizes both width wise and lengthwise. The cubicles may be made up of single suite, 2 Suite, 3 Suite, 4 Suite, etc., The width of the cubicles generally varies from 400 mm to 1650mm.The length of the cubicle, generally varies from 1500 mm to 4800 mm. The height is normally 2430 mm. In some cases, the height may be less/more.

7.4 MULTI LAYER CROSS LAMINATED POLY FILM

The inner surface of 4 sides of shook's shall be nailed with Multi-layer cross laminated poly film (as per 6.5.7) using blue nails (as per 6.5.2) wherever 2 pieces of Cross laminated poly film are used, the joint shall have an overlap of minimum 20mm.

The inner surface of top cover shall be nailed with Multi-layer cross laminated poly film (as per 6.5.7). This sheet shall project outside on 4 sides by at least 100mm and shall be nailed properly on sides. Joining of sheets should have overlap of minimum 20mm.

The cubicles shall be covered with Multi-layer cross laminated poly film (as per 6.5.7).

7.5 SILICA GEL:

Silica gel (as per 6.5.12) packed in cotton bags shall be kept at different places inside the cubicle as per BHEL-Unit directions. Each suit of cubicle shall be provided with 1 kg of Silica gel (for a 4 suit cubicle 4 kgs of Silica Gel to be used. The bag containing silica gel to be as per 6.5.13).

7.6 LOOSE PARTS:

Any loose parts in the cubicles shall be tied using cotton/ plastic tape. Wooden battens shall be provided wherever necessary.

7.7 WOODEN BATTENS:

In case of cubicle which are not rectangular in shape like control desks, sufficient number of wooden rafters/battens of proper size shall be provided to give strength to the package.

7.8 RUBBERISED COIR:

Gap between the cubicle and the case shall be filled with rubberized coir (as per 6.5.8) with distance between consecutive layers less than 500mm.

7.9 CLAMPING:

Packing shall be bound at edges by nailing M.S. Clamps / Brackets (as per 6.5.5). Each vertical edge shall have minimum 3 clamps. Top horizontal edges will have one clamp for every meter length of package. However, minimum 4 clamps shall be nailed at the top for any cubicle.

7.10 PACKING SLIP:

Packing slip kept in the polyethylene bag (As per 6.5.16) shall be placed in the box at appropriate place. In addition, one more packing slip covered in polyethylene cover and packing slip holder (as per 6.5.11) shall be nailed to front / rear of case.

7.11 MARKING PLATE:

One no. (As per 6.5.10) shall be nailed to the front side of the case.

7.12 CASE MOUNTING:

After complete packing, stencil marking of various details and marking of symbols shall be done as per BHEL instructions using indelible / non washable marking ink.

7.13 Different types (Typical) of Cubicles with sizes for Packing

1. Single suite cubicle - 900 x 950 x2500
2. Two suite cubicle - 1650 x 950 x 2500
3. Three suite cubicle - 2400 x 950 x2500
4. Four suite cubicle - 3150 x 950 x 2500
5. Regulation cub - 1300 x 1350 x 2500
6. Thy cub - 2870 x 1350 x 2500
7. VFD Cub - 3800 x 1550 x 2500

7.14 PACKING OF CUBICLES FOR EXPORT

Refer Corporate Standard AA0490009.

8 PACKING OF LOOSE ITEMS/SPARES

1) Shape of cases shall be square, rectangular with single gabled roof or with double gabled roof depending on the nature of the job to be packed. Construction shall be as per drawings enclosed. Only gable will be additional as required.
2) Wood shall conform to specification AA51401 or AA51402 with Tongue and Groove joint as per clause 6.3.
3) Width of planks shall be at least 100 mm. Width of binding planks (battens) shall be at least 75mm.
4) External surface of planks on front and rear shall be plane 100% (except bottom plank).
5) Inner surfaces of all 6 sides shall be lined with Multi Layered Cross Laminated Polythelene Film (as per clause 6.5.7) using blue nails.
6) Rubberized coir of minimum 25mm thickness and 100 mm width shall be nailed to inner surfaces of bottom and 4 sides of box.
7) Internal packing: Items that go into the box shall be packed using 100GSM, (Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No: AA51420. Any space left between the job and the sides and the top of the box shall be filled with rubberized coir to get proper cushioning effect.
8) Certain items like transformers, reactors, breakers, etc., shall be bolted to the bottom of the box using bolts, nuts and washers.
9) Silica gel as per clause 6.5.12 held in cotton bags as per clause 6.5.13 shall be kept at proper places in the box.
10) Packing slip kept in polyethylene bag (clause 6.5.16) shall be placed in the box.
11) Marking plate as per clause 6.5.10 shall be nailed to side of the box.
12) Two numbers of hoop iron strips as per clause 6.5.3 shall be strapped tightly on the case using clips.
13) Stencil marking of various details and marking of various symbols shall be done as per BHEL instructions using indelible/non-washable marking ink.
14) Loose items to be kept inside the cubicle

- The components which are removed from cubicle for shipping purpose only, such as meters shall be kept inside the cubicle individually, kept in wooden box and tied firmly in bottom of Cubicle.

- Other items which are given loose in addition to cubicle shall be packed in separate boxes.

9 BOX SIZES

9.1 BOX SIZES

COPYRIGHT AND CONFIDENTIAL
The Information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.
It must not be used directly or indirectly in any way detrimental to the Interest of the company.

Table 1 – SPARES WOODEN BOX DETAILS

SNO	BOX TYPE	BOX SIZE (in mm)	BOX Wt (in KG)	Carrying Capacity
1	A	800 X 200 X 200	15	
2	B	1500 X 200 X 200	22	
3	C	2000 X 200 X 200	27	
4	D	1100 X 200 X 200	15	
5	E	200 X 200 X 200	5	
6	F	320 X 250 X 260	13	
7	G	320 X 250 X 430	16	
8	H	430 X 370 X 430	23	
9	I	1100 X 400 X 400	45	
10	J	1500 X 500 X 400	65	
11	K	2000 X 500 X 400	93	
12	L	2500 X 500 X 400	88	
13	M	900 X 600 X 600	100	
14	N	3000 X 400 X 400	60	
15	P	600 X 500 X 400	35	
16	Q	710 X 630 X 600	90	
17	R	850 X 630 X 670	102	
18	S	1000 X 770 X 670	140	
19	T	2500 X 850 X 800	180	
20	U	1500 X 700 X 700	120	
21	W	1200X900X600	120	
22	Y	450 X 200 X 200	10	

Table 2 – WOODEN BOX DETAILS

BOX TYPE	BOX SIZE (in MM)	BOX Wt (in KG)	Carrying Capacity
1	320X250X260	10	
2	320X250X430	15	
3	430X370X430	25	
4	670X670X470	65	
5	720X630X600	75	
6	1000X770X660	100	
7	1100X430X670	80	
8	1200X1200X900	80	
9	1300X770X1050	155	
10	2500X850X800	225	
11	2000X1500X1200	305	
12	1850X1050X1250	260	
13	2000X800X800	180	
14	2600X1500X1600	470	
15	250X250X600	20	
16	250X250X880	30	
17	300X300X700	25	
18	380X380X880	45	
19	510X510X1400	60	
20	570X570X1400	80	
21	575X575X1875	105	
22	3600X1100X1100	390	
23	900X500X800	110	
24	2000X950X740	225	
25	1600X1120X700	220	
26	2500X2000X1200	490	
27	2900X1900X1400	525	
28	3000X1000X900	370	
29	3200X2200X950	450	
30	2150X1100X750	325	
31	2000X2000X700	130	
32	700X1200X1325	130	

Table 3 – STEEL BOXES

SL NO	TYPE	DIMENSION IN MM			WEIGHT	CARRYING CAPACITY (KGS)
		LENGTH	BREADTH	HEIGHT		
1	I	2480	1680	1500	339	4500
2	II	1200	900	600	061	2000
3	IIB	1800	850	950	115	2500
4	III	900	600	600	029	1000
5	IV	600	450	500	019	750
6	V	400	350	300	011	500

TYPICAL PATTERN OF WOODEN BOX

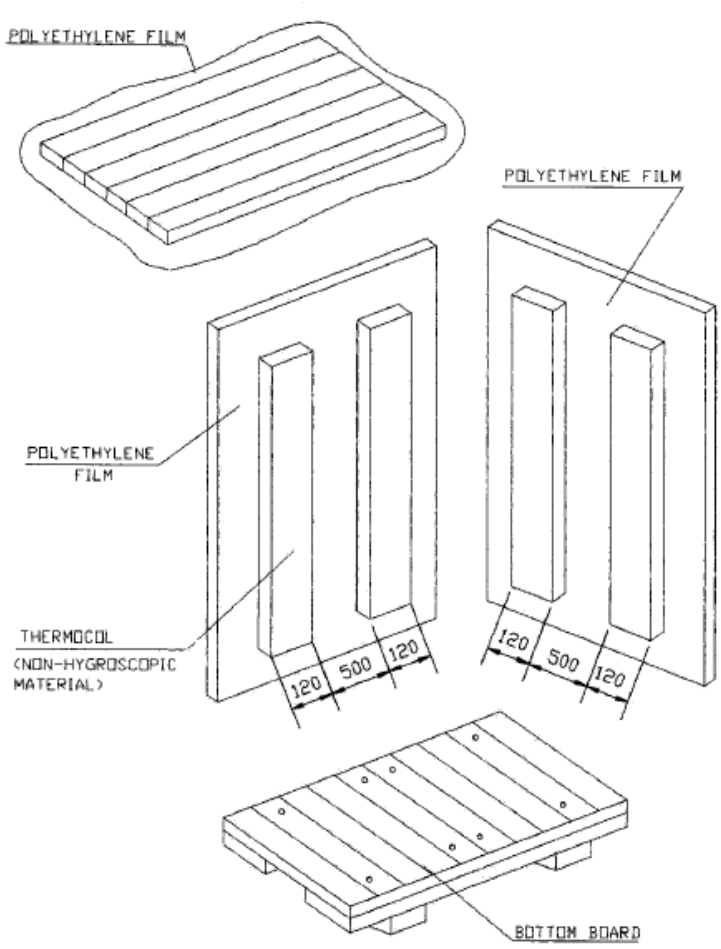


Figure 1

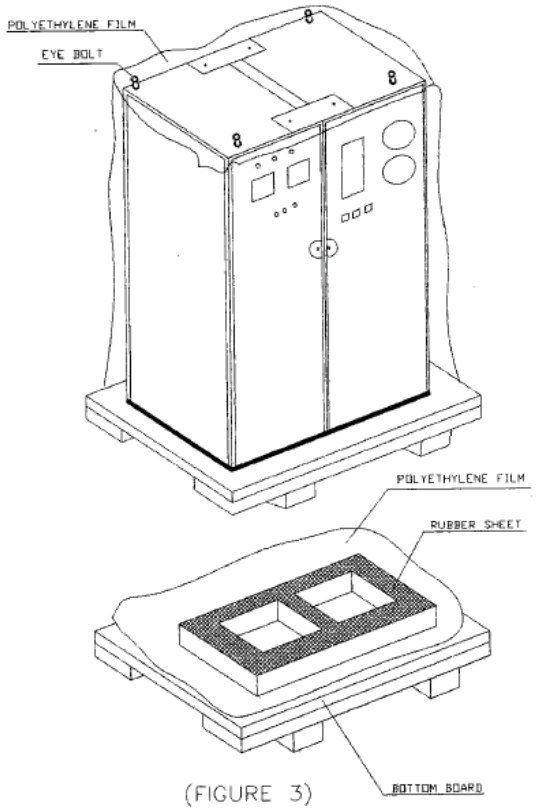


Figure 2

9.2 STEEL CONTAINERS:

Steel containers for packing can be used in case of repeated supplies of the same equipment. Empty steel containers are to be returned back from customer's end and to be reused for the next supplies. The containers are to be made of structural steel as per AA10108 with proper reinforcement with I, C and T Sections. Depends on the availability of resources & requirements units may be allowed to use standard cargo containers also instead of fabricated steel boxes.

a) Following precautions are to be taken during packing: -

b) Put the machine in the steel container properly,

c) Cover the machine with polythene.

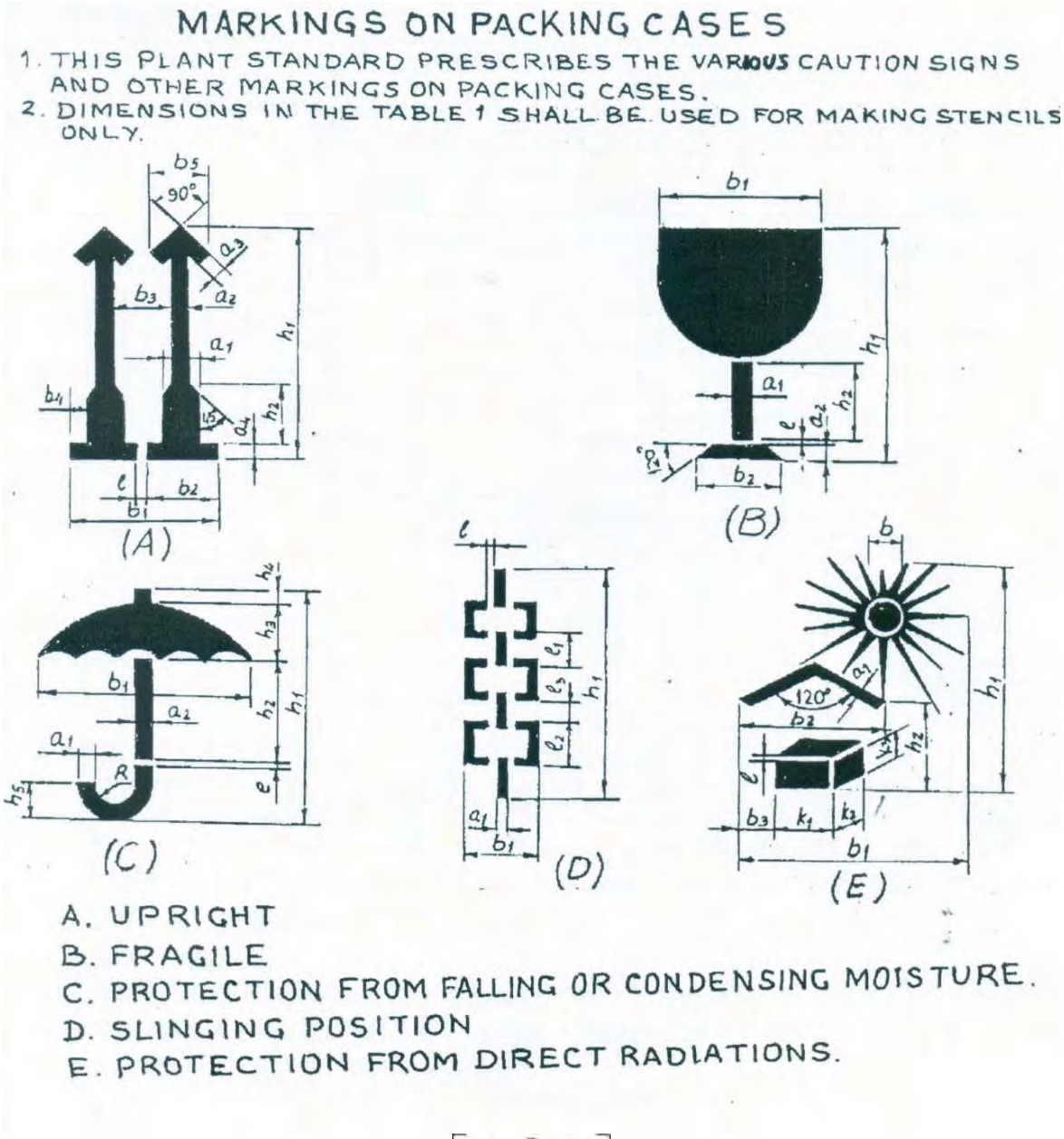
d) To arrest the movement in the steel container necessary wooden Blocks/Battons may be put.

e) Put cover on steel, container and Bolt Properly

9.3 SEALED PACKING:

Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture. The components sub-assemblies and assemblies are completely covered with 2 layers of polyethylene sheet. All sharp corners and edges are to be protected by rubber mats to prevent the polyethylene sheet from damage. Top surface of the case shall be free from dents to prevent rain water pockets.

10 MARKINGS/STENCILINGS



Center of Gravity

Figure 3

DESIGN-ATION		DIMENSION IN MM																						
		a1	a2	a3	a4	b1	b2	b3	b4	b5	b	l	h1	h2	h3	h4	h5	k1	k2	k3	l1	l2	l3	R
A	1	12	5	5	4	52	25	19	8	21		2	84	23										
	2	17	7	7	6	75	36	29	11	30		3	119	33										
	3	24	10	10	8	104	50	38	16	42		4	168	46										
	4	34	14	14	11	147	71	59	23	60		5	239	65										
B	1	5	5			50	33					2	84	25										
	2	7	7			71	47					3	119	36										
	3	10	10			100	66					4	168	50										
	4	14	14			142	94					5	239	71										
C	1	4	3			66						2	80	39	19	5	11							6
	2	6	4			85						3	114	55	27	7	16							9
	3	8	6			120						4	160	78	38	10	22							12
	4	11	9			170						5	227	110	54	14	31							17
D	1	6				30						4	148								30	30	10	
	2	9				42						5	209								42	42	14	
E	1	3				69	47	10			16	2	91	26				17	8	11				
	2	4				98	67	15			23	3	128	33				24	11	16				
	3	6				138	94	20			32	4	182	62				34	16	22				

Table 4

Black and Red Marking Ink to IS:1234 "Ink, Stencil, Oil Base, For Marking Porous Surfaces" or duplicating ink stencilling, oil base for marking porous surfaces.

All cases containing fragile items are to be stencilled with red marking and stencilling paint/ink

"HANDLE WITH CARE", "FRAGILE DO NOT TURN OVER".

Besides the caution signs the product information's shall be stencilled of letters with 13mm to 50mm height.

In case of consignment consists of more than one package, each package shall carry its package no as given in shipping list. All caution signs shall be stencilled in high quality full glossy out door finishing paint red in colour (AA56126). All other markings shall be carried out in black enamel(AA56126).

Caution signs & other markings shall be stencilled on both the end shooks & the side shooks.

Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.

Note: Incase the size of package is small for using the stencils, then hand written letters/figures shall be allowed.

	BHEL – <unit> - <location> - <pin>				
CONSIGNEE					
MATERIAL					
CUSTOMER REF.				MO. NO.	
DESPATCH ADVICE NOTE NO				CASE NO	
DIMENSIONS(MM) L x B x H				NET WT –KGS	GROSS WT –KGS
SPECIAL INSTRUCTIONS	HANDLE WITH CARE - KEEP DRY DO NOT DROP - DO NOT TILT				

Figure 4 – TYPICAL MARKING PLATE (225 X 170)

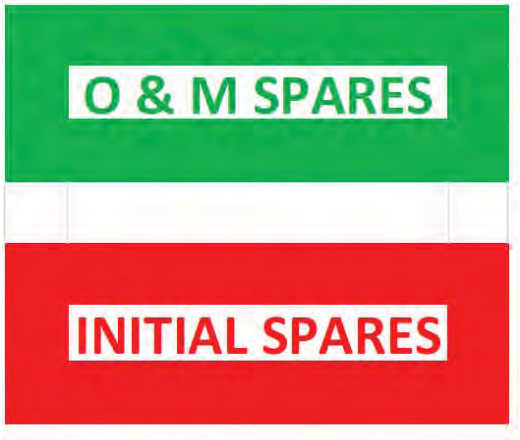


Figure 5

Easy spares [Initial and O&M] Traceability and Identification at units and as well as at sites:

11 RECYCLING OF INCOMING WOODEN PACKING CASES

OBJECTIVES

– To utilize useable wood of incoming packing cases, for manufacturing of new packing boxes.
– To recycle incoming wooden packing cases, as such, wherever possible.

1) All incoming wooden packing cases received from suppliers /customers will be opened carefully, with the intention of reusing them, by Shop.
2) After carefully taking out the contents, the empty wooden packing cases will be shifted by Shop to the specified locations i.e. bin / nearly spaces, already earmarked in stores.
3) Material shifting contractor engaged by store, will collect all such wooden packing cases and scrap wood from specified points, on a regular basis.
4) After collecting / loading the empty packing cases/ scrap wood, contractor will take the carrier first to Weighment Bridge for weighment, thereafter; he will go to Carpentry, where Carpentry representative will identify the packing cases which can be used by Carpentry for manufacturing of New Packing Boxes. All such identified packing boxes will be unloaded and handed over to Carpentry by contractor.
5) These packing boxes will be made re-useable after necessary rectification and additional work.
6) Contractor will again take the carrier for weighment and this second reading will also be recorded on the same “Weighment Slip”.
7) Weight of empty packing cases / scrap wood taken will be calculated on the basis of 1st and 2nd weighment readings recorded on the “Weighment Slip”. A copy of“Weighment Slip” (where both the weighment readings are recorded) will be given by the contractor to the carpentry representative. Based on this “Weighment Slip”, carpentry will maintain a register in which details of quantity received will be recorded.
8) All “Weighment Slips” will invariably be signed by carpentry representative (even when no boxes have been unloaded by carpentry). Store will accept the scrap wood only if “Weighment Slips” are signed by carpentry representative.
9) Balance empty packing cases / scrap wood will be handed over by contractor to Store, for storing in scrap yard.
10) A separate area in Scrap yard will be provided, for executing the work of denailing of wooden packing cases, under supervision of carpentry.
11) Carpentry contractor will identify packing cases / scrap wood for denailing, which will behanded over to him by Store, at Scrap yard, for denailing and further operation.
12) Quality and Carpentry will jointly inspect the wood generated by de-nailing process and will prepare “INSPECTION CUM RECEIPT REPORT OF USEABLE WOOD RECEIVED FROM TPS – STORE BY CARPENTRY”.
13) After acceptance of the wood by Quality and Carpentry, the same will be shifted to carpentry for receipt and its record will be maintained by carpentry.
14) This will be a Permanent Productivity Project executed by carpentry. “Productivity Savings “duly verified at the current Purchase Order rate of wood, will be sent every month to Resource Management Department, for highlighting it in their monthly progress report.

12 STANDARD METHOD OF PACKING

Table 5 - Standard Method of Packing

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
PRESSUE VESSELS								
TOWERS					O			
TANKS					O			
VESSELS					O			
GASKETS	O							
FASTENERS	O							
COVERS		O						
EXCHANGERS								

CORPORATE STANDARD

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
HEAT EXCHANGERS					O			
TUBE BUNDLE	O							
SHELL					O			
AIR FIN COOLERS					O			
COLOUMNS, MOTOR SUSPENSIONS, PLENUM CHAMBERS, SCREEN GUARDS, ETC					O			
BEARING BLOCKS	O							
FANS	O	O						
MOTORS	O							
GASKETS	O							
FASTENERS	O							
TEST FLANGES			O					
TEST RINGS			O					
COVERS			O					
CRYOGENIC VESSELS								
COLD CONVERTERS					O			
HORIZONTAL STORAGE TANKS					O			
TRANSPORTATION TANK					O			
COLD BOX					O			
DRYING UNIT					O			
DRYING BOTTLES					O			
MOISTURE SEPARATORS					O			
SILENCERS					O			
ONGC SKIDS					O			
VAPORISER		O						
SPECIAL PRODUCTS								
SI/VI PIPING		O						
CRO BIO CONTAINERS	O							
AIR BOTTLES	O							
TITANIUM BOTTLE	O							
WAR HEAD CONTAINER	O							
MISSILE CONTAINER	O							
FUEL CONTAINER	O							
AIR LOCK ASSEMBLY	O							
BOILER DRUMS					O			
BOILER ITEMS								
COILS			O					
PANELS					O			
HEADERS			O		O			
FEEDERS								
MACHINED ITEMS								
SHELL SEGMENTS					O			

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
SHELL SEGMENTS IN STACKS					O			
SPHERE PETALS								
COLOUMNS, BASE PLATES, TIERCOS, PIPES, NOZZLE E1, F1, INTERNAL PIPES, PADS ETC.					O			
ROLLERS	O							
VALVE TRAYS								
VALVE TRAY COMPONENTS	O							
LATTICE GIRDERS		O						
FASTENERS	O							
GASKETS	O							
SUB CONTRACTS								
FAB STRUCTURALS					O			
SUPPORTING STRUCTURALS					O			
STRUCTURE SUB ASSEMBLY					O			
FAB PIPES					O			
GRATINGS					O			
STAIR CASES					O			
HANDRAILS/ PLATFORMS					O			
BOUGHT OUT COMPONENTS								
IRON & STEEL (LIKE PLATES, BEAMS, ANGLES, CHANNELS ETC.)					O			
PIPE FITTINGS								
CS PIPES, TUBES					O			
SS PIPES, TUBES					O			
FIN TUBES	O							
ELBOWS		O			O			
FLANGES	O	O						
VALVES	O							
GAUGES	O							
DEMISTERS		O						
ABSCRBANTS (LIKE MOLECULAR SIEVES, ACTIVATED ALUMINA, MOBILE SORBID)						O		
PAINT TINS		O						
PAINT DRUMS						O		
IGNITORS	O							
SPRAY NOZZLES	O							
ELECTRICAL INSTRUMENTATION								
MOTORS, PUMPS, COMPRESSORS, TURBINES	O							
SWITCH BOARDS, DISTRIBUTION BOARDS, STARTERS, JUNCTION BOXES		O						
INDICATORS, VIBRATOR SWITCHES	O							

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
CABLE BUNDLES, CABLE DRUMS					O			
CABLE TRAYS, CABLE RACKS, EARTHING MATERIAL		O						
OPERATIONAL SPARES	O							

13 PROCEDURE FOR HANDLING OF COMPONENTS

The purpose of this procedure is to protect the quality of the components/equipment while handling in various stages of manufacturing packing & despatching.

13.1 Adequate care shall be taken in handling the material, and components to avoid damage during receipts, storage issue manufacture & despatch operations.

13.2 Appropriate material handling equipment like fork lifters, cranes etc. shall be used where needed.

13.3 Lifting by crane and transportation by trolley of critical items and large components like rotors castings etc. shall be done carefully.

13.4 For critical items, where specified, special handling fixtures shall be used for lifting.

13.5 Slings and shackles used for lifting the components/equipment shall be checked for fitness and suitability before use.

13.6 Slings used on machined surfaces shall be suitably padded. No slings shall be used on journal surfaces.

13.7 Precision machined components like blades, catches, rollers etc. shall be lifted using suitable wooden pallets.

13.8 HANDLING OF COMPONENTS ON RECEIPT/DESPATCH

Before loading/unloading a packing case from the carrier look for the following shipping instructions painted on the packing case.

a) The markings showing the upright position.

b) The markings showing the sling position

c) Markings showing the fragile contents.

d) Other required markings as per clause no.10

13.8.1 Appropriate cranes and slings should be used for different components/ cases. Slings should normally make an angle as minimum as possible (width wise) but in no case more than 15º.

13.8.2 Handling and lifting should be done without jerks or impacts.

13.8.3 Immediately after receipt of the goods, the packing should be examined all-round for any sign of damage. If necessary, lift the cover or a number of boards of the case so as to make the contents visible. In the event of sealed packing being used the plastic sheeting should not be damaged. It is imperative that the packing material is restored in original condition after the inspection.

13.8.4 On receipt of the equipment it should be checked with the shipping list and missing or damage if any should be reported immediately. It is important to arrange for immediate examination to determine the extent of the damage, the cause of the damage and where applicable the person or persons responsible for the damage. According to general practice when transporting by railway or by road vehicle the carrier concerned should be immediately called upon (within specified periods) for jointly establishing a statement of the damage. This is essential as a basis for a subsequent claim and possible damage report to the insurance company.

13.8.5 Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.

13.8.6 Silica gel and such other chemicals kept in the box as desiccants and indicators should also be left in the box itself.

14 GENERAL GUIDELINES FOR ODC TRANSPORTATION/DESPATCH

Based on the Dimensions/Weight indicated in the Transportation Sketch, the type of Trailer is decided and indicated in the Tender Enquiry.

14.1 TRANSPORTATION:

1. LOW BED TRAILERS (LB 8):
   - Well Bed Length : 10000mm
   - Over Gooseneck : 13000mm
   - Width : 3000mm
   - Carrying Capacity : 40MT

2. LOW BED TRAILERS (LB 16):
   - Well Bed Length : 12000mm
   - Over Gooseneck : 16000mm
   - Width : 3000mm
   - Carrying Capacity : 75MT

3. TOW TYPE TRAILERS (WITH FRONT DOLLEY 16 TYRES): 12000MM length
   (for Exceptional equipment length: 30000mm and above)

   Bigger Dia equipment are loaded in the Well with overhanging.

   Smaller Dia equipment with excess length are loaded over Gooseneck with rear hanging.
   The Vehicle Dimensions are defined above are only guidelines for selection based on actual Dimensions/ Weight of the Consignment

14.2 PACKING:

For all ODCs, Wooden Saddles are cut to the diameter of equipment as per the Transportation Sketch.

Wooden Saddles	For Diameter up to 4000mm	For Diameter above 4000mm
Length:	1836/2743mm (6'0"/9'0")	3353mm (11'0")
Width:	300mm (1'0")	300mm (1'0")
Height:	Saddle + one/two wedges a top	Saddle + three/four wedges a top

Number of Saddles:	
Minimum	3 in case of Loading inside Well +1 when loaded on Gooseneck
Maximum:	4 in case of Loading inside Well +2 when loaded on Gooseneck

For Securing the equipment firmly on the Trailer, 19mm (3/4"), wire rope with 25mm (1") Heavy Duty Turn Buckles / BD Clamps are used as Lashing for the equipment.

14.3 NUMBER OF LASHINGS:

	CONSIGNMENT LOADED INSIDE WELL BED	CONSIGNMENT LOADED OVER GOOSENECK
a) up to 40MT	4 (2 Single Line lashing 2 Double Line Lashing)	5 (3 Single Line Lashing 2 Double Line Lashing)
b) 40MT to 60MT	5 (3 Single Line Lashing 2 Double Line Lashing)	5 (Single Line Lashing 3Double Line Lashing)
c) 60MT and above	5 (2 Single Line Lashing 3 Double Line Lashing)	6 (3 Single Line Lashing 3 Double Line Lashing)

15 GUIDELINES FOR HANDLING/LOADING/LASHING

15.1 HANDLING



Figure 6

Before unloading the jobs Completely painted and neatly stencilled will be checked.

Pipes with split type end cover will be checked



Figure 7

All Coil Tubes to be provided with End Caps.



Figure 8

Neatly stacked Coil Assemblies.



Figure 9

Columns to be lifted with Nylon belts. This protect painting, edges and attachments.



Figure 10

15.2 LOADING

All the components to be transported by putting inside the properly fabricated Crating



Figure 11

Small components may fall down while transporting without closed crating and there are chances of missing of small parts. Hence, it is always better to transport small components in closed containers/crating. Loose to be being shipped in a closed crating.



Figure 12

No component loaded over the crating.



Figure 13

Headers supported with wooden V blocks at 3 meters interval.



Figure 14

Spacers in between each coil assembly.



Figure 15

Goose pipe to be provided with rubber pad protects removal of painting and damage to the job.



Figure 16

15.3 LASHING

Use Nylon belts only for lashing of all components. It prevents removal off painting and cut in the materials.



Figure 17

Nylon Belts used for lashing the beams.



Figure 18

16 PRODUCT WISE SPECIAL INSTRUCTION

Additional instructions of packing not included in this standard shall be covered by individual product standard.

17 REFERRED STANDARDS (Latest publications including amendments):

1) AA51420	2) AA55619	3) AA51414	4) IS:3401	5) AA10108
6) AA56126	7) AA51402	8) AA51401	9) IS:1234	

VACUUM PACKING FOR ELECTRONIC COMPONENTS

1 GENERAL

This standard lays down the packing instructions for packing of components / Electronic module / Assemblies to be dispatched against Customer contracts.

2 SCOPE

This procedure covers method of packing electronic components using vacuum packing in a wooden packing boxes.

3 OBJECTIVE

To establish a rust proof safe packing procedure and where the components required to protect against temperature and humidity. In general minimum temperature +5 deg C and maximum temperature 45 deg C, and relative humidity between 10% to 40%.

4 PACKING BOX

Wooden Box shall be made as per BHEL Standard AA0490010 for Domestic/ AA0490009 for Export/ AA0490004 for Seaworthy packing. Size of the box as per the contract requirement which has to be checked by QC.

5 PACKING PROCEDURE

a) Cleaning parts shall be thoroughly cleaned just before VCI (Volatile Corrosion Inhibitor) Vacuum packing. Finger prints on cleaned items are to be avoided as the same are very corrosive.

b) VCI Rust preventive oil (Ferrous grade oil base) shall be applied to all the components to withstand any corrosion.

6 VCI VACUUM PACKING

a) Bubble wrapping the items VCI vacuum packing.

b) Appropriate vapour corrosive packets one pouch (1 gm. /pouch) of VCI Anticorrosive Powder and one pouch (10gm./ pouch) of VCI Desiccant per 1000 cub. meter packing space shall be placed inside the VCI vacuum packing.

c) All the components shall be separately packed using VCI laminated Aluminium foils from which air/moisture are removed by the air vacuum device and sealed thoroughly using heat sealing machine. At the time of the evacuation the vacuum inside the pack should be less than 0.5 ata.

d) One identification slip containing component information such as description of item, Material No. Customer PO, Item No. Quantity etc. shall be put inside the VCI vacuum packing.

e) Top cover of the wooden box shall be sealed only after final clearance from QC for confirmation of above.

f) All boxes should be covered by water proof tarpaulin over top and on all sides.

g) The packing boxes shall be covered with GI sheets (0.25 -0.4mm thick) on all the sides for Export / Seaworthy packing.

h) Vacuum packing room temperature and Relative Humidity should be maintained as mentioned below:

Min. +5 deg. C and Max. 45 deg. C, Relative humidity between 10% to 40%.

COPYRIGHT AND CONFIDENTIAL
The Information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.
It must not be used directly or indirectly in any way detrimental to the Interest of the company.

7 COMPONENTS REQUIRED

7.1 VCI laminated Aluminium foil

Volatile Corrosion Inhibitor (VCI) safe foil shall be with aluminium barrier laminated which is flexible, heat sealable, water vapour and anticorrosion resistant barrier laminate of polyester, Aluminium foil and VCI Polyethylene. It is used as a primary packaging material for packing metal components and sealed with the help of a heat sealer after vacuuming with vacuum machine maintaining the humidity level below 40 RH inside the package.

7.2 Composition construction of VCI laminated Aluminium foil

a) PET Film : 12 Microns
b) Bonding layer : 2 Microns
c) Aluminium Foil : 9 Microns
d) Bonding layer : 2 Microns
e) VCI Poly film : 100 Microns
f) Total thickness : 125 Microns + or – 5%

7.3 Properties of VC Laminated Aluminium foil

a) Basic Weight : 138 gsm +/- 8%
b) Sealing condition : 180 C/ 2 sec
c) Tensile strength
   MD: 20 kgf
   CD: 18 kgf
d) Tear Strength
   MD 4.8 kg
   CD:3.4 kg
e) Heat Seal Strength : 30.380 N/cm
f) WVTR Value : 0.05gms/m /24 hrs.
g) OTR Value : 0.1 cc/m/24 hrs

8 MARKING OF PACKING BOX

Mark the following information on the two adjacent sides of the each package

a) Material No.
b) Customer PO
c) Item No.
d) Quantity
e) Storage Requirement : Indoor
f) Content Description : Electronic Module
g) Net weight (in kg)
h) Dimension (L x W x H in centimetres)
i) Project Name
j) Consignee
k) Water proofing (Umbrella Stencilling)
l) Upside direction

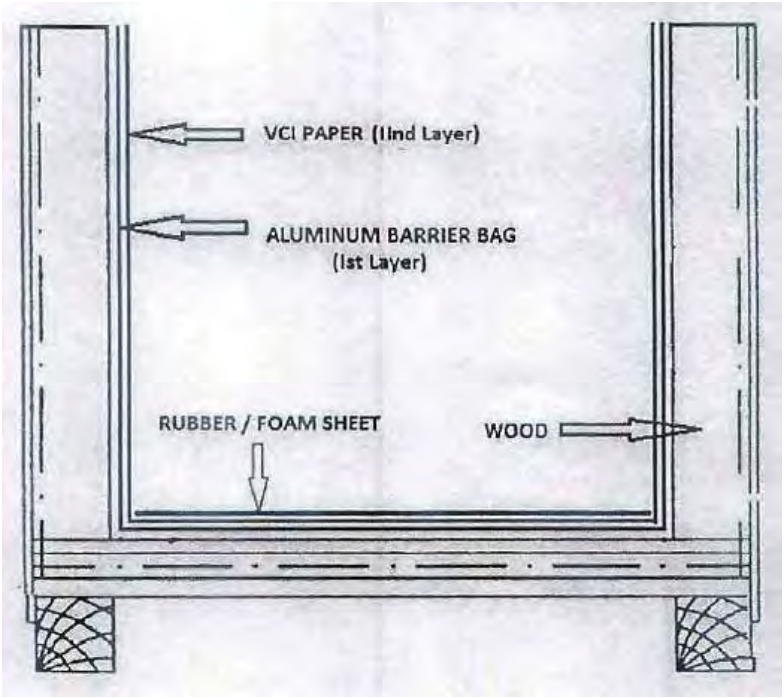

VCI PAPER (IInd Layer)
ALUMINUM BARRIER BAG
(Ist Layer)
RUBBER / FOAM SHEET
WOOD

Figure 1

VACUUM PACKING FOR ELECTRICAL COMPONENT

1 GENERAL

This standard lays down the packing instructions for packing of components / Electrical components Stator/ Rim punching, Wound Pole/ Field Coils and Stator coils / bars to be dispatched against Customer contracts.

2 SCOPE

This procedure covers method of packing component in a wooden packing boxes.

3 OBJECTIVE

To establish a rust proof safe packing procedure and where the components required to protect against temperature and humidity. In general minimum temperature +5 deg C and maximum temperature 45 deg C, and relative humidity between 10% to 40%.

4 PACKING BOX

Wooden Box shall be made as per BHEL Standard AA0490010 for Domestic/AA0490009 for Export/ AA0490004 for Seaworthy packing. Size of the box as per the contract requirement, which has to be checked by QC.

5 PACKING PROCEDURE

a) All items packed are to be marked by QC with “OK” stickers. Varnished stator punchings are to be brought down to room temperature before labelling them “OK” for packing. Do not pack hot/warm stator punchings that have is just received from the varnishing.

b) Packing of stator punchings, wound pole/ field coils and stator coils / bars should be done in a covered shed.

c) Packed materials are to be stacked in proper alignment and to be kept in wooden packing.

6 Additional Packing Methodology for Stator / Rim Punchings (Double stacking) only

In order to eliminate the use of studs avoid double stack packaging per box. Where double stacked packing boxes are unavoidable, the stator /rim punchings are to be securely tightened using GI studs, nuts and soft material washers (rubber/plastic). GI studs, nuts and soft material only to be used in case of double stacking of rim / stator punchings (with holes). Use soft rubber washers to seal the punctured opening at the bottom from where the studs pass in each layer of VCI (Volatile Corrosion Inhibitor) paper, polythene and tarpaulin sheet in case of rim /stator punchings (with holes).

a) GI studs with rubber washer to be placed initially inside the wooden packing box.

b) Over the wooden base, place water proof tarpaulin sheet.

c) Rubber washer shall be placed after the layer of tarpaulin sheet.

d) Then place a layer of porous plastic sheet with total thickness of at least 5mm (for cushioning and reduces the chances of damage to punchings).

e) Place the Aluminium Barrier laminated Bags over this porous sheet, place the rubber washer over it.

f) Place VCI papers on the Aluminium barrier bag and fix with rubber washer.

COPYRIGHT AND CONFIDENTIAL
The Information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.
It must not be used directly or indirectly in any way detrimental to the Interest of the company.

g) PVC Pipes shall be inserted over the GI studs. These pipes are to be used to cover each stud, to protect its direct contact and hence rubbing with punchings.

h) Now place the stack of punchings over the VCI paper and securely tighten the punchings using nuts and soft material, washers.

i) Each layer should be secured in position. Wrap the punchings with VCI paper and properly sealed separately using an adhesive tape.

j) Silica Gel packets are to be placed over the VCI paper and uniformly distributed inside the boxes on the VCI paper to remove/prevent moisture.

k) Aluminium barrier laminated bag has secured in position and properly sealed by using heat sealing machine and air to be drained out by using vacuum pump. At the time of the evacuation the vacuum inside the pack should be less than 0.5ata.

Use two separate VCI papers for doubled stacked boxes independently covering each stack. Similarly two Aluminium barrier laminated bag are to be used to wrap the two stacks independently, as explained above.

7 Additional Packing Methodology for Wound Pole/ Field Coils and Stator Coils/Bars only

a) Over the wooden base, place the waterproof tarpaulin sheet.

b) Then place a layer of porous plastic sheet with total thickness of at least 5mm (for cushioning and reduces the chances of damage to Wound pole/field coils and stator coils/ bars.

c) Place the Aluminium barrier laminated bag over this porous sheet.

d) Place the VCI paper (Volatile Corrosion Inhibitor as per BHEL Standard AA51406) on the Aluminium barrier laminated bag along with rubber washer.

e) Bare copper portion of field coils and stator coils / bars to be covered by VCI paper pouch and fasten with VCI tape.

f) Now place the wound pole, stack of field coil and stator coil / bars over the VCI paper.

g) Each layer should be secured in position. Wrap wound pole / field coils and stator coils / bars with VCI paper and properly sealed separately using an adhesive tape.

h) Silica Gel packets are to be placed and uniformly distributed inside the boxes on the VCI paper to remove/prevent moisture.

i) Then Aluminium barrier laminated bag has secured in position and properly sealed by using heat sealing machine and air to be drained out by using vacuum pump. At the time of evacuation the vacuum inside the pack should be less than 0.5ata.

j) The VCI paper must contact the stator / rim punchings, wound pole / field coils and stator coils/bars. It has to ensure that the VCI paper, Aluminium barrier bag should not get damage / puncture during the packing process.

k) Top cover of the wooden box shall be sealed only after final clearance from QC for confirmation of above.

l) All boxes should be covered by water proof tarpaulin over top and on all sides.

m) The packing boxes shall be covered with GI sheets (0.25 -0.4mm thick) on all the sides for Export / Seaworthy packing.

n) Vacuum packing room temperature and Relative Humidity should be maintained as mentioned below:

Min. +5 deg. C and Max. 45 deg. C, Relative humidity between 10% to 40%.

8 COMPONENT REQUIRED

8.1 VCI laminated Aluminium foil

Volatile Corrosion Inhibitor (VCI) safe foil shall be with aluminium barrier laminated which is flexible, heat sealable, water vapour and anticorrosion resistant barrier laminate of polyester, Aluminium foil & VCI Polyethylene. It is used as a primary packaging material for packing metal components and sealed with the help of a heat sealer after vacuuming with vacuum machine maintaining the humidity level below 40 RH inside the package.

8.2 Composition construction of VCI laminated Aluminium foil

a) PET Film : 12 Microns
b) Bonding layer : 2 Microns
c) Aluminium Foil : 9 Microns
d) Bonding layer : 2 Microns
e) VCI Poly film : 100 Microns
f) Total thickness : 125 Microns + or – 5%

8.3 Properties of Aluminium Barrier laminated Bag

a) Basic Weight : Unit: g/sq. m 150 +/- 5
b) Tensile strength : Unit: N/sq. mm MD: 40 (min.)
Unit: N/sq. mm TD: 41 (min.)
c) Water Vapour Transmission : Unit: g/m^2 0.01 in 24 hrs. at 38 deg C & 90% RH(max)
d) Oxygen Transmission : Unit: cm^3/m^2 0.02 in 24 hrs. at 38 deg C & 90% RH (max)
e) Sealing Temp. : Unit : Degree C 180-220 deg C

9 MARKING ON PACKING BOX

Mark the following information on the two adjacent sides of the each package.

a) Box No.
b) Customer PO
c) Product Name.
d) Project Name
e) Quantity
f) Storage Requirement : Indoor
g) Net weight (in kg)
h) Dimension (L x W x H in centimetres)
i) Consignee
j) Water proofing (Umbrella Stencilling)
k) Upside direction
l) Sling position indicator

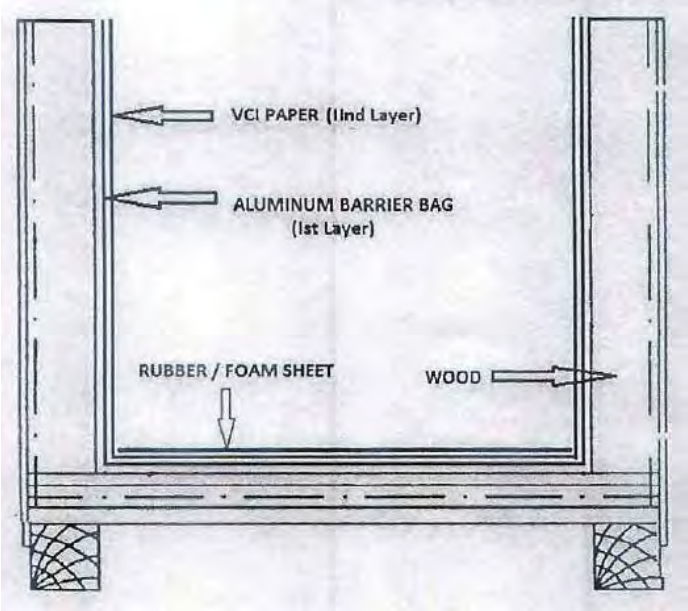


Figure 1



Figure 2



Figure 3



Figure 4



Figure 5

ANNEXURE-IX

SITE STORAGE AND PRESERVATION
(COMMON FOR TG & SG)

SITE STORAGE AND PRESERVATION GUIDELINES

FOR

MECHNANICAL BOPs

(Doc No: PE-DC-SSG-A001 REV.00)



PROJECT ENGINEERING MANAGEMENT, POWER SECTOR

BHARAT HEAVY ELECTRICALS LIMITED-NOIDA

CONTENT

1 SCOPE OF THE DOCUMENT

2 PURPOSE OF STORAGE & PRESERVATION

3 MEASURES TO BE TAKEN FOR STORAGE AND PRESERVATION

- a) GENERAL STORAGE REQUIREMENTS
- b) GENERAL PRESERVATION REQUIREMENTS
- c) GENERAL INSPECTION REQUIREMENTS

4 TYPE OF STORAGE FOR VARIOUS EQUIPMENT

5. CONCLUSION

6. STACKING ARRANGEMENT FOR PLATES AND STRUCTURAL STEEL

1. SCOPE OF THE DOCUMENT

This guideline is prepared in intent to provide proper site storage and preservation of the Mechanical, Electrical and C & I items / equipment supplied under various bought out packages/items. This storage procedure shall be followed at different power plant sites by concerned agency for storage and preservation from the date of equipment received at site until the same are erected and handed over to the customer.

2. PURPOSE OF STORAGE & PRESERVATION

Many of the items may be required to be kept in stores for long period. It shall therefore be essential that proper methods of storage and preservation be applied so that items do not deteriorate, loose some of their properties and become unusable due to atmospheric conditions and biological elements.

3. MEASURES TO BE TAKEN FOR STORAGE, HANDLING & PRESERVATION

a) GENERAL STORAGE REQUIREMENTS

1. To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2. The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3. The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. ‘No smoking’ signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4. Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5. Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
7. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks,

preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

6. At no time shall any materials be stored directly on ground. All materials shall be stored minimum 200 mm above the ground preferably on wooden sleepers

b) GENERAL PRESERVATION REQUIREMENTS

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.
2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.
3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.
4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings
5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.
6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.
7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.
8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.
9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.

11. Following preservatives/preservation methods can be used depending upon type of equipment

    a. Rust preventive fluid (RPF)

    b. Rust protective paints

    c. Tarpaulin covers, in case of outdoor storage

    d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –

    - Ingress of moisture and corrosion damages.
    - Damage to protective coating.
    - Open ends in pipes, vessels and equipment -
        - In case any open ends are noticed, same shall be capped.

2. Any damages to equipment / materials.

    - In case of any damages, these shall be promptly notified and in all cases, the repairs / rectification shall be carried out.
    - Any items found damaged or not suitable as per project requirements shall be removed from site. If required to store temporarily, they shall be clearly marked and stored separately to prevent any inadvertent use.

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

The types of storage are broadly classified under the following heads:

i **Closed storage with dry and dust free atmosphere**. (C)

The closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated asbestos sheets / galvanised iron sheets for roofing. Brick walls / asbestos sheets can be used to cover all the sides. The floor of the shed can be finished with plain cement concrete suitably glazed. The shed shall be provided with proper ventilation and illumination.



ii **Semi-closed storage**. (S)

The semi closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated / asbestos sheets for roofing. The floor shall be brick paved. If required a small portion of sides can be covered to protect components from rainwater splashing onto the components.





iii Open storage (O)

The open yard shall be levelled, well consolidated to achieve raised ground with the provision of feeder roads for crane approach along with access roads running all sides. One part of the open yard shall be stone pitched, levelled and consolidated with raised ground suitable for storing / stacking heavier and critical components with due space to handle them by cranes etc . Adequate number of sleepers, concrete block etc. to be provided to make raised platforms to stack critical materials.

A separate yard to be identified as “scrap yard” slightly away from main open yard to store wooden/steel scraps, which are to be disposed off. This is required to avoid mix up with regular components as well as to avoid fire hazard.

Some of the components, which are having both machined & un-machined surfaces and are bulky, shall be stored in open storage area on a raised ground and suitably covered with water proof / fire retardant tarpaulin.



The equipment listed below shall be stored and inspected as per requirement mentioned in the table below.

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
Raw material /mechanical items like pipes, plates, structure sections etc.)				
1.	Steel pipes (lined/unlined)	S	Damage , paint, corrosion, rubber lining peeling	Provide end cap
2.	MS Plates	S	Damage, paint, corrosion	
3.	SS Plates	S	Damage	
4.	Non-metallic pipes	S	Damage, cracks	Provide end cap
5.	Stainless steel pipes	S	Damage ,	Provide end cap
6.	MS sections, beams	S	Damage, paint, corrosion	
7.	Cable trays	S	Damage, condition of preservations	
8.	Insulation sheets	S	Damage	
9.	Insulation	C	Damage, packing	
10.	Hangers Rods	S	Damage, paint, packing	
11.	Tubes	S	Damage, paint , packing	Provide end cap
12.	Hume pipes	O	Damage	
13.	Castings	O	Damage, paint, corrosion	
Fabricated mechanical items (pressure vessels, tanks etc.)				
14.	Pressure vessels (unlined)	O	Damage, paint, corrosion,	Covered nozzles
15.	Atmospheric storage tanks (unlined)	O	Damage, paint, corrosion	Covered nozzles

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
16.	Pressure vessels (lined)	S	Damage, paint, corrosion, rubber lining	
17.	Atmospheric storage tanks(lined)	S	Damage, paint, corrosion, rubber lining	
18.	Support structures	O	Damage , paint, corrosion	
19.	Flanges	C	Damage , paint, corrosion	
20.	Fabricated pipes	S	Damage , paint, corrosion	Provide end cap
21.	Vessels internals	C	Damage , paint, corrosion ,packing	
22.	Grills	S	Damage , paint, corrosion	
23.	Angles	S	Damage , paint, corrosion	
24.	Bridge mechanism/clarifier mechanism	O	Damage , paint, corrosion	
25.	Cranes, rails	S	Damage , paint, corrosion	
26.	Stair cases	O	Damage , paint, corrosion	
27.	Ladders/handrails	O	Damage , paint, corrosion	
28.	Fabricated ducts	S	Damage , paint, corrosion	
29.	Isolation Gates	O	Damage , paint, corrosion	
30.	Fabricated boxes/panels	S	Damage , paint, corrosion	
Mechanical components like valves, fittings, cables glands, spares etc.)				
31.	Valves	S	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
32.	Fittings	S	Damage , packing	Provide end cap
33.	Cable glands	C	Damage , packing	
34.	Tools & tackles	C	Damage , packing	
35.	Nut , bolts, washers,	C	Damage , packing	
36.	Gasket & Packings	C	Damage , packing	
37.	Copper tubes	C	Damage , packing, corrosion	Provide end cap
38.	SS tubing	C	Damage , packing	Provide end cap
Rotating assemblies (pumps, blowers, stirrers, fans, compressors etc.)				
39.	Pumps	S	Damage , packing, corrosion	Shaft rotation
40.	Blowers/Compressors	S	Damage , packing, corrosion	Shaft rotation
41.	Agitators/stirrers/radial launders	C	Damage , packing, corrosion	Shaft rotation
42.	Rollers for chlorine tonner mounting	C	Damage , packing, corrosion	
43.	Centrifuge	S	Damage , packing,	
44.	Gear box	C	Damage , packing, corrosion	
45.	Bearings	C	Damage , packing, corrosion	
46.	Fans	S	Damage , packing, corrosion	
47.	Dosing skids	S	Damage , packing, corrosion	
48.	Pump assemblies	S	Damage , packing, corrosion	
49.	Air washers(INTERNALS)	S	Damage , packing	
50.	Air conditioners (split)	C	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
51.	Elevators(CONTAINERIZED)	O	Damage , packing, corrosion	
52.	Chillers/VA machines	S	Damage , packing	
53.	Air handling Unit/Package unit	S	Damage , packing	
54.	Chlorinators & Evaporators	C	Damage , packing	
55.	Ejectors	C	Damage , packing	
56.	Electrolyser	C	Damage , packing	
Miscellaneous items like chain pulley blocks, hoists etc.				
57.	Chain pulley blocks	S	Damage, Packing	
58.	Electric hoists	S	Damage, Packing	
59.	Fire extinguishers	C	Damage, expiry date	
60.	Fork Lift Truck	S	Damage, Packing	
61.	Hydraulic Mobile Crane	O	Damage, Packing	
62.	Mobile Pick Up & Carry Crane	O	Damage, Packing	
63.	Motor boats	O	Damage, Packing	
64.	Safety showers	S	Damage, Packing	
65.	Diffusers/dampers	S	Damage, Packing	
Chemicals and consumables (acid, alkali, paints, oils, reagents and special chemicals)				
66.	Hydro Chloric Acid (HCl)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical
67.	Sulphuric acid (H_2SO_4)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
68.	Sodium hydroxide (NaOH)	Store in canes/ storage tank in dyke area	Date of production/ leakage/ fumes/ breather	hazardous chemical ,breather to be checked for air ingress
69.	Sodium hypo chlorite	To be stored under shed	Date of production/ leakage/ fumes	hazardous chemical ,self-life normally 15-30 days after which strength of chemical decays
70.	Ammonia	S	Date of production/ leakage/ fumes	Store in closed storage tanks, hazardous chemical
71.	CW treatment chemicals	S	Date of production , Self-life	Store in closed canes
72.	RO/UF cleaning chemicals	S	Date of production , Self-life	Store in closed canes
73.	Lime	C	Damage to packing , seepage	Prevent moisture, rain
74.	Alum bricks	C	Damage to packing	Prevent moisture, rain
75.	Poly electrolyte	S		Store in closed storage tanks
76.	Laboratory chemicals(powder)	C	Damage, Packing self-life	
77.	Laboratory chemicals(liquid)	C	Damage, Packing self-life	
78.	Lubrication oils	C	Leakage	
79.	Paints	S	Leakage ,air tightness	
80.	Sand	O	Damage of packing	No hooks
81.	Salt (NaCl)	C	Damage of packing, water ingress	Prevent moisture, rain
82.	Anthracite	S	Damage of packing	
83.	Activated carbon	S	Damage of packing	

Sl. No.	**Description of the equipment**	**Type of Storage**	**Check for**	**Remarks**
84.	Thermal insulation	S	Damage of packing	
85.	Cement	C	Damage of packing	Prevent moisture, rain
86.	Gravels	O	Damage of packing	
87.	ION exchange resins	C	Damage , packing	Refer manufacturer guidelines
88.	RO membranes	C	Damage , packing	Refer manufacturer guidelines
89.	UF membranes	C	Damage , packing	Refer manufacturer guidelines
90.	Cleaning chemicals	C	Damage , packing	Refer manufacturer guidelines
91.	Chemicals for analysers/calibration	C	Damage , packing	Refer manufacturer guidelines
Electrical and C & I items (motors, cables etc.)				
92.	Motors	C	Damage , packing	
93.	Cable drums	O	Damage	
94.	Control Panel /control desk, UPS ,JB	S	Damage, Packing	
95.	Instruments(gauges/analysers)	C	Damage	
Special items		As per Manufacturer's item, like Hydrogen cylinders, Ozonator, Analyser, Chlorine dioxide generators etc.		

5. CONCLUSION

Concerned storage agency at site should make sure that loss in equipment performance and wear & tear are minimised through proper storage and preservation. The above are broad guidelines and cover major equipment / materials. However specific storage practices shall be followed as per manufacturer recommendation. All the necessary measures even in addition to the ones mentioned above, if found necessary, should be taken to achieve the objective.

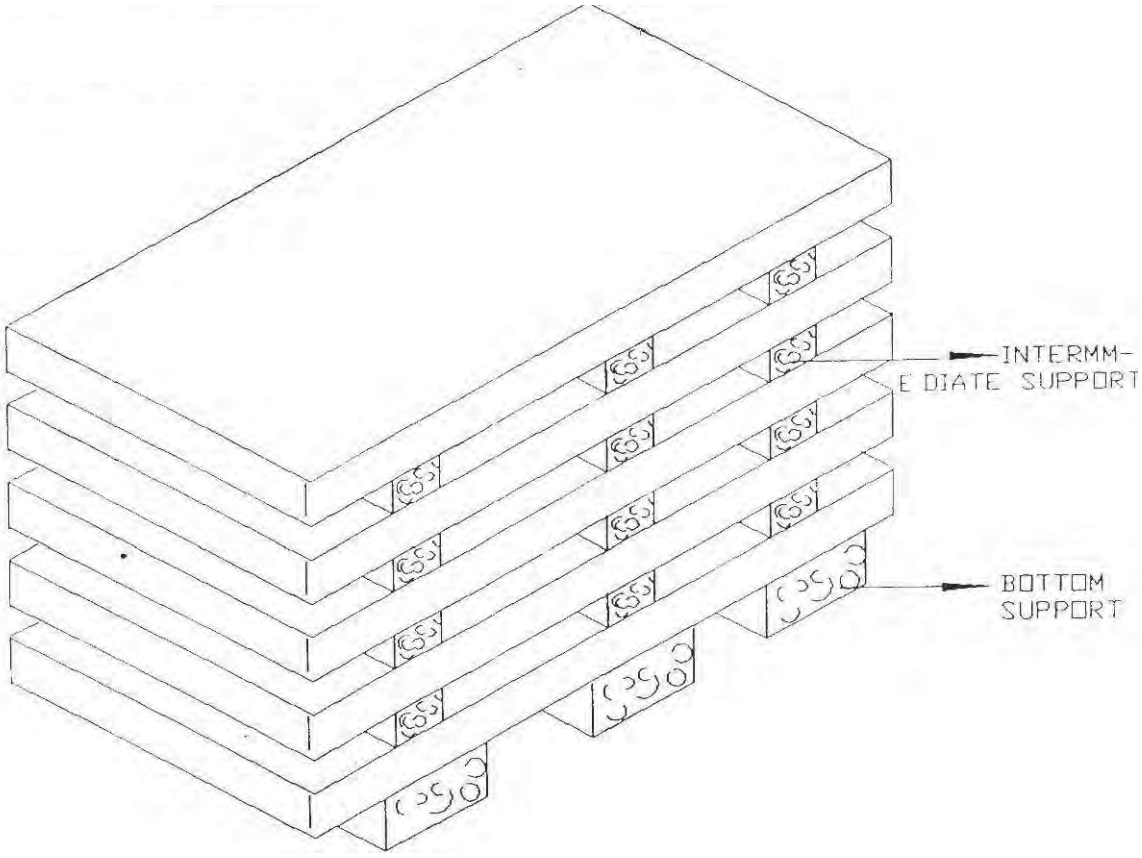


Figure – 1 – PLATE STACKING ARRANGEMENT

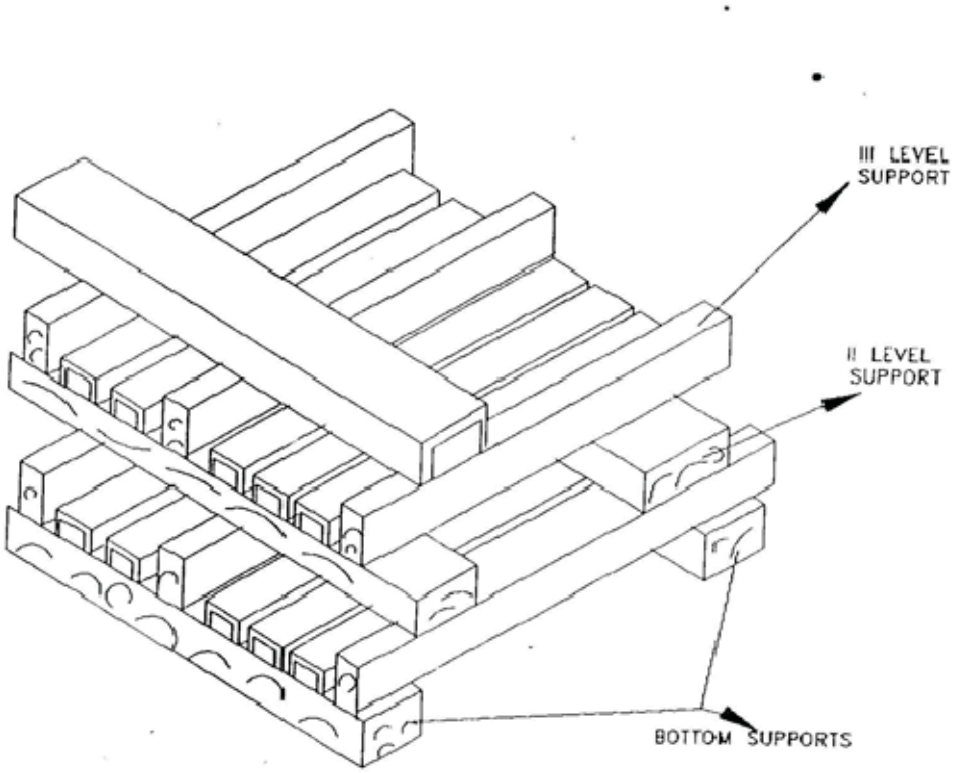


Figure – 2 – STRUCTURAL STEEL STACKING ARRANGEMENT

ANNEXURE X

WATER ANALYSIS AND INFLUENT QUALITY
(COMMON FOR TG & SG)

DESIGN CLARIFIED WATER ANALYSIS

CONSTITUTUENTS	As	CONTENTS
Calcium	$CaCO_3$	116.5 ppm
Magnesium	$CaCO_3$	58.0 ppm
Sodium & Potassium	$CaCO_3$	68.0 ppm
TOTAL CATIONS	$CaCO_3$	242.0 ppm
(except iron in solution)		
Bicarbonate	$CaCO_3$	93.5 ppm
Carbonate	$CaCO_3$	ppm
Sulphate	$CaCO_3$	116.0 ppm
Chloride	$CaCO_3$	33.0 ppm
Nitrate	$CaCO_3$	Ppm
Phosphate	$CaCO_3$	ppm
TOTAL ANIONS	$CaCO_3$	242.5 PPM
Silica	SiO_2	13.5 ppm
pH value at 25^0C		7.5 – 8.0
Turbidity		15 NTU(maximum)
Residual Chlorine	Cl_2	0.5 ppm

Note :

1) The above figures have been arrived with due consideration of injection of 80 ppm alum, 20 ppm lime and 5 ppm chlorine in raw water.

2) For arriving circulating water analysis, the above referred design clarified water analysis shall be multiplied by COC 4.0.

SEWAGE TREATMENT PLANT

INFLUENT QUALITY (MINIMUM)			
S. No	**Description**	**Unit**	**Value**
a.	BOD_5	mg/ l	300
b.	COD	mg/ l	600
c.	TSS	mg/ l	300
d.	pH		6.5 – 8
e.	Oil & Grease	mg/l	50
f.	NH4-N		40
g.	Coliform Count	Count/100ml	1000
h.	N Total	mg/l	70
i.	Temperature	Deg. Celsius	Ambient

ANNEXURE-XI

OPERATION AND MAINTENANCE
(COMMON FOR TG & SG)

1. The Bidder's scope covers the Operation and Maintenance (O&M) services of CW Treatment Plant for one (1) year. O&M shall start after successful completion of PG test of complete CW System. Bidder to note that O&M activities of both the units will be staggered and time gap from Unit#1 to Unit#2 may please be considered as 6 months.

   Start date of O&M shall be intimated separately by BHEL site.

   Bidder to note that the spares and consumables required for maintenance of the equipment during this O&M period shall be in Bidder's scope of supply. Bidder shall use only genuine parts as mentioned in O&M manual. Any damage or malfunction caused by the use of unauthentic parts or unqualified personnel shall be responsibility of Bidder and as a consequence of above Bidder is required to replenish the unauthorised part and abridge the qualified person without any commercial implication to BHEL.

   O&M Services scope also covers all regular maintenance by trained service engineers and supply of genuine parts and lubricants as per the original equipment manufacturer's recommendations.

   For the purpose of Operation of CW Treatment Plant, One-day shall be considered as 24 hours i.e. 3 shifts of 8 hours each. The CW Treatment Plant (along with related accessories) shall be operated on Round-the-clock basis and on all the days of the year including Sundays and Public Holidays meeting outlet guarantee parameters as defined in specification.

   O&M Personnel should be acquainted with local language. Bidder to extend/ provide the full support for obtaining Government/ Statutory clearance/ approval for O&M of CW TREATMENT PLANT, if required by BHEL/ Customer.

   Total duration of the Operation and Maintenance services has been envisaged for twelve (12) months for complete CW Treatment Plant as mentioned in price format/ specification. Operation & Maintenance services payment shall be made to the bidder, on pro-rata basis.

   The Operation and Maintenance services can be continuous or intermittent as per the site requirement for complete CW TREATMENT PLANT.

   Bidder has to compulsorily maintain a log book for the O&M staff engaged for O&M jobs and submit to the Engineer in charge for certification for realization of the bills. After certification of the bills by Engineer in charge of BHEL/ Customer, Bidder shall claim the amount as per tender's T&Cs.

   There is a possibility that some period of O&M services and warranty period of the equipment may overlap. **However, it is clarified that if any spare/ item of CW Treatment Plant is replaced during the warranty period of the equipment, the cost for such replacements/ repairs shall not be included by the bidder, in the cost estimates of O&M services.**

   Wherever CW Treatment Plant has been written in O&M Service Specification, the same shall be deemed as complete CW Treatment Plant.

   MANPOWER REQUIREMENT:

   The Bidder shall deploy following minimum manpower for Operation & Maintenance of CW Treatment Plant.

   I. One qualified and experienced CW Treatment Plant operator per shift on "Round the Clock" basis throughout the year including Sundays & Public Holidays. There must be minimum 30 minutes overlapping between two shift operators to get familiarize with the latest status of the O&M/ CW Treatment Plant.

   II. Two Helper per shift on "Round the Clock" basis throughout the year including Sundays and Public Holidays. The helper shall assist the CW Treatment Plant Operator in day to day operation of the Plant & its accessories and shall assist him for keeping CW Treatment Plant equipment in neat and tidy condition.

III. Wages of all manpower deployed for O&M shall be borne by Bidder.

1.1 Responsibility of CW Treatment Plant Operator:

I. CW Treatment Plant operator shall be responsible for dosing of chemicals and proper sequential operation of CW Treatment Plant including operation of standby equipment in a predefined sequence and stopping the same (whenever necessary) as per the procedural practice. In case of any abnormality (like non-availability of power supply at incomer of CW Treatment Plant), he shall immediately report the matter to BHEL site Engineer for further action. Similarly, any malfunctioning in the system shall be immediately resolved by CW Treatment Plant operator with suitable corrective action irrespective of time of occurrence of malfunctioning/ abnormality in the system in consultation with BHEL site Engineer. A log book of all such outrages shall be maintained by CW Treatment Plant operator, which shall be shared with BHEL site engineer on periodic basis.

II. CW Treatment Plant operator shall take reading of all the parameters of CW Treatment Plant periodically as per requirement which shall be mutually discussed and finalised with BHEL site engineer. However, the frequency of taking the reading may change based upon instruction from BHEL site Engineer. All the readings shall be recorded in a logbook register.

1.2 Responsibility of Helper:

I. The CW Treatment Plant helper shall assist CW Treatment Plant operator for day to day smooth operation of plant & its accessories. He shall be responsible for keeping all the equipment of plant in clean and tidy condition. He shall also carry out general cleaning of all CW Treatment Plant equipment including Electrical & Control Panels (Part of CW Treatment Plant), etc. on regular basis.

II. The helper shall work under the control of CW Treatment Plant operator and shall always ensure that unusable junk materials are not allowed to be kept in CW Treatment Plant. Under such eventuality, he will report the matter to Plant Operator, who in turn will take suitable action including reporting the matter to BHEL site Engineer.

1.2.1 All the log book registers shall be arranged by Bidder. Log book register duly paged and bounded will be maintained in good condition by Bidder.

1.2.2 All the necessary tools & tackles and other materials, required for O&M of CW Treatment Plant shall be arranged/ kept by the Bidder under the control of plant operator, which shall be handed over to customer in new condition. Required testing instruments should also be always available with Plant Operator.

1.2.3 In case of any operator/ helper being on leave, Bidder shall immediately take advance action and provide substitution so that minimum manpower as indicated above is not reduced on any day. In case a particular shift duty plant Operator or helper does not turn up due to any reasons, the earlier duty person shall continue to make sure that CW Treatment Plant never remains unattended.

2.0 O&M of CW Treatment Plant

i. O&M work under scope of the Bidder shall broadly include but in no way limited to the following:

a) Preventive maintenance of the plant.

b) Servicing of the CW Treatment Plant and associated equipment's at regular interval.

c) Attending to complaints.

d) Replacement of worn out or defective components

e) Replacing of consumables like greases, oil, lubricants, servo fluids/control fluids, gases, reagents for analysers and etc. as and when required.

f) Dosing of chemicals and analysing & maintaining the cooling water parameters.

ii. No consumable or any other items of CW Treatment Plant shall be arranged by Customer & BHEL and no extra payment shall be made by customer & BHEL in this regard.

iii. The bidder has to install monitoring equipment like corrosion racks, deposit monitor and bio-fouling monitor on starting day of treatment. The coupons shall be taken out on every 30th day of the installation. Every time fresh new coupons with test certificates should be supplied and installed by vendor.

iv. O&M of CW Treatment System shall be carried out by the bidder during Initial start-up, intermediate start-up and during shut-down condition also.

v. Bidder shall indicate clearly the percentage concentration of major constituents and/ or active components of the chemicals/ formulations to be used in CW treatment. The bidder should submit the test certificate from the manufacturer's lab or any reputed Govt. approved laboratory of each lot of chemicals along with supply. If required, the active constituents' concentration of each chemical of each consignment is to be demonstrated in lab at bidder's cost. Without proper quality test certificates, dosing of formulations will not be allowed.

vi. Complete water analysis as required to carry out CW treatment program shall be in bidder's scope. The same shall be necessarily done by bidder before starting the treatment program.

However, minimum requirement of frequency/ recording of water analysis and monitoring of various cooling water parameters have been stipulated below for bidder's compliance/ adherence. Analysis should be carried out from any reputed or Govt. approved laboratory.

a. Scaling, corrosion, fouling and bio-fouling shall be monitored on monthly basis.

b. Make up, circulating water analysis shall be done twice a day along with recording of unit load, condenser parameters.

c. Micro-biological analysis (TVC & SRB) of cooling water shall be carried out on fortnightly basis. TVC & SRB should be done by Dip Slide method.

d. Operational parameters like Flow, Temperature, Differential pressure etc. of various monitoring equipment shall be recorded daily.

e. Daily log showing chemical consumption, water analysis data, performance monitoring equipment data etc. shall be submitted to BHEL/ Customer.

vii. Bidder shall provide complete literature of the chemicals including material Safety data sheet; procedure for safe handling, first aid required in case of any accident, working mechanism of chemicals, troubleshooting guidelines etc. before start of the treatment program.

viii. Bidder to maintain the alkalinity of cooling water at 150 ppm after H_2SO_4 acid dosing, at COC: 5. Accordingly, CW chemical treatment program is to be designed by the bidder.

ix. The cooling water parameters are to be maintained within their limits mentioned elsewhere in the specification, throughout the treatment program. Corrective actions as required are to be immediately taken by the bidder if any of the parameter is exceeding the specified limit.

x. Bidder shall be responsible at all time, during the entire period of contract for satisfactory performance of plant (including accessories) with zero down time. During emergency or breakdown, Bidder's Engineer along with related technicians shall be available immediately even though it may be beyond normal working hours or on public holidays till the CW Treatment Plant is restored back into normal satisfactory condition. Response time for attending breakdown complaints shall not exceed 2 hours.

xi. Defective/ worn out components shall be replaced only by genuine and original parts. OEM or its authorized dealer's invoice shall be submitted as proof of using genuine parts. All common spares

required for CW Treatment Plant shall normally be kept available in the plant by the Bidder. However, for critical spares, the same shall be made available in not more than 72 hours from the time of break-down requiring such spare.

Preventive Maintenance, servicing of CW Treatment Plant equipment's and accessories etc. shall be done by Bidder in a planned manner in consultation with concerned BHEL engineer. Preventive maintenance and service should be done as per the recommendations/ guidelines of various OEMs.

Bidder shall arrange and maintain separate logbook register for services/ maintenance of CW Treatment Plant. Record of work done for services/maintenance repairs etc. shall be recorded by Bidder's engineer in this register. This register shall always be with updated records & shall be produced to BHEL engineer on weekly basis or as & when required by him.

xii. Bidder shall arrange and maintain sufficient stock of spares and consumable at site. Similarly, all necessary tools & instruments required for the purpose of servicing/ maintenance/ routine testing etc. shall also be arranged by Bidder and should be available at site at all times.

In case of any urgency, the mandatory spares available at site can be used by bidder but the same has to be immediately ordered and replenished within 30 days' time.

xiii. Repairs/ servicing works shall normally be done by Bidder at site up to maximum possible extent. However, in case any equipment or accessories is essentially required to be taken by Bidder out of the plant premises for repairing/ servicing, all necessary arrangements including to and fro transportation shall be the responsibility of Bidder. Bidder shall also inform concerned BHEL & customer's engineer for doing procedural formalities (like issue of gate pass etc.), prior to taking out the materials out of Plant premises.

xiv. In case Bidder fails to supply the spares required for maintenance of the equipment, same shall be provided by BHEL at Bidders risk and cost.

xv. Bidder shall be fully responsible for safety of his personal at all times. Bidder shall also be responsible for taking all safety precautions at all the times, especially during servicing/ preventive maintenance and repairs of CW Treatment Plant.

xvi. Technicians & helpers engaged by the Bidder shall wear uniform with nameplate for easy identification, while being within plant premises

xvii. Bidder's engineer shall be focal point for BHEL & customer. He shall report to BHEL engineer on daily basis, for taking necessary instructions and to update the status of CW Treatment Plant.

xviii. If any damage to the equipment and its accessories has happened due to improper maintenance by Bidder, same shall be recovered from the Bidder.

xix. Bidder is to arrange all the safety gears like helmets, air plugs, safety shoes, googles, Personal Protection Equipment (PPE)] comprising PVC protection suits with hoods, rubber boots, face visors and thick PVC gauntlets etc. during the maintenance for the O&M Staff.

xx. Fabrication and erection of platform/ extra support for maintenance of any type of CW Treatment Plant equipment, if felt necessary during operation and maintenance of the system, has to be done by the Bidder, over and above the platform/ support provided as per specification requirement without any implication to BHEL/ Customer.

Notes:

1. The Bidder shall take approval from Engineer-in charge of BHEL by submitting organization Chart of O&M staff for this site clearly indicating man power deployment with their educational background & experience with supporting documents.

2. The Bidder shall be solely and wholly responsible for safety and security of workers engaged in the job and the BHEL property. In case of any accident the contractor shall pay proper compensation to

the workers as per workmen's compensation act and repair/replace BHEL property at their own cost & arrangement. The Bidder shall also make adequate provision of insurance for their workers at their own cost to cover them against the risk of accident.

3. The Bidder and their workers engaged in the job shall follow all safety rules at the time of execution of work. It shall be responsibility of the Bidder to supply all safety equipment as necessary to its O&M staff.

4. Beyond general shift if any trouble/ breakdown occurs in the plant, Maintenance team must reach the plant without any delay along with Engineer/ Site In-charge.

5. No Person from the list of manpower shall leave the plant site without prior permission from the Engineer in charge of BHEL.

6. However, in operation part, if any person is absent, substitute must be given immediately otherwise proportionate deduction will be made.

7. The replacement/ substitute personnel for maintenance, manpower shall have the same educational qualification and experience.

8. If any additional manpower is required during O&M whatsoever under the scope of contract the same shall be made available by Bidder in time within the cost. To cater the need of time bound maintenance jobs, the Bidder shall depute additional manpower without any cost implication to BHEL

9. During execution of work if any personnel is found not suitable for the job or his presence inside premises is felt undesirable, the personnel has to be replaced within 15 days by Bidder.

10. BHEL will not be responsible for payment towards idle labour charges.

11. All CW speciality chemicals (such as HEDP & PBTC (common), Polymeric dispersant, Bio-dispersant, Corrosion inhibitor (Zn) etc.)/ reagents/ oils/ consumables etc. as required during this O&M period shall be in Bidder scope of supply.

12. Quantity of chemicals (scale/ corrosion inhibitor, bio-dispersant, etc.) required to be dosed for initial fill & passivation shall also be in bidder's scope.

13. Any other chemical other than those specified in the bid, if required to maintain the guarantees, the same shall also be supplied without any commercial implication to BHEL/ Customer.

14. Daily operation log sheet shall be submitted by Bidder to BHEL site.

Statutory Compliance by the Bidder:

All Statutory compliances related to Labour, Health & Safety, Quality & Environment protection and insurance shall be as GCC (Latest Edition).

Bidder shall provide complete literature of the chemicals including material Safety data sheet; procedure for safe handling, first aid required in case of any accident, working mechanism of chemicals, troubleshooting guidelines etc. before start of the treatment program.

ANNEXURE-XII

PRE-COMMISSIONING & COMMISSIONING
(COMMON FOR TG & SG)

PRE-COMMISSIONING ACTIVITIES, COMMISSIONING OF FACILITIES AND INITIAL OPERATIONS

1.00.00 **GENERAL**

1.01.00 The pre-commissioning and commissioning activities including Guarantee tests, checks and initial operations of the equipment furnished and installed by the Contractor shall be the responsibility of the Contractor as detailed in relevant clauses in Technical Specification. The Contractor shall provide, in addition, test instruments, calibrating devices, etc. and labour required for successful performance of these operations. If it is anticipated that the above test may prolong for a long time, the Contractor's workmen required for the above test shall always be present at Site during such operations.

1.02.00 It shall be the responsibility of the Contractor to provide all necessary temporary instrumentation and other measuring devices required during start-up and initial operation of the equipment systems which are installed by him. The Contractor shall also be responsible for flushing & initial filling of all oils & lubricants required for the equipment furnished and installed by him so as to make such equipment ready for operation. The Contractor shall be responsible for supplying such flushing oil and other lubricants unless otherwise specified elsewhere in these specifications & documents.

1.03.00 The Contractor upon completion of installation of equipments and systems, shall conduct pre-commissioning and commissioning activities, to make the facilities ready for sustained safe, reliable and efficient operation. All pre-commissioning/commissioning activities considered essential for such readiness of the facilities including those mutually agreed and included in the Contractors quality assurance program as well as those indicated in clauses elsewhere in the technical specifications shall be performed by the Contractor.

2.00.00 **TESTING / COMMISSIONING PROCEDURES**

The contractor shall submit his testing / commissioning check lists and procedures for various equipments / systems covered under the contract at least 18 months before the actual commissioning of the equipments / systems for review and approval of employer.

The testing / commissioning procedures are to be of a standard format in order to maintain consistency of presentation, content and reporting. The list of commissioning check lists and procedures to be submitted and their content details shall be agreed upon during preaward discussions.

An indicative list of Testing / Commissioning procedures/schedules and Standard Checklists and the details regarding the contents of testing/commissioning are enclosed as annexure at the end of this sub-section of section-VI, Part B. The actual list of such equipments / systems shall depend on the equipments / systems being supplied by the contractor.

i) Annexure-I : Standard Checklist of items

ii) Annexure-II : Testing / Commissioning Procedure/schedules

iii) Annexure-III : Commissioning procedures requiring approval of Employer.

iv) Annexure – IV : Demonstration/Acceptance test procedures during Commissioning/Initial operation

v) Annexure – V : Brief write up on Contents of Testing / Commissioning Procedures

Procedure/schedules shall be approved by the employer.

3.00.00 PRECOMMISSIONING & COMMISSIONING ACTIVITIES

3.01.00 General

The pre-commissioning activities including some of the important checks & tests for certain major equipment/ systems (as a minimum) are described below, although it is the Contractor's responsibility to draw up a detailed sequential & systematic list of checks / tests and various activities / procedures connected with pre-commissioning of the complete facilities with all systems, sub-systems and equipment supplied and installed by him and get the same approved by the Employer.

3.02.00 PRE-COMMISSIONING ACTIVITIES/TESTS:

Steam Generator

3.02.01 Hydraulic Testing of Pressure Parts

On completion of installation of the Steam Generator pressure parts and high pressure boiler external piping & non boiler external piping a hydraulic test in accordance with the requirements of the Indian Boiler Regulations, shall be performed by the Contractor. However, making use of valves/control valves supplied by others and installed on the contractor's piping system during hydraulic testing shall be subjected to the acceptance of respective valve supplier otherwise hydraulic cap/blanking arrangement as required shall be used. The procedure adopted for hydraulic test and preservation shall have the prior approval of the Employer. The detailed schemes and procedure for carrying out hydraulic testing shall be prepared and furnished by the contractor and it shall be discussed and finalized during detailed engineering stage. The water for hydraulic test shall be made alkaline by addition of suitable chemicals. After the test, the Steam Generator and high pressure external piping shall be suitably drained and preserved.

All blank flanges, removable plugs, temporary valves, pipes & fittings, spools, other accessories and services required for carrying out hydraulic testing of boiler external pipings & non boiler external pipings and boiler & its pressure parts shall be furnished by the Contractor. The pressurization equipment including water piping and any chemicals for preservation, needed for the above test shall also be furnished by the Contractor. Any defect noticed during the testing shall be rectified and the unit shall be retested by the Contractor.

In the case of branch connections/ tap-off piping (in others scope) from contractor's scope of piping are not ready or not erected at the time of hydrostatic testing of piping in contractor's scope, then the contractor to supply/use necessary blanking arrangement as required at these tap-off /branch connections. The hydraulic test shall be considered successful only on certification to that effect by the concerned inspecting authority as per the provision of the IBR and the Project Manager.

3.02.02 Air & Gas Tightness Test

After completion of installation of furnace tubes and/or inner skin casing wherever applicable ducts and air heaters, and before commencement of application of thermal insulation a test shall be performed on the Steam Generator by the contractor to prove or to establish the tightness of the erected equipments from the outlet of FD fan through Steam Generator to the stack. Such test shall be done, as far as possible, with all mountings like soot blowers etc. installed in position. The procedure adopted for such tests shall have the prior approval of the Employer. Normally physical leak detection method by pressurizing the section under test by running FD Fan / PA Fan / Temporary blower, as the case may be, is adopted. The contractor may adopt any other better method of testing.

All equipments including any temporary blanking, if required, for the above test shall be provided by the Contractor.

The Contractor's air and gas tightness test procedure shall be such that it shall enable conductance of air/gas tightness test on the ducts in segmented manner (as and when these duct segments are ready), so that these duct segments can be immediately released for application of insulation after their air/gas tightness tests. Contractor shall made all necessary arrangement for conducting tests in this manner. Any blanking etc. on the duct side required for testing of duct segments shall be provided by Contractor. Contractor shall bring fan / blower (s) of adequate size / capacity and other necessary instruments so that these tests can be conducted without necessity of FD / PA fans. The above equipment shall be brought to site by the Contractor on temporary basis and shall be taken back after successful completion of air / gas tightness test.

3.02.03 **Chemical Cleaning of Pressure Parts**

The Contractor shall perform thorough and efficient cleaning operations of all the internal parts of the boiler, like economiser, water wall / evaporator, separator, feed water line, piping, start-up recirculation lines and associated piping and all other pressure parts and associated high pressure piping covered under these specifications (except those portions which are to be steam blown).

The cleaning operation shall consist of De-mineralised (DM) water flushing, the chemical cleaning using acids like hydrofluoric acid or as recommended by the manufacturer, DM water rinsing, DM water flushing, nitrogen capping etc. Complete chemical cleaning procedure, the scheme and layout including parameters of the pumps, size of tanks, materials of construction, the rate of consumption and total requirements of steam and water for such cleaning process shall have the approval of the Employer.

The Contractor shall furnish all labour, materials such as the required chemicals and other consumables, all equipment such as acid/chemical transfer and acid/chemical circulating pumps complete with drive motors, acid storage and acid/chemical mixing tanks, all temporary piping, valves and specialities and local instruments for pressure, temperature and flow measurements and any other items needed to carry out the process. All equipment required for chemical cleaning of Steam Generator shall be supplied by the contractor.

The Contractor shall take care to dispose off the used chemicals and the effluents from the cleaning operations, after neutralisation, meeting all the statutory regulations and in a manner acceptable to the Project Manager and which would comply with the norms of the State Pollution Control Board. This includes construction of suitable neutralization pit, channels, disposal equipments etc.

The Contractor shall specifically make all necessary arrangements for prevention of any fire accidents, explosions etc. during the performance of the chemical cleaning operations.
The Contractor shall ensure that during the cleaning process the procedure adopted shall be such as to consume minimum demineralized water.

The cleaning procedure shall include final flushing and draining of the boiler under a nitrogen gas cap and/or filling the boiler with inhibited water or any other proven procedure recommended by the manufacturer for the preservation of the boiler which is acceptable to the Employer. The Contractor shall furnish a detailed procedure for boiler preservation during detailed engineering for Employer's approval.

All equipment needed for such preservation including the nitrogen cylinders, interconnecting piping and any regulating equipment for N2 cap and other preservatives shall be provided by the Contractor for the Steam Generator and the same shall also become the property of the Employer after completion of the chemical cleaning.

The Contractor shall provide adequate safety and protective equipment for all his employees and ensure that they are worn at all times of danger. Specialized treatment equipment (such as required for first aid when using hydrofluoric acid/chemical) must be provided at the place of handling acid/chemical. An acid/chemical cleaning report and log of each cleaning must be provided by the Contractor to the Employer, immediately after the cleaning operation.

Dry Preservation of non-drainable portion during shutdown to be provided.

3.02.04 **Steam Blowing**

Steam blowing of complete Superheaters, Reheaters and various boiler external piping and non boiler external piping shall be carried out by the Contractor as per requirements/scope of work (indicated in Part-A & Part-B, Section-VI) of this specification. Temporary materials as required for steam blowing of these piping systems shall be supplied by the contractor.

Steam blowing of contractor's scope of piping systems shall be performed without valves/control valves supplied in steam blowing circuit otherwise valve supplier's acceptance to include these valves for steam blowing operation is to be submitted by the contractor. Based on the above the Contractor shall give recommended procedures, method of blowing and scheme for steam blowing indicating clearly additional system, if any, to be cleaned by steam blowing and furnish data/ write-up/ layouts/ drawings to that effect to the Employer for approval.

The Contractor shall furnish his recommendations regarding use of various test equipments and instruments and termination/acceptance criteria for steam blowing, which in any case shall meet the steam turbine-generator requirements.

The systems which should be ready and operational before steam blowing shall be made ready/operational by the Contractor by the scheduled date for starting of steam blowing.

For equipments/components installed on high pressure external piping, such as various thermo-wells, flow meter, control valves, HP/LP Bypass valves etc., the Contractor shall comply with guidelines to be followed during steam blowing, with respect to removal / blanking / replacement of such items their internals etc. by spool pieces as given by the respective manufacturer/sub-contractor.

Supply of all such spools (as above) and/or blanks, temporary piping and supports etc. as required, cutting / welding / edge preparation and rewelding required for blanking, temporary piping connection and/or for replacements by spool pieces shall be the responsibility of the Contractor. After steam blowing removal of spool pieces & temporary piping and reinstallation of various components, shall also be the responsibility of the Contractor.

In the case of branch connections/ tap-off piping are not ready or not erected at the time of steam blowing operation then the contractor to supply/use necessary blanking arrangement as required at these tap-off / branch connections.

It will be the responsibility of the Contractor to operate the Steam Generator and its accessories equipment to generate adequate steam at the parameter and quality in line with the requirements of steam blowing procedure. The Contractor shall make adequate provisions for temporary enhancement of fuel oil firing capacity of the steam generators by changing oil gun tips etc. as may be required so as to be able to conduct complete steam blowing operation by oil firing alone. All necessary precautions to avoid fires and cold end corrosion of Air preheater, during such oil firing at enhanced SG loads, shall be taken by the Contractor.

The Contractor shall ensure successful and timely completion of steam blowing of all systems and will render all help/services as required including:

(i) Services of test/operating personnel/supervisors.

(ii) Extending all cooperation during erection, pre-commissioning of plant and equipment to be made ready and operational before starting steam blowing.

(iii) Extending all cooperation for interface engineering of equipments/components of temporary system required for steam blowing operation.

(iv) Contractor's engineers shall be available for all coordination meetings arranged by the Employer for finalizing the details of temporary system for steam blowing.

For the steam blowing operation, steam conditions like pressure, temperature etc. at the Steam Generator outlet shall be so selected that a minimum cleaning ratio/ disturbance factor of more than 1.4 is achieved. A cycle of heating, cooling and blowing/ purging, is to be repeated to ensure thorough cleaning of the interior of the pipes/ tubes etc. The final indication of cleanliness shall be demonstrated by purging through target plates positioned at the discharge point.

3.02.05 **NOT USED**

3.02.06 **ESP**

Complete pre-commissioning work including tests of facilities such as air and gas tightness tests of ESP, pressure drop test of ESP, gas distribution test of ESPs etc. and all other tests as mutually agreed in the Contractor’s quality assurance program as well as those identified in the specification.

3.02.07 **FGD System**

3.02.07.01 **Air and Gas Tightness Test**

After completion of installation of Booster fans (if required), ducts & absorber, and before commencement of application of thermal insulation a test shall be performed on the FGD system by the contractor to prove or to establish the tightness of the erected equipments. The procedure adopted for such tests shall have the prior approval of the Employer. Normally physical leak detection method by pressurizing the section under test by running Temporary blower is adopted. The contractor may adopt any other better method of testing.

All equipments including any temporary blanking, if required, for the above test shall be provided by the Contractor.

The Contractor's air and gas tightness test procedure shall be such that it shall enable conductance of air/gas tightness test on the ducts in segmented manner (as and when these duct segments are ready), so that these duct segments can be immediately released for application of insulation after their gas tightness tests. Contractor shall made all necessary arrangement for conducting tests in this manner. Any blanking etc. on the duct side required for testing of duct segments shall be provided by Contractor. Contractor shall bring fan / blower (s) of adequate size / capacity and other necessary instruments so that these tests can be conducted. The above equipment shall be brought to site by the Contractor on temporary basis and shall be taken back after successful completion of air / gas tightness test.

3.02.07.02 All pre-commissioning tests & activities as indicated in Annexure-I, II & III and elsewhere in the technical specification shall be performed by the Contractor.

3.02.08 Any other pre-commissioning activity such as floating of safety valves etc. as considered essential for readiness of facilities for commencement of commissioning activities shall also be undertaken by the Contractor.

3.03.00 **Demonstration/Acceptance tests during Commissioning/Initial Operation**

The following tests shall be demonstrated during commissioning for which the bidder has to furnish the procedure and get the approval of the employer:

3.03.01 Unit Load Ramp rate capability test: Demonstration of ± 3% per minute ramp rate for 50% to 100% load range and minimum ± 1% per minute below 50% load to minimum boiler once through load, maintaining the parameters within prescribed limits as defined in closed loop control system requirements (Refer Functional Guarantee Chapter).

3.03.02 to
3.02.04 NOT USED

3.03.05 **Balance Pumps, Blowers, Fans, Compressors and rotating equipment.**

a) The vibration, noise level and parallel operation, wherever applicable, of the pumps, blowers, fans, compressors and rotating equipment shall be demonstrated.

b) Pumps, blowers, fans, compressors and rotating equipment shall be capable of delivering flow and head corresponding to design point as specified.

3.03.06 **Balancing of Coal/Primary air flow**

Contractor shall balance the primary air as well as coal flows in the pulverised fuel pipes such that the minimum PF and PA flow imbalance in the PF pipes from each coal pulveriser does not exceed 5% of average flows.

The above balancing shall be checked by the Contractor by carrying out both clean air test and dirty air test (using dirty pitot tubes).

3.03.07 **Demonstration of boiler operation, rate of change of load and sudden load change withstand capability**

Refer Sub section-A-02 and A-03 ,Part-B (Mechanical), Section VI of Technical Specification.

3.03.08 **Steam Temperature Imbalance**

The Contractor shall demonstrate that at SH and RH outlets (in case of more than one outlet) the temperature imbalance between the outlets does not exceed 10 deg C under all loads including transients.

3.03.09 **No fuel oil support shall be required above 40% TMCR**

Contractor shall demonstrate that oil support for flame stabilization shall not be required beyond 40% of BMCR load when firing the coals from the range identified. The Contractor shall demonstrate that with any combination of mills/ adjacent mills in service (to Employer's choice) the Steam Generator does not require any oil firing for stable and efficient boiler operation at and above 40% BMCR loads.

3.03.10 **Capabilities of all drives**

After completion of installation of drives, contractor shall demonstrate the capability of all drives as specified elsewhere in Section VI Part B of Technical Specifications.

3.03.11 **Margin on Fans**

After completion of installation of fan drives, Fans, inlet and outlet ducting, measuring equipments etc. contractor shall demonstrate the margin on seal air fans, primary fans, Forced draft fans and induced draft fans as specified elsewhere in Section VI Part B of Technical Specifications.

3.03.12 **Cold Air Velocity Test (CAVT)**

A CAVT shall be conducted on each Steam Generator during commissioning before its initial operation to establish the average cold air velocity and the velocity distribution at minimum three predetermined sections (Employer's Choice) of steam generator. The data obtained from the CAVT will be used to compute the actual flue gas velocities as well as their distribution at the test sections during actual operation by correlating the CAVT data with the test/computed data from Thermal Performance Test as per Clauses 1.03.04 (iii) sub section-IV, Section-VI- Part-A. Should the CAVT results after this correlation with TPT data indicate actual localized high flue gas velocity zones/ mal-distribution of gas flow and/or flue gas laning, suitably designed stainless steel screens at required SG cross sections shall be provided by the Contractor to bring the deviation of the localized gas velocity within ± 20% of average gas velocity specified. Through this test the Contractor shall also demonstrate the compliance with the specification requirements regarding the maximum allowable flue gas velocities at various sections of the Steam Generator, refer sub-sectdion-A-03, Part-B of Technical Specifications.

The detailed CAVT procedure shall be to Employer's approved. The Contractor shall submit a detailed CAVT report and the computations of actual velocities after correlating CAVT data with TPT data to the Employer for approval.

3.03.13 **Capabilities of firing of 30% imported coal**

Contractor shall demonstrate the capability of Steam generator and its auxiliaries to operate at rated parameters safely and on sustained basis at TMCR load while firing range of Indian coal(s) as specified in Table-1(A), Annexure-IV-2 ,sub section-IB ,Part-A of Section-VI blended with imported coal up o 30% by weight specified in Table-4, Annexure-IV-4, sub section-IB ,Part-A, Section-VI. Such demonstration shall be for 72 hours of continuous operation

3.03.13 a) Performance characteristic of fans (PA/FD/ID fan capacity, head developed, etc.)

3.03.14 Passenger & good elevators for steam generator – overload tests, travel and hoist speed checks.

3.03.15 ESP Air in Leakage

Contractor shall demonstrate that ESP air in leakage shall be limited to 1% of the total gas flow under guarantee point condition.

3.03.16 Pressure Drop Across ESP

Contractor shall demonstrate that the maximum flue gas pressure drop across the ESP under specified guarantee point condition shall not exceed 20 mmwc.

3.03.17 FGD System

(i) Performance characteristics of fans (capacity, head developed, etc.) and margins on fans in case Booster Fan, as specified in Part-B of technical specification, is provided by the Contractor.

(ii) Capabilities of all drives (Refer Part B of Technical Specifications)

(iii) Passenger cum Goods Elevator for FGD absorber & Limestone Grinding Building: Over load tests, travel and hoist speed checks.

3.03.18 Unit startup/shutdown demonstration as per combined startup curves for cold, warm and hot conditions.

3.03.19 **Fire Detection and Protection System**

a) Following shall be demonstrated at Site:

i) Vibration & Noise level of fire water pumps.

ii) Performance test of each of systems such as Hydrant, HVW Spray, MVW Spray, Inert gas extinguishing system, fire detection and alarm system, Fire extinguishers and Fire monitors as per the design parameters/ standards/TAC.

iii) Parallel Operation, vibration & noise level of the fire water pumps and diesel engines.

b) All tests as required by the TAC.

3.04.00 **Pre-commissioning & Commissioning activities requiring approval of the employer:**

(a) Steam blowing & chemical cleaning, as applicable of integral piping of the Low pressure piping, Power cycle piping & other piping in the scope of the Contractor shall be done by the Contractor.

(b) Steam blowing & chemical cleaning, as applicable of integral piping & other piping in the scope of the Contractor shall be done by the Contractor.

(c) Steam blowing & chemical cleaning, as applicable of integral piping & other piping (if applicable) shall be done by the Contractor.

(d) Hydraulic Test for all low and high pressure piping, equipment cooling water system pipes and associated equipment etc. shall be done as per statutory requirement and specified elsewhere shall be carried out. All equipment needed for the tests shall be furnished by the Contractor.

(e) Any other pre-commissioning checks/ tests and activities as described below and also those mutually agreed between the Contractor & the Employer shall be undertaken.

3.05.00 COMMISSIONING OF FACILITIES
General

Upon completion of pre-commissioning activities/test the Contractor shall initiate commissioning of facilities. During commissioning the Contractor shall carryout system checking and reliability trials on various parts of the facilities.

Contractor shall carry out these checks/tests at site to prove to the Employer that each equipment of the supply complies with requirements stipulated and is installed in accordance

with requirements specified. Before the plant is put into initial operation the Contractor shall be required to conduct test to demonstrate to the Employer that each item of the plant is capable of correctly performing the functions for which it was specified and its performance, parameters etc. are as per the specified/approved values. These tests may be conducted concurrently with those required under commissioning sequence.

The Contractor shall finalize the protocol of check lists, after erection of the system and equipment, as per International Codes/Standard with the Employer.

The Contractor shall furnish requisite no. of copies of procedures and list of start up, pre-commissioning, commissioning and initial operation tests for Employer's approval.

The Contractor shall also demonstrate the performance of all C&I equipment, the tests on main equipment or prior to that as the case may be.

Other tests shall be conducted, if required by the Employer, to establish that the plant equipments are in accordance with requirements of the specifications.

3.05.01 The Commissioning tests/checks shall specifically include but will not be limited to following:

(a) Checks on the operation of all controls of isolating gas and air dampers.

(b) Checks on operation of all fans and all rotating equipment to ascertain level of noise and vibration.

(c) Test running of all pumps.

(d) Checks on operation of all air heaters and adjustment of seals, if necessary when each heater is upto its working temperature.

(e) Checks on operation of all soot blowers and retraction gear and the sequences control.

(f) Check run on the Pulverised Fuel (P.F.) Mills including clean air flow test.

(g) Standard commissioning tests and procedures as per Contractor's practice for Steam Generator, FGD System and other equipment / auxiliaries.

(h) Checks on operation of all individual control loops in the Steam Generator control loops in the Steam Generator control system including FGD System.

(i) Checks on inter-relation between each control loop in the Steam Generator control system including FGD system. Checks on inter-relation between each control loop in the turbine generator control system.

(j) Checks on correct functioning of the Burner Management System (BMS).

(k) Calibration tests of orifice, flow nozzles, instruments and control equipment to the extent included in these specifications.

(l) Tests on Control & Instrumentation (C&I) Equipments:

3.05.02 **NOT USED**

3.06.00 **Balance of Plant equipment & systems**

All pre-commissioning tests &activities as required for successful running of the equipment or as mentioned in the technical specification elsewhere shall be performed by the contractor.

4.00.00 **INITIAL OPERATION**

Upon completion of system checking/tests and as a part of commissioning of facilities, complete plant/facilities shall be put on initial operation for a period of thirty (30) days or 720 hours as stipulated in General Technical Requirements.

5.00.00 The Contractor shall conduct all the commissioning tests and undertake commissioning activities pertaining to all other auxiliaries and equipments including all Electrical & C&I equipment/systems not specifically brought out above but are within the scope of work and facilities being supplied & installed by the Contractor and follow the guidelines indicated above or elsewhere in these technical specifications (Section-VI).

6.00.00 The Contractor shall conduct the comprehensive guarantee tests on the Steam Generator in co-ordination with the Steam Generator to establish the functional guarantee values at stipulated conditions as per Sub-section-IV, Part-A, Section-VI.

7.00.00 The Contractor shall conduct all the commissioning tests and undertake commissioning activities pertaining to all other auxiliaries and equipments including all Electrical & C&I equipment/systems not specifically brought out above but are within the scope of work and facilities being supplied & installed by the Contractor and follow the guidelines indicated above or elsewhere in these technical specifications (Section-VI).

8.00.00 **COMMISSIONING SPARES**

8.01.00 It will be the responsibility of the Contractor to provide all commissioning spares including consumable spares required for initial operation till the Completion of Facilities. The Contractor shall furnish a list of all commissioning spares within 60 days from the date of Notification of Award and such list shall be reviewed by the Employer and mutually agreed to. However, such review and agreement will not absolve the Contractor of his responsibilities to supply all commissioning spares so that initial operation do not suffer for want of commissioning spares. All commissioning spares shall be deemed to be included in the scope of the Contract at no extra cost to the Employer.

8.02.00 These spares will be received and stored by the Contractor at least 3 months prior to the schedule date of commencement of initial operation of the respective equipment and utilized as and when required. The unutilized spares and replaced parts, if any, at the end of successful completion of guarantee tests shall be the property of the Contractor and he will be allowed to take these parts back at his own cost with the permission of Employer.

ANNEXURE-I

STANDARD CHECKLIST

This is an indicative list of items. The actual list shall depend on the Equipment / System being supplied by the contractor.

MECHANICAL

VALVES

1. Manually Operated Valve
2. Electrically Operated Valve
3. Pneumatically Actuated Valve
4. Hydraulically Actuated Valve
5. Safety Valve
6. Electromatic Relief Valve
7. Steam Trap
8. Non Return Valve (including Hydraulic/ Pneumatic QCNRVS)
9. Control Valve
10. Relief Valve
11. Differential Pressure Regulating Valve
12. One spare EOTV for steam blowing

TANKS & PRESSURE VESSELS

1. Tanks (metal) up to 20 M^3
2. Tanks (Large Storage)
3. Pressure Vessel (Below 17 bars)
4. Air Receiver
5. Pressure Vessel – Access Door

PUMPS

1. Pump-Low Pressure Centrifugal (Motor driven)
2. Pump-Up to 350HP
3. Pump-Sump installation
4. Gear Pump/Screw pump

PIPE WORK SYSTEM

1. Steam services
2. Water services
3. Oil / Fire Resistant fluid system
4. Air services (Compressor)
5. High pressure services
6. Constant load support

7. Spring supports
8. PF Coal
9. Hangers and other Supports

STRAINER AND FILTER

1. Strainer / Filter Basket Type
2. Strainer Rotary (Low Pressure)
3. Filter & Strainers Centrifugal Separators
4. Filter & Strainer Y-Type
5. Filter & Strainer (Plate Type)
6. Purifier
7. Filter – Compressed Air Line

HEAT EXCHANGER

1. Heat Exchanger (General)
2. Heat Exchanger – Oil / Water
3. Rotary Air Heater

FANS & COMPRESSORS

1. Fans –Non-Pressure Lubricated
2. Fans – Axial Flow pressure Lubricated
3. Compressors-General

DAMPERS & GATES

1. Manually Operated Damper
2. Pneumatically Operated Damper
3. Electrically Operated Damper
4. Manually Operated Gates
5. Pneumatically Operated Gate
6. Electrically Operated Gate

DUCT WORK

1. Boiler Flue Ducting
2. Expansion Joints
3. Observation & Access Door

CRANES AND ELEVATORS

1. Auxiliary Overhead Crane
2. Travel Support Structure for Crane
3. Long Travel & Cross Traverse Motion of Crane
4. Main Aux. Hoist Motion (Crane)
5. Crane Electric Hoist

POWER TRNAMISSION

1. Power Transmission Gear Box
2. Bearings
3. Fluid Couplings

BOILER & AUX.SYSTEM

1. Soot Blower Long Retractable
2. Wall Deslagger/Soot Blower
3. Bottom Ash Hopper
4. Fly Ash Hopper
5. Lubricator –Compressed Air Lines
6. Wind Box Assembly
7. Mixer / Stirrer
8. Compressed Air Breathing Apparatus
9. Oil Burner
10. Ignitors
11. Scanner
12. Manual Lubricators
13. Air Motor
14. Driers-Non Regenerative /Regenerative
15. Coal Bunker

ELELCTRICAL

1. D.C. Motor
2. HV Squirrel Cage Induction Motor
3. 415 V Squirrel Cage Induction Motor
4. Motor Operated Actuators
5. Soot Blower (Deslagger)
6. Soot Blower (Long Retractable)
7. Soot Blower (Air Heater)
8. Aux. Control and Relay Panel Desk

CONTROL & INSTRUMENTATION

1. Conductivity Measuring Equipment Including Test Procedures
2. pH Analyser Including Test procedure
3. Level Switch (Float Actuated)
4. Level Switch (Displacer Actuated)
5. Transmitter (Float Operated Pneumatic Output including Testing procedures
6. Level indicator (Float/Pulley Type)

7. Local Temperature Indicator Including Test Procedure
8. Resistance Thermometer Element Including Test procedure
9. Thermocouple Element and Connecting Cable
10. Thermocouple and Resistance Thermometer Convertor/Transmitter Including Test Procedures
11. Temperature Switch Including Test Procedure
12. Cold Junction Boxes
13. 0_2Analyser
14. 0_2 in Hydrogen including Test procedures
15. Pressure and Vacuum Switch Including Test procedures
16. Differential Pressure Transmitter including Test Procedures
17. Differential pressure switch including Test procedures
18. Flow indicator (Variable Area)
19. Orifice plate
20. Flow Switch
21. Nozzle
22. Flow indicator (Float Operated) Including Test Procedure
23. Venturi (Fluid)
24. Flow Switch (Magnetic Type)
25. Limit Switches
26. Position Measurement & Indication Including Test procedures
27. Vibration Measurement
28. Digital Indicator
29. Moving Coil Indicator Including Test Procedures
30. Recorder Including Test procedure
31. Flame Scanner
32. Electrical Auto Manual Control Station
33. Push Button Module
34. Test Procedure for Electronic Modules of DDCMIS
35. Thermo Control Valve
36. Test procedure for Adjustment of Modulating Controller-PID Term
37. Test Procedure Indicating Controller-Electrical Input & Pneumatic Output

ANNEXURE-II

COMMISSIONING PROCEDURES

Following is an indicative list of equipments / systems for which Testing / Commissioning procedures are to be submitted. The actual list will depend on the equipment / system being supplied by the Contractor.

S. No	DESCRIPTION
1.	ID Fan
2.	FD Fan
3.	PA Fan
4.	Air Heater
5.	Scanner Air Fans
6.	Fuel Firing System
7.	Milling System
8.	Soot Blower System
9.	Aux. Steam System
10.	Mill Reject Handling System
11.	HP Bypass System
12.	S.A.D.C. and its control
13.	Boiler Chemical Analysis Equipment
14.	SH / RH Spray system
15.	Chemical Dosing System
16.	Boiler Air and Gas System -Interlock Operation

ANNEXURE-III

COMMISSIONING PROCEDURES REQUIRING APPROVAL OF EMPLOYER

S.NO.	DESCRIPTION
1.	Boiler Hydraulic Test and Preservation
2.	Boiler Chemical Cleaning
3.	Air and Gas Tightness Test of Furnace, Ducts etc.
4.	Steam Blowing of Boiler including Interconnecting Pipe Lines of Boiler, Turbine, Aux. Steam Header and Steam Supply lines.
5.	Steam Blowing and Oil Flushing of Fuel Oil System
6.	Clean Air Flow Test of Coal Pipes
7.	Oil Flushing of Lub Oil System of Rotary Equipments
8.	Cold Air Velocity Test

ANNEXURE-IV

Demonstration/Acceptance tests during Commissioning/Initial Operation

The following tests shall be demonstrated during commissioning for which the bidder has to furnish the procedure and get the approval of the employer:

1. Balance Pumps, Blowers, Fans, Compressors, and rotating equipment.
2. Balancing of Coal/Primary air flow
3. Demonstration of boiler operation, rate of change of load and sudden load change withstand capability
4. Steam Temperature Imbalance
5. No fuel oil support shall be required above 40% BMCR
6. Capability of all drives
7. Margin on Fans
8. Cold Air Velocity Test (CAVT)

-ANNEXURE-V

BRIEF WRITE UP ON THE CONTENTS OF TESTING / COMMISSIONING PROCEDURE

Testing / Commissioning Procedure is required to be of a standard format in order to maintain consistency of presentation, content and reporting. These should contain the following sections to make the document a self contained one.

1. Plant Details / Design data
2. Objective
3. Proposal
4. Services Required
5. Safety Precautions
6. Emergency Procedures
7. State of the Plant (Status in respect of erection completion of Mech, Elect and C&I items)
8. Method
9. Completion / Acceptance Criteria
10. Appendix
    - Result
    - Log sheet
    - Drawing etc.

ANNEXURE - XIII

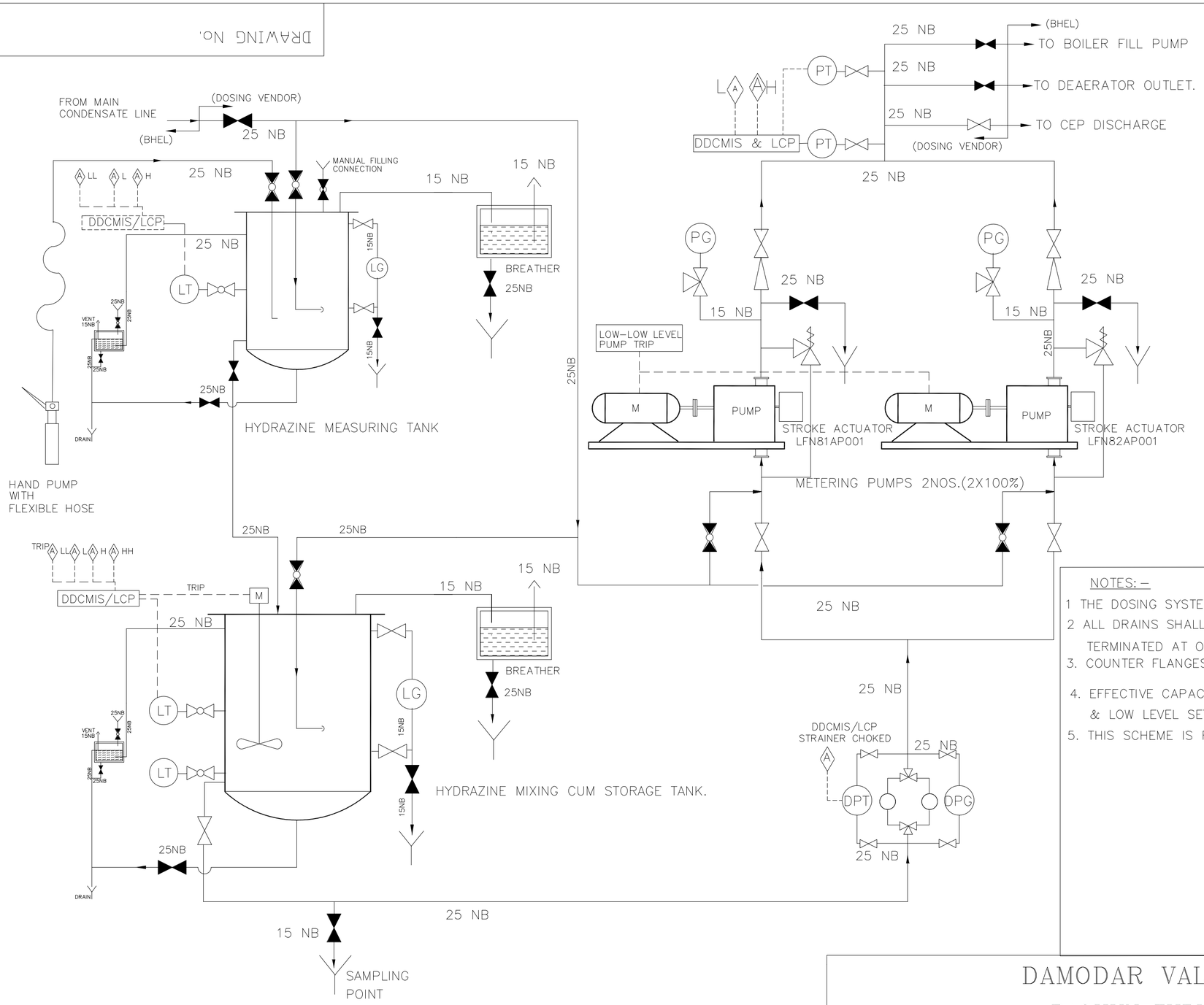
DRAWINGS
(COMMON FOR TG & SG)

S.No.	Description	Drawing No.
1.	P & ID DIAGRAM FOR CHEMICAL DOSING SYSTEM (Sheet 1 of 3 to 3 of 3)	PE-DG-528-154-W001
2.	P & I DIAGRAM CONDENSATE POLISHING PLANT (Sheet 1 of 2 to 2 of 2)	PE-DG-390-155-W001
3.	EQUIPMENT LAYOUT CUM CIVIL INPUT FOR CONDENSATE POLISHING UNIT (REGENERATION AREA) (Sheet 1 of 2 to 2 of 2)	PE-V0-390-155-A003
4.	P & ID DIAGRAM FOR OXYGEN DOSING SYSTEM (Sheet 1 of 2 to 2 of 2)	PE-DG-528-154-W101
5.	P & ID FOR EFFLUENT TRANSFER SYSTEM (Sheet 1 of 1)	PE-DG-528-164-W001
6.	P & ID FOR SEWAGE TREATMENT PLANT (Sheet 1 of 4 to 4 of 4)	PE-DG-528-164-W001
7.	PLOT PLAN	PE-DG-528-100-M001

FIRST ANGLE PROJECTION ALL DIMENSIONS ARE IN MM

DRAWING No.

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
it must not be used directly or indirectly in any way detrimental to the interest of the company.



L E G E N D

	GATE VALVE NORMALLY OPEN
	GATE VALVE NORMALLY CLOSED
	NON RETURN VALVE
	GLOBE VALVE NORMALLY OPEN
	PRESSURE RELIEF VALVE
	THREE WAY VALVE
	VENT TO ATMOSPHERE
	FUNNEL
PG	PRESSURE GAUGE
LG	LEVEL GAUGE
M	MOTOR OPERATED (AC)
	GLOBE VALVE NORMALLY CLOSED
LT	LEVEL TRANSMITTER.
	DUPLEX FILTER
DPT	DIFF PRESSURE TRANSMITTER
DPG	DIFFERENTIAL PRESSURE GAUGE
PT	PRESSURE TRANSMITTER.
LT	LEVEL TRANSMITTER.

NOTES: –

1 THE DOSING SYSTEM INCLUDING ITS LOCAL CONTROL PANEL SHALL BE SKID MOUNTED.
2 ALL DRAINS SHALL BE CONNECTED VIA FUNNELS TO MAIN DRAIN HEADER AND TERMINATED AT ONE POINT ON SKID.
3. COUNTER FLANGES SHALL BE PROVIDED AT SKID INLET & OUTLET TERMINAL POINTS.
4. EFFECTIVE CAPACITY IS THE CAPACITY BETWEEN OVERFLOW LEVEL & LOW LEVEL SET POINT.
5. THIS SCHEME IS FOR ONE SKID & IT SHALL BE TYPICAL FOR OTHER SKID.

REV.	DATE	ALTD	CHD	APPD

JOB No. 528
STATUS CONTRACT
DISTRIBUTION

DAMODAR VALLEY CORPORATION

RAGHUNATHPUR THERMAL POWER STATION PHASE–II (2x660 MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
A	DRN			
	DESN			
	CHD			
	APPD			

TITLE **P&I DIAGRAM FOR HYDRAZINE DOSING SYSTEM**

DRAWING No. PE-DC-528-154-W001

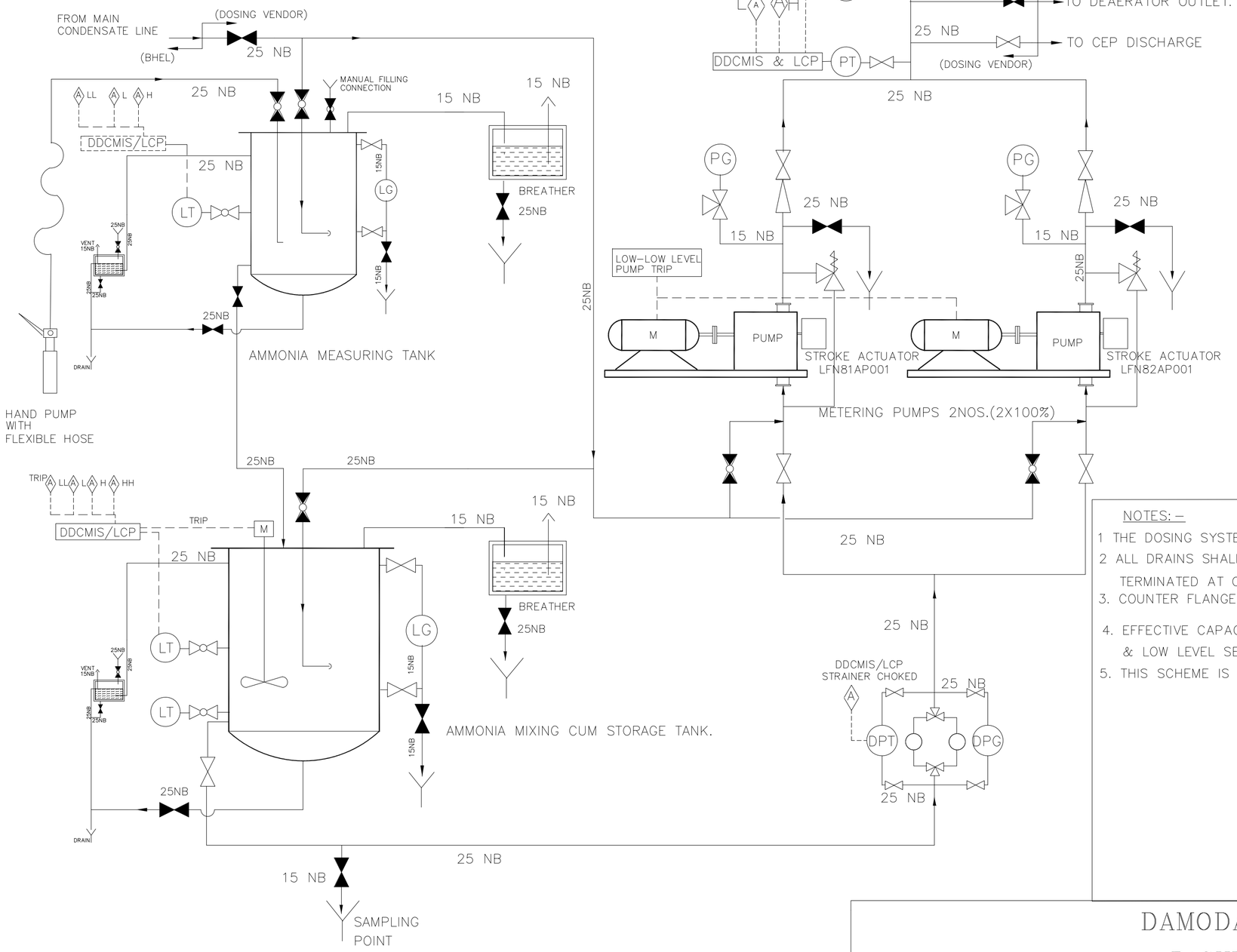
SHEET 01 OF 03 REV 0

SIZE-A3

COMPUTER FILE NAME : .

FIRST ANGLE PROJECTION ALL DIMENSIONS ARE IN MM

DRAWING No.



L E G E N D

	GATE VALVE NORMALLY OPEN
	GATE VALVE NORMALLY CLOSED
	NON RETURN VALVE
	GLOBE VALVE NORMALLY OPEN
	PRESSURE RELIEF VALVE
	THREE WAY VALVE
	VENT TO ATMOSPHERE
	FUNNEL
PG	PRESSURE GAUGE
LG	LEVEL GAUGE
M	MOTOR OPERATED (AC)
	GLOBE VALVE NORMALLY CLOSED
LT	LEVEL TRANSMITTER.
	DUPLEX FILTER
DPT	DIFF PRESSURE TRANSMITTER
DPG	DIFFERENTIAL PRESSURE GAUGE
PT	PRESSURE TRANSMITTER.
LT	LEVEL TRANSMITTER.

NOTES: –

1 THE DOSING SYSTEM INCLUDING ITS LOCAL CONTROL PANEL SHALL BE SKID MOUNTED.
2 ALL DRAINS SHALL BE CONNECTED VIA FUNNELS TO MAIN DRAIN HEADER AND TERMINATED AT ONE POINT ON SKID.
3. COUNTER FLANGES SHALL BE PROVIDED AT SKID INLET & OUTLET TERMINAL POINTS.
4. EFFECTIVE CAPACITY IS THE CAPACITY BETWEEN OVERFLOW LEVEL & LOW LEVEL SET POINT.
5. THIS SCHEME IS FOR ONE SKID & IT SHALL BE TYPICAL FOR OTHER SKID.

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
it must not be used directly or indirectly in any way detrimental to the interest of the company.

COMPUTER FILE NAME : .

REV.	DATE	ALTD	CHD	APPD

JOB No. 528
STATUS CONTRACT
DISTRIBUTION

DAMODAR VALLEY CORPORATION
RAGHUNATHPUR THERMAL POWER STATION PHASE–II (2x660 MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
A	DRN			
	DESN			
	CHD			
	APPD			

TITLE P&I DIAGRAM FOR AMMONIA DOSING SYSTEM

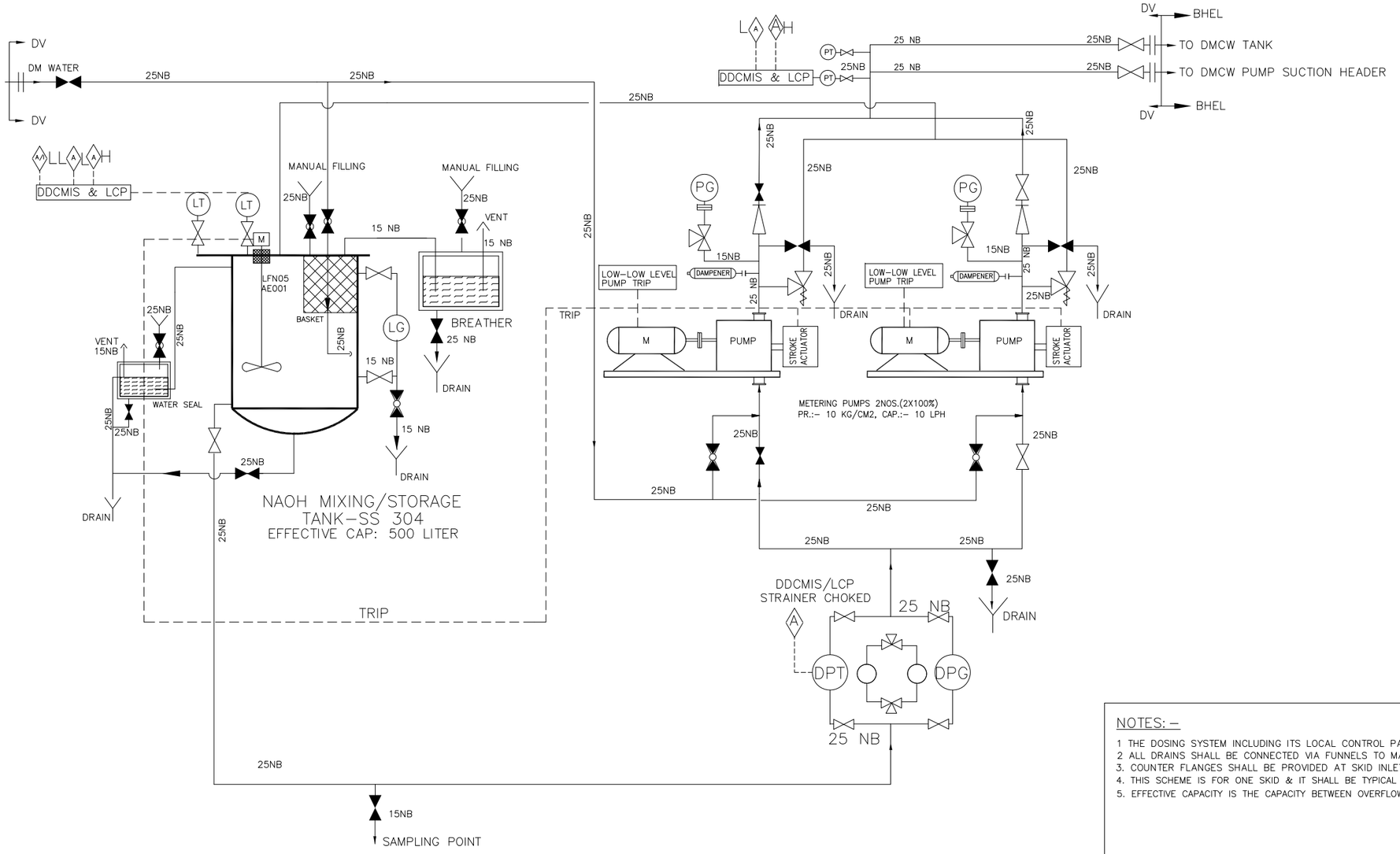
DRAWING No. PE-DG-528-154-W001

SHEET 02 OF 03 REV 0

SIZE-A3

FIRST ANGLE PROJECTION ALL DIMENSIONS ARE IN MM

DRAWING No.



DV
DV: DOSING VENDOR
DV

	LEGEND
	METERING PUMP
	PUMP MOTOR
	GATE VALVE NORMALLY OPEN
	GATE VALVE NORMALLY CLOSED
	NON RETURN VALVE
	GLOBE VALVE NORMALLY OPEN
	PRESSURE RELIEF VALVE
	MULTI VALVE MANIFOLD
	VENT TO ATMOSPHERE
	FUNNEL
PG	PRESSURE GAUGE
LG	LEVEL GAUGE
M	STIRRER MOTOR
	GLOBE VALVE NORMALLY CLOSED
LT	LEVEL TRANSMITTER
	DUPLEX STRAINER
DPT	DIFFERENTIAL PRESSURE TRANSMITTER
DPG	DIFFERENTIAL PRESSURE GAUGE
PT	PRESSURE TRANSMITTER
	STIRRER
	CHEMICAL SEAL DIAPHRAGM
A	ALARM
A	INTERLOCK
	STUFFING BOX

NOTES:-

1. THE DOSING SYSTEM INCLUDING ITS LOCAL CONTROL PANEL SHALL BE SKID MOUNTED.
2. ALL DRAINS SHALL BE CONNECTED VIA FUNNELS TO MAIN DRAIN HEADER AND TERMINATED AT ONE POINT ON SKID.
3. COUNTER FLANGES SHALL BE PROVIDED AT SKID INLET & OUTLET TERMINAL POINTS.
4. THIS SCHEME IS FOR ONE SKID & IT SHALL BE TYPICAL FOR OTHER SKID.
5. EFFECTIVE CAPACITY IS THE CAPACITY BETWEEN OVERFLOW LEVEL & LOW LEVEL SET POINT.

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
it must not be used directly or indirectly in any way detrimental to the interest of the company.

COMPUTER FILE NAME :.

REV.	DATE	ALTD	CHD	APPD

JOB No. 528

STATUS CONTRACT

DISTRIBUTION

DAMODAR VALLEY CORPORATION

RAGHUNATHPUR THERMAL POWER
STATION PHASE-II (2x660 MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
A	DRN			
	DESN			
	CHD			
	APPD			

TITLE P&I DIAGRAM FOR NaOH DOSING SYSTEM

DRAWING No. PE-DG-528-154-W001

SHEET 03 OF 03 REV 0

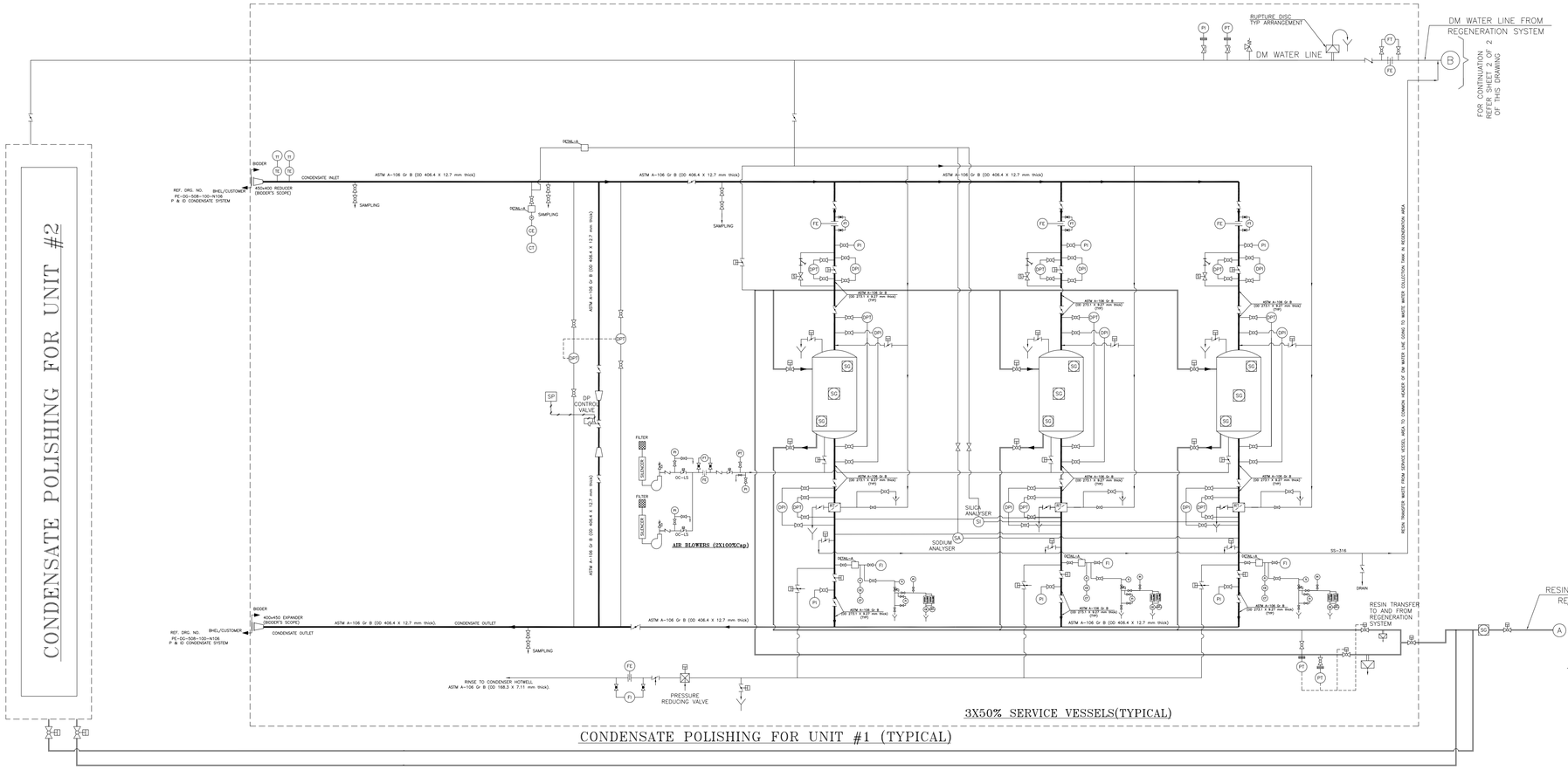
SIZE-A3

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHEL
it must not be used directly or indirectly in any way detrimental to the interest of the company.

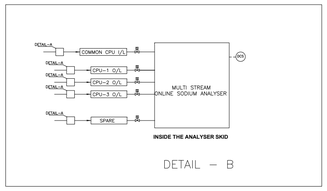
FIRST ANGLE PROJECTION — ALL DIMENSIONS ARE IN MM

DRAWING NO. — CUSTOMER'S DRAWING NO.

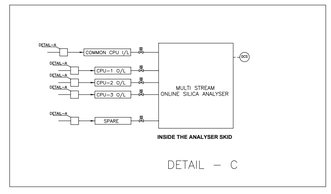
CONDENSATE POLISHING FOR UNIT #2



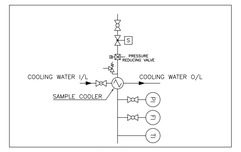
CONDENSATE POLISHING FOR UNIT #1 (TYPICAL)



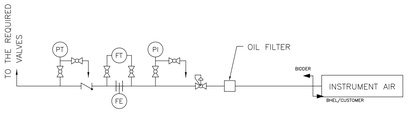
DETAIL – B

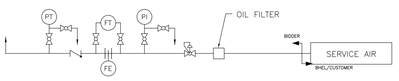


DETAIL – C



DETAIL – A





LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	PRIMING TANK / CHAMBER		BLOWER
	PUMP		ISOLATION GATE
	BALL VALVE / PLUG VALVE		DRAIN
	BUTTERFLY VALVE		OVERFLOW SEAL POT/CO_2 ABSORBER
	GLOBE VALVE		RUPTURE DISC
	DIAPHRAGM VALVE		PRESSURE REDUCING VALVE
	MOTORISED VALVE		CONDENSATE LINE
	PRESSURE RELIEF VALVE		D.M.WATER/DRAIN LINE
	NON RETURN VALVE		RINSE WATER LINE
	BUTTERFLY VALVE WITH GLAND SEALING		ACID SOLUTION LINE
	SOLENOID VALVE		ALKALI SOLUTION LINE
	RESIN TRAP		RESIN TRANSFER LINE
	SIGHT GLASS		FIELD MOUNTED INSTRUMENT
	DOUBLE ACTING PNU.CYLINDER OPERATOR		PANEL MOUNTED INSTRUMENT
	PNEUMATICALLY OPERATED VALVE		PULSATION DAMPER
	'Y' TYPE STRAINER		DIAPHRAGM SEAL
	ORIFICE PLATE	OC LS	OPEN CLOSED LIMIT SWITCH

LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
CS	CONTROL SYSTEM	FE	FLOW ELEMENT
LS	LEVEL SWITCH	CE	CONDUCTIVITY ELEMENT
LI	LEVEL INDICATOR	CT	CONDUCTIVITY TRANSMITTER(SP)
LT	LEVEL TRANSMITTER	DI	DENSITY INDICATOR
PS	PRESSURE SWITCH	FI	ORIFICE (Pressure Breakdown)
PI	PRESSURE INDICATOR(LOCAL)	SC	SAMPLE COOLER
PT	PRESSURE TRANSMITTER	SA	ONLINE SODIUM ANALYSER
DPS	DIFF. PRESSURE SWITCH	SI	ONLINE SILICA ANALYSER
DPI	DIFF. PRESSURE INDICATOR	SP	SMART POSITIONER
DPT	DIFF. PRESSURE TRANSMITTER	OC LS	OPEN CLOSE LIMIT SWITCH
TI	TEMPERATURE INDICATOR (LOCAL)	FN	FLOW NOZZLE
TT	TEMPERATURE TRANSMITTER		EXPANDER
TS	TEMPERATURE SWITCH		REDUCER
TE	TEMPERATURE ELEMENT (METAL)		
FI	FLOW INDICATOR		
FT	FLOW TRANSMITTER		
FS	FLOW SWITCH		

NOTES:
1. MINIMUM REQUIREMENT OF VALVES, INSTRUMENTATION ETC. HAS BEEN SHOWN IN THIS P&ID. HOWEVER, BIDDER TO FURNISH COMPLETE SCHEME IN ALL RESPECTS INCLUDING ALL INSTRUMENTS, VALVES ETC. FOR SMOOTH, SAFE, EFFICIENT,TROUBLE FREE OPERATION OF PLANT FOR BHEL / CUSTOMER APPROVAL DURING DETAILED ENGINEERING.
2. ⌐ INDICATES TERMINAL POINTS BETWEEN BHEL/CUSTOMER & BIDDER.
3. SERVICE VESSELS OF SPHERICAL DESIGN IS ALSO ACCEPTABLE.
4. ALL THE INSTRUMENT ISOLATION VALVES OTHER THAN FOR ACID/ALKALI APPLICATION SHALL BE GLOBE PATTERN AND DIAPHRAGM TYPE FOR ACID/ALKALI/REG WASTE APPLICATION TO BE PROVIDED AT SOURCE. NEAR THE INSTRUMENT 2-VALVE MANIFOLD FOR PRESSURE MEASURING INSTRUMENTS/3-VALVE MANIFOLD FOR DP MEASURING INSTRUMENTS/5-VALVE MANIFOLD FOR DPT'S, BALL VALVE FOR FLOW INDICATORS/ANALYTICAL INSTRUMENT SHALL BE PROVIDED BY BIDDER.
5. WHERE EVER PROVIDING 2 VALVE MANIFOLD IS NOT FEASIBLE TWO NUMBERS OF GLOBE VALVES SHALL BE PROVIDED TO MEET THE FUNCTION OF 2-VALVE MANIFOLD.
6. ACID,ALKALI,DM LINE, DM WASTER LINE, REG WASTE, RESIN LINES, REGENERATION VESSEL AND MIXED RESIN STORAGE VESSELS PR. INSTRUMENTS SHALL BE PROVIDED WITH DIAPHRAGM SEAL.
7. FLOW TOTALISATION SHALL BE DONE IN SOFTWARE.
8. ALL SOLENOID OPERATED VALVES SHALL BE PROVIDED WITH SOLENOID VALVE, AIR LOCK RELAY ETC. AS REQUIRED BY PROCESS.
9. BLIND FLANGES, COUNTER FLANGES & ISOLATION VALVES SHALL BE PROVIDED BY THE BIDDER AT THE TERMINAL POINTS WHEREVER TERMINAL POINTS ARE APPLICABLE.
10. ALL THE ISOLATION VALVES OF ALL THE INSTRUMENTS SHALL BE OF SS316.
11. REFER SHEET 2 OF 2 OF THIS DRAWING FOR ADDITIONAL NOTES.
12. FOR DESIGN PRESSURE ABOVE 40 kg/sq.cm & DESIGN TEMPERATURE LESS THAN 425 DEG C, 2 NOS. ROUTE VALVES OF 15 NB SIZE OF 800 CLASS HAVE TO BE PROVIDED BY THE BIDDER FOR PRESSURE, FLOW, LEVEL & TEMP MEASUREMENT.
13. ALL THE CONTROL LOOPS SHALL BE INDICATED IN VENDOR DOCUMENT DURING DETAIL ENGINEERING.
14. ACROSS ALL THE INDIVIDUAL 'Y' TYPE STRAINERS, DPT SHALL BE PROVIDED BY THE BIDDER.
15. ALL SOLENOID VALVE SHALL BE PROVIDED BY BIDDER WITH LOCAL LED STATUS DISPLAY AND LIMIT SWITCHES SHALL BE PROVIDED BY BIDDER FOR CRITICAL APPLICATIONS TO FACILITATE REMOTE INDICATION ON DWS.
16. ALL ANALYSERS (SODIUM,SILICA,CONDUCTIVITY,pH ETC) SHALL BE PROVIDED BY BIDDER IN ALL WEATHER LOCAL PANEL FITTED WITH INTEGRAL AIR CONDITIONED PANEL/ CABINET. AIR CONDITIONING EQUIPMENT REQUIRED FOR ALL ANALYSERS PANEL SHALL BE IN BIDDER'S SCOPE. ALL REQUIRED TUBING AND RACK ALONG WITH DRAIN DISPOSAL PIPES SHALL BE IN BIDDER'S SCOPE.
17. FOR DETAIL-A & ALL ANALYSERS,ALL REQUIRED ACCESSORIES & VALVES SUCH AS ISOLATION VALVES,PRESURE REDUCING VALVE BACK PRESS REDUCING VALVE ETC SHALL BE PROVIDED FOR IMPLEMENTING SAMPLE MEASUREMENT AS PER BIDDER'S STANDARD PRACTICE.
18. PIPE LINE SIZE & THICKNESS, WHEREVER MENTIONED ARE IN MM & INDICATES MINIMUM REQUIREMENT.
19. EACH CONDENSATE POLISHING PLANT SHALL CONSIST OF THREE (3) SERVICE VESSELS (3X33.33% CAPACITY) FOR EACH TG UNIT.
20. BIDDER TO INDICATE RECOMMENDED ALARM LIST ALONGWITH CONTROL PHILOSOPHY AND INTERLOCK/PROTECTION WRITE UP IN LINE WITH TECHNICAL SPECIFICATION/ PROCESS ADOPTED.
21. INSTRUMENTATION INDICATED IN THIS P&ID IS BARE MINIMUM. HOWEVER, BIDDER TO SUBMIT THE FINAL P&ID DURING DETAIL ENGINEERING CONSIDERING REDUNDANCY CRITERION OF INSTRUMENTS [TRANSMITTERS (PRESSURE,LEVEL,TEMPERATURE,DIFFERENTIAL PRESSURE,FLOW ETC.) AND ANALYSERS] AS PER SECTION IC AND IIC OF THIS TECHNICAL SPECIFICATION.
22. SERVICE VESSEL AREA DRAIN SHALL BE TERMINATED TO NEAREST C ROW SIDE DRAIN THRU DRAIN TRENCH.
23. ALL DOUBLE ACTING PNEUMATIC VALVES HANDLING CONDENSATE IN CPU SERVICE VESSEL AREA SHALL BE PROVIDED WITH DOUBLE COIL SOLENOID VALVE AND THE SAME SHALL BE IN BIDDER'S SCOPE.
24. THIS DRAWING IS APPLICABLE FOR EACH UNITS OF 660 MW.
25. BIDDER TO INDICATE RECOMMENDED ALARM LIST ALONG WITH CONTROL PHILOSOPHY AND INTERLOCK/PROTECTION WRITE-UP INLINE WITH THE TECHNICAL SPECIFICATION / PROCESS ADOPTED.

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

DVC DRG. NO.	
CUSTOMER	DAMODAR VALLEY CORPORATION RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2x660MW) STEAM TURBINE GENERATOR (STG) PACKAGE
CONSULTANT	DEVELOPMENT CONSULTANTS PRIVATE LIMITED [DCPL]
JOB NO.	390
STATUS	CONTRACT
DISTRIBUTION	

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED it must not be used directly or indirectly in any way detrimental to the interest of the company.

DEPT CODE		NAME	SIGN	DATE
M	DRN.	DK	Sd/-	22.09.2026
	DESN.	MKG	Sd/-	22.09.2026
	CHD	RR	Sd/-	22.09.2026
	APPD	JP	Sd/-	22.09.2026

TITLE
P & I DIAGRAM CONDENSATE POLISHING PLANT

DEPT. M | SCALE NTS | SIGN

DRAWING NO. PE-DG-390-155-W001

SHEET 1 OF 2 | REV. 00 | SIZE-A0

COMPUTER FILE NAME:

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
it must not be used directly or indirectly in any way detrimental to the interest of the company.

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

DRAWING NO.

CUSTOMER'S DRAWING NO.

P&ID OF REGENERATION SYSTEM

FOR CONTINUATION REFER SHEET 1 OF 2 OF THIS DRAWING

FILTER
SILENCER
TO THE REQUIRED REGENERATION VESSELS
TO N-PIT COMP.-I
TO N-PIT COMP.-II

TO THE REQUIRED VESSELS & VALVES
OIL FILTER
BIDDER
INSTRUMENT AIR
BHEL/CUSTOMER

OVER PRESSURE PROTECTION DEVICE

RESIN MAKE UP HOPPER
EJECTOR
TO REGENERATION VESSEL
50NB
TO RESPECTIVE REGENERATION/ RESIN SEPARATION VESSELS

RESIN SEPARATION AND CATION REGENERATION UNIT
ANION REGENERATION UNIT
MIXED RESIN STORAGE UNIT-I
MIXED RESIN STORAGE UNIT-II
REFER NOTE 1
SAMPLING

AIR BLOWERS (2x100% CAPACITY)

PUMP RECIRCULATION (TYP)
PUMP RECIRCULATION (TYP)

BIDDER
DM WATER FROM DM MAKE UP LINE AT 10M FROM REGENERATION AREA
BHEL/CUSTOMER
100NB SS

DM WATER STORAGE TANK # 1
DM WATER STORAGE TANK # 2
CO2 ABSORBER (TYP)

D.M. WATER PUMPS FOR RESIN TRANSFER (2X100%)
D.M. WATER PUMPS FOR REGENERATION SYS (CPU) (2X100%)

1. TO DRAIN TRENCH LEADING TO NEAUTRALISATION PIT
2. REFER NOTE NO.3 IN THIS SHEET.

MEASURING ORIFICE BOARD

SERVICE WATER

ALKALI FLAKE
ALKALI PREPARATION TANK
ALKALI STORAGE TANK-I
ALKALI STORAGE TANK-II
TO N-PIT

ALKALI TRANSFER CUM RECIRCULATION PUMP

AC FILTER (ALKALI)

ALKALI DAY TANK

HOT WATER TANK
STEAM
CONDMS
CONC.
DI
MIXING TEE

2X100 % ALKALI DOSING PUMPS

FROM TANKERS CUSTOMER SCOPE
ALKALI UNLOADING/ PUMPS (2X100%)

ACID MEASURING TANK No 1
ACID MEASURING TANK No 2
Fume Absorber (TYP)
2X100%ACID DOSING PUMPS

ACID STORAGE TANK-I
ACID STORAGE TANK-II
POLYPROPYLENE LINE
ACID UNLOADING PUMPS (2X100%)

BIDDER
POTABLE WATER
BHEL
SAFETY SHOWER WITH EYE WASH (2 Nos.)

TO CW CHANNEL
DM WASTE WATER FROM RESIN TRANSFER OF CPU SERVICE VESSEL AREA (UNIT-I & UNIT-II)
DM WASTE WATER FROM RESIN TRANSFER OF CPU REGENERATION AREA
RESIN WASTE WATER COLLECTION TANK (MSRL)
RECIRCULATION LINE
D.M. WATER WASTE TRANSFER PUMPS (2X100%)
TO N PIT

TO ASH SLURRY PUMP HOUSE
N.PIT COMPARTMENT -I STAGE-I
N.PIT COMPARTMENT -II STAGE-II
ACID DOSING FROM BULK ACID TANK
ALKALI DOSING FROM BULK ALKALI TANK
CPU REGENERATION WASTE FROM RESIN AREA

LIME TANK FOR NEUTRALISATION

NOTES:

1. THE REGENERATION VESSELS ARRANGEMENT SHALL BE AS PER TECHNICAL SPECIFICATION SECTION IA.
2. FOR OTHER NOTES & LEGENDS REFER SHEET 1 OF 2 & SHEET 2 OF 2 OF THIS DRAWING.
3. COLLECTION AND DISPOSAL ARRANGEMENT OF DM WASTE WATER USED FOR RESIN TRANSFER FROM EACH REGENERATION SYSTEM TO EACH CPU SERVICE VESSELS AND FROM EACH CPU SERVICE VESSELS TO EACH REGENERATION SYSTEM IS TO BE PROVIDED BY BIDDER. ADDITIONAL PNEUMATIC OPERATED VALVES, PIPE LINE , INSTRUMENTS AS REQUIRED SHALL BE PROVIDED BY BIDDER IN EACH SERVICE VESSEL AREA AND REGENERATION AREA.
4. FLUSHING CONNECTIONS WITH VALVES SHALL BE PROVIDED FOR ALL ACID/ALKALI PUMPS/ PIPELINES AS PER REQUIREMENT.
5. PUMPS RECIRCULATION LINE WITH VALVES AT TANK END SHALL BE PROVIDED FOR EACH SET OF PUMPING SYSTEM BY BIDDER.
6. ALL ACID AND HOT WATER TANKS SHALL HAVE LT OF RADAR TYPE, OTHER THAN THAT ALL OTHER TANKS SHALL HAVE LT OF ULTRASONIC TYPE.
7. ALL WEATHER LOCAL PANEL FITTED WITH INTEGRAL AIR CONDITIONER SHALL BE PROVIDED FOR HOUSING ALL ANALYZERS (pH,Conductivity,concentration ETC).
8. ONE ADDITIONAL VESSEL FOR REGENERATED MIXED RESIN STORAGE ALONG WITH INTERCONNECTION TO THE REGENERATION VESSELS IN THE EXTERNAL REGENERATION SYSTEM WILL BE PROVIDED BY BIDDER ALONGWITH ALL INSTRUMENTATIONS, VALVES & DOSING LINES ETC.
9. ALL THE VALVES, TANKS, VESSELS, INSTRUMENTS, EQUIPMENTS ETC. SHOWN IN THE P&ID ARE BARE MINIMUM. HOWEVER ANY ADDITIONAL VALVES, INSTRUMENTS, EQUIPMENTS ETC. AS REQUIRED BY BHEL/CUSTOMER DURING DETAILED ENGINEERING /EXECUTION/E&C STAGE SHALL BE PROVIDED BY THE BIDDER WITHOUT ANY DELIVERY AND COMMERCIAL IMPLICATION TO BHEL/CUSTOMER.
10. ALL THE EQUIPMENTS , VALVES, INSTRUMENTS, PIPING ETC SHOWN IN THE P & ID (SHEET 1 OF 2 & SHEET 2 OF 2) ARE IN BIDDER'S SCOPE UNLESS EXCLUSIVELY MENTIONED.

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

DVC DRG. NO.	xxx
CUSTOMER	DAMODAR VALLEY CORPORATION RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2x660MW) STEAM TURBINE GENERATOR (STG) PACKAGE
CONSULTANT	DEVELOPMENT CONSULTANTS PRIVATE LIMITED [DCPL]
JOB NO. 390	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA
STATUS CONTRACT	
DISTRIBUTION	

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED it must not be used directly or indirectly in any way detrimental to the interest of the company.

DEPT CODE	NAME	SIGN	DATE
M	DRN. DK	Sd/-	22.09.2026
	DESN. MKG	Sd/-	22.09.2026
	CHD RR	Sd/-	22.09.2026
	APPD JP	Sd/-	22.09.2026

TITLE
P & I DIAGRAM CONDENSATE POLISHING PLANT

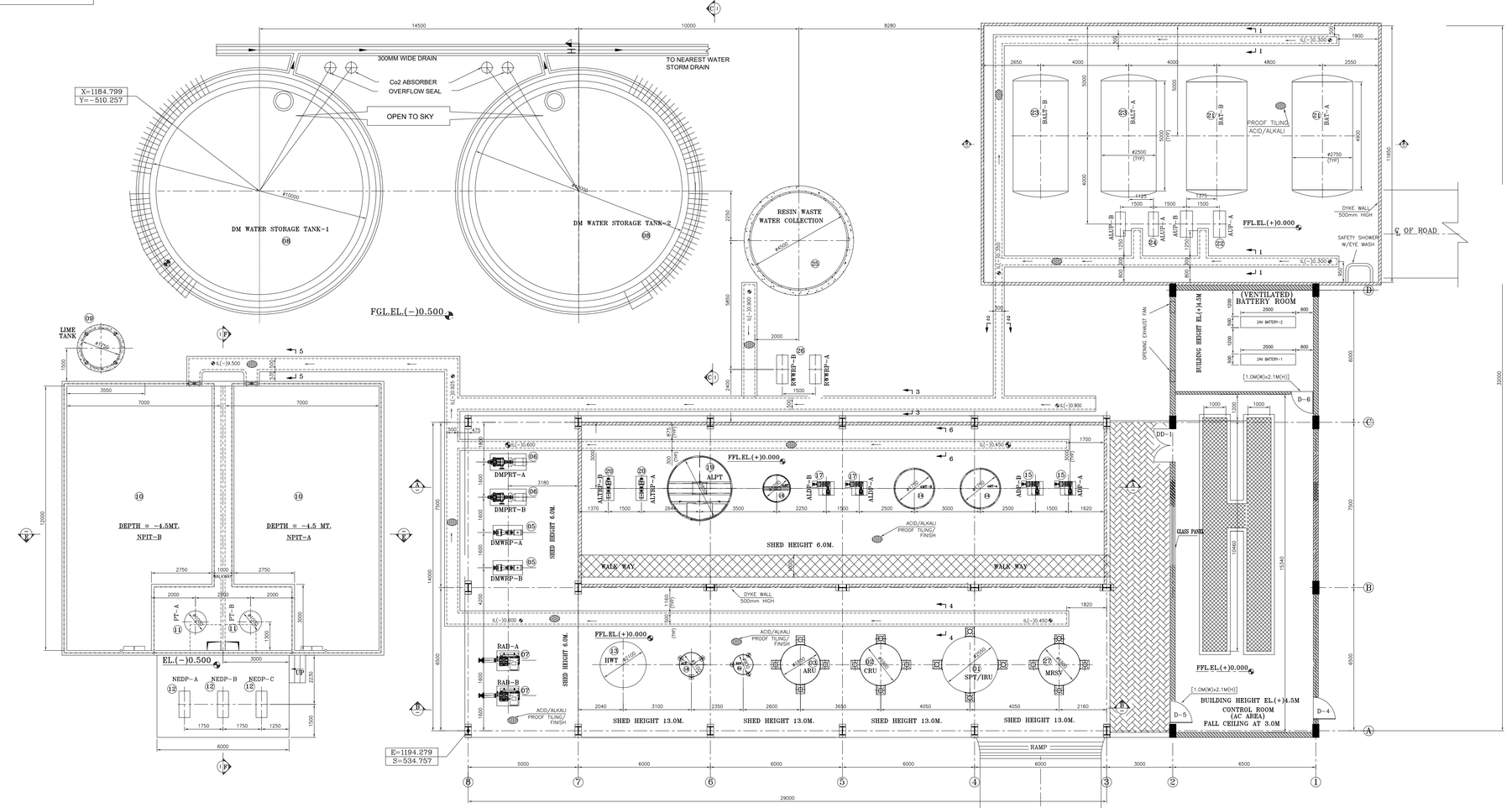
DEPT. | SCALE: NTS | DRAWING NO. PE-DG-390-155-W001
SIGN | SHEET 2 OF 2 | REV. 00

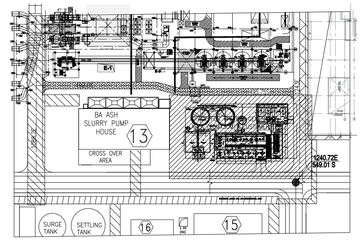
SIZE-A0

COMPUTER FILE NAME:

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
It must not be used directly or indirectly in any way detrimental to the interest of the company.

NORTH





KEY PLAN

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETER AND ELEVATIONS IN METRES.
2. FFL OF CPU REGENERATION SHED, CONTROL ROOM SHALL BE EL. 0.00M WHICH CORRESPONDS TO RL(+)154.50M.
3. ALL DRAIN CHANNELS WILL BE PROVIDED WITH ACID/ALKALI RESISTANT TILING.
4. MCC ROOM HAS NOT BEEN INDICATED IN THIS LAYOUT AS THE CPU REGENERATION AREA MCC IS IN CUSTOMER'S SCOPE.
5. ACID/ALKALI DYKE AREA FLOOR & WALLS TO BE PROVIDED WITH ACID/ALKALI RESISTANT TILING.
6. ALL THE EQUIPMENT SIZES & CAPACITY(*) AS TABULATED IN THE EQUIPMENT LIST ARE TENTATIVE & SHALL BE FINALIZED AFTER ORDERING OF THE PACKAGE ON PACKAGE VENDOR.
7. * MARK INDICATES TENTATIVE SIZE & CAPACITY OF EQUIPMENT

ENGG. REF. DWGS:

DVC/BHEL DWG. No.	TITLE
1. 2115-102-002-PVM-F-045/ PE-DG-528-100-M001	MAIN EQUIPMENT LAYOUT SG ISLAND WITH FGD

EQUIPMENT LIST :-

CPU REGENERATION BUILDING

S.No.	EQUIPMENT	CAPACITY / SIZE	QTY
01	SPT VESSEL OR IRU	1800/2550 mmDia x 8000mm HOS OR 450mmDia x 3200mm HOS*	1 No.
02	CATION REGENERATION UNIT(CRU)	1900mmDia x 5000mmHOS *	1 No.
03	ANION REGN. UNIT(ARU)	1800mmDia x 6035mmHOS*	1 No.
04	RESIN INJECTION HOPPER(RIH)	900mmDia X 700mm(H)*	1 No.
05	DM WATER PUMP FOR REGENERATION	$40m^3/hr$ x $2.5Kg/cm^2$ (1W+1S)*	2 Nos.
06	DM WATER PUMP FOR RESIN TRANSFER	$35m^3/hr$ x $6.0Kg/cm^2$ (1W+1S)*	2 Nos.
07	REGENERATION BLOWERS	300 m^3/hr @ 0.5 kg/cm^2*	2 Nos.
08	DM WATER STORAGE TANK	10000mmDia x 8500mmHOS *	2 Nos.
09	LIME TANK FOR N.PIT	1750mm DIA x 1250mm H *	1 No.
10	NEUTRALIZATION PIT	7000mm W x 12000mm L x 4500mm D* (2 COMP.)	2 Nos.
11	PRIMING TANKS	1000mmDia x 1000mmHOS*	2 Nos.
12	NEUTRALIZATION PIT DISPOSAL PUMPS	$50m^3/hr$ x $5Kg/cm^2$ (1W+1S+1MS)*	3 Nos.
13	HOT WATER TANK	2100mmDia x 2500mmHOS *	1 No.
14	ACID MEASURING TANK FOR CATION	1750mmDia x 1500mmHOS *	2 Nos.
15	ACID DOSING PUMPS	2000LPHx30 MLC*	2 Nos.
16	ALKALI MEASURING TANK FOR ANION	1200mmDia x 1500mmHOS *	1 No.
17	ALKALI DOSING PUMPS	1000LPHx30 MLC*	2 Nos.
18	ACTIVATED CARBON FILTER(ACF)	1100mmDia x 1750mmHOS*	1 No.
19	ALKALI PREPARATION TANK	2850mmDia x 2000mmHOS *	1 No.
20	ALKALI TRANSFER CUM RECIR. PUMPS	$10.0m^3/hr$ x 10MWC (1W+1S)*	2 Nos.
21	BULK ACID STORAGE TANK	2750mmDia x 4900mmLOS*	2 Nos.
22	ACID UNLOADING PUMPS	$10m^3/hr$ x $1Kg/cm^2$ (1W+1S)*	2 Nos.
23	BULK ALKALI STORAGE TANK	2500mmDia x 5000mmLOS *	2 Nos.
24	ALKALI UNLOADING PUMPS	$10m^3/hr$ x $1Kg/cm^2$ (1W+1S)*	2 Nos.
25	RESIN WASTE WATER COLLECTION TANK	4500mmDia x 4000mmHOS*	1 No.
26	RESIN WASTE WATER TRANSFER PUMPS	$50m^3/hr$ x $5Kg/cm^2$ (1W+1S)*	2 Nos.
27	MIXED RESIN STORAGE VESSEL(MRSV)	1900mmDia x 5000mmHOS *	1 No.

LEGEND :-

ACF	ACTIVATED CARBON FILTER
ADP	ACID DOSING PUMPS
AMT	ACID MEASURING TANKS
ALUP	ALKALI UNLOADING PUMPS
ALDP	ALKALI DOSING PUMPS
SPT/IRU	SEPARATION CUM PREPARATION TANK/INTERFACE RESIN UNIT
ARU	ANION REGENERATION UNIT
AUP	ACID UNLOADING PUMPS
BAT	BULK ACID STORAGE TANK
BALT	BULK ALKALI STORAGE TANK
ALMT	ALKALI MEASURING TANK
ALPT	ALKALI PREPARATION TANK
SLG	SLUICE GATE
RWWRP	RESIN WASTE WATER TRANS. PUMPS
℄	CENTRE LINE

HWT	HOT WATER TANK
MRSV	MIXED RESIN STORAGE VESSEL
CRU	CATION REGENERATION UNIT
DMPRT	DM WATER RESIN TRANSFER PUMPS
DMWRP	DM WATER REGENERATION PUMPS
N-PIT	NEUTRALIZATION PIT
ALTRP	ALKALI TRANSFER & RE-CIRCULATION PUMP
NEDP	NEUTRALIZATION EFFLUENT DISPOSAL PUMPS
RAB	REGENERATION AIR BLOWERS
RIH	RESIN INJECTION HOPPER
PT	PRIMING TANK

- BRICK WALL
- DYKE WALL
- RCC WALL / FLOOR / COLUMN
- ACID/ALKALI PROOF TILING/FINISH

EL – ELEVATION
FFL – FINISHED FLOOR LEVEL
RCC – REINFORCED CEMENT CONCRETE
DD – DOUBLE DOOR
D – DOOR
TOC – TOP OF CONCRETE
TOP – TOP OF PAVING

DVC DRG. NO.	2115-110-002-PVM-F-037
CUSTOMER	DAMODAR VALLEY CORPORATION RAGHUNATHPUR THERMAL POWER PROJECT PHASE-II (2x660MW) STEAM TURBINE GENERATOR (STG) PACKAGE
CONSULTANT	DEVELOPMENT CONSULTANTS PRIVATE LIMITED [DCPL]

EQUIPMENT LAYOUT FOR CPU-REGENERATION AREA

JOB NO.	390
STATUS	CONTRACT
DISTRIBUTION	

BHARAT HEAVY ELECTRICALS LTD

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED it must not be used directly or indirectly in any way detrimental to the interest of the company.

DEPT CODE		NAME	SIGN	DATE
M	DRN	DK	Sd/-	24.07.2026
	DESN	MKG	Sd/-	24.07.2026
	CHD	RK	Sd/-	24.07.2026
	APPD	JP	Sd/-	24.07.2026

TITLE
EQUIPMENT LAYOUT CUM CIVIL INPUT OF CONDENSATE POLISHING UNIT (REG. AREA)

DEPT. SCALE 1:150 SIGN

DRAWING NO. PE-V0-390-155-A003

SHEET 1 OF 2 REV. 00

SIZE-A0

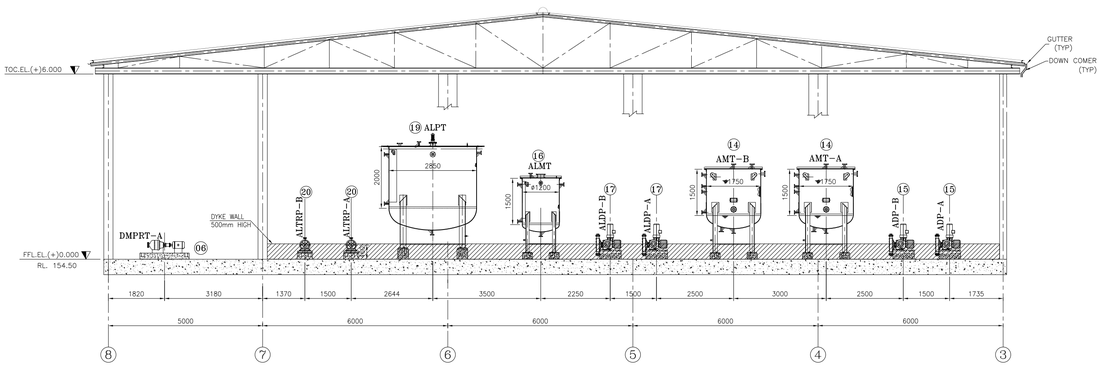
COMPUTER FILE NAME: RAGHUNATHPUR CPU REGENERATION AREA LAYOUT27-7-26.dwg

COPYRIGHT AND CONFIDENTIAL
This drawing is the property of BHARAT HEAVY ELECTRICALS LIMITED
The information on this document is the property of BHEL and it must not be used directly or indirectly in any way detrimental to the interest of the company.

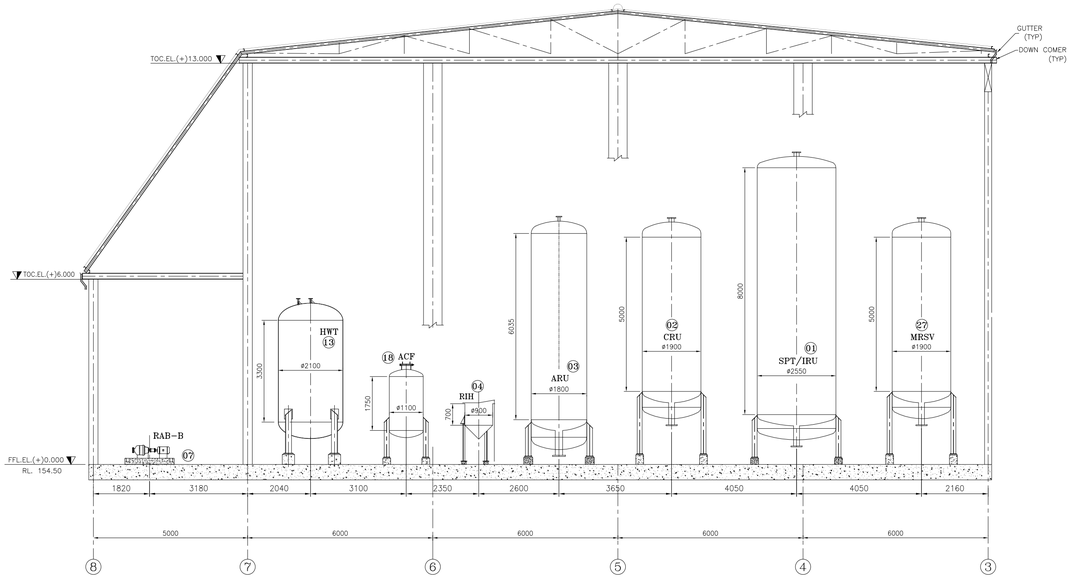
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

DRAWING NO.



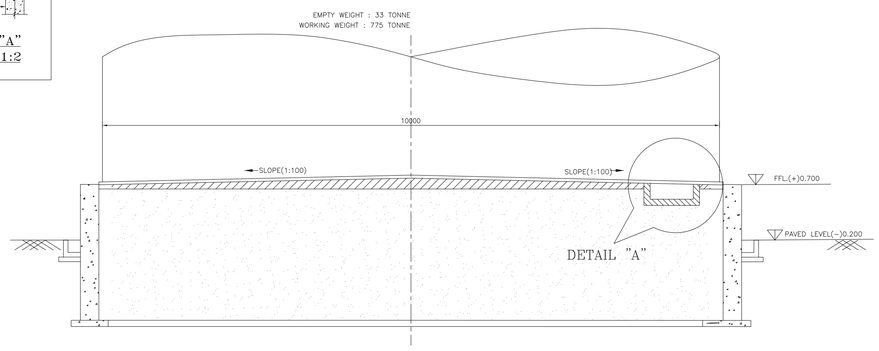
SECTION A–A



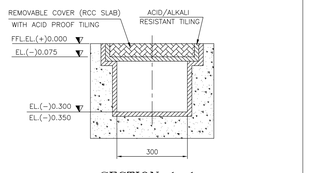
SECTION B–B



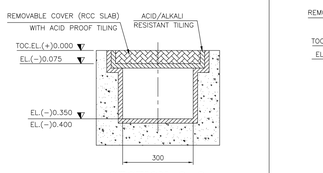
DETAIL "A"
SCALE–1:2



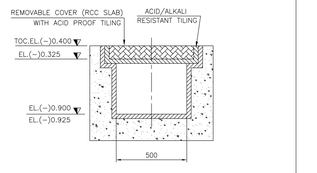
SECTION C–C



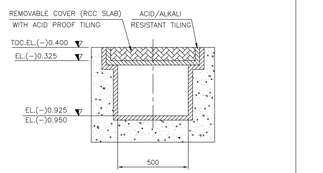
SECTION 1–1



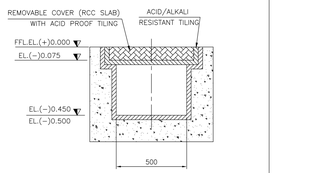
SECTION 2–2



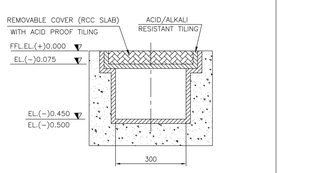
SECTION 3–3



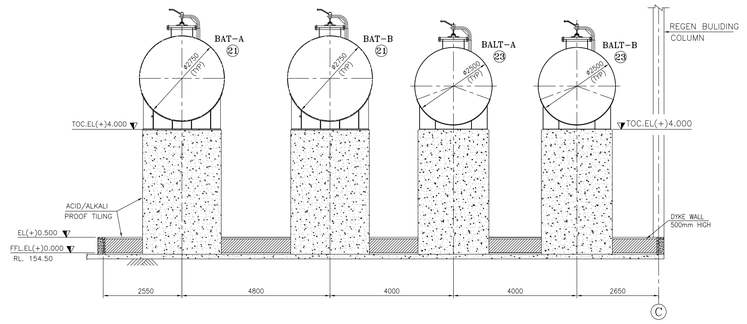
SECTION 5–5



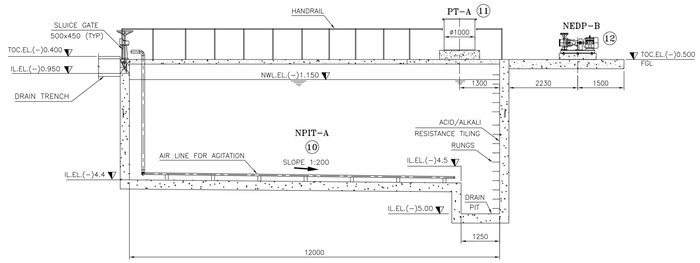
SECTION 4–4



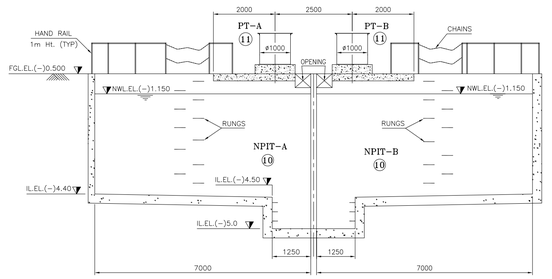
SECTION 6–6



SECTION D–D



SECTION F–F



SECTION E–E

REV.	DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD

OWNER
JOB NO. 390
STATUS CONTRACT
DISTRIBUTION
TO
No. OF

DVC DRAWING No. 2115-110-002-PVM-F-037

DAMODAR VALLEY CORPORATION

RAGHUNATHPUR THERMAL POWER PROJECT
PHASE II (2X660MW)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
M	DRN	DK	Sd/-	24.07.2026
	DESN	MKG	Sd/-	24.07.2026
	CHD	RR	Sd/-	24.07.2026
	APPD	JP	Sd/-	24.07.2026

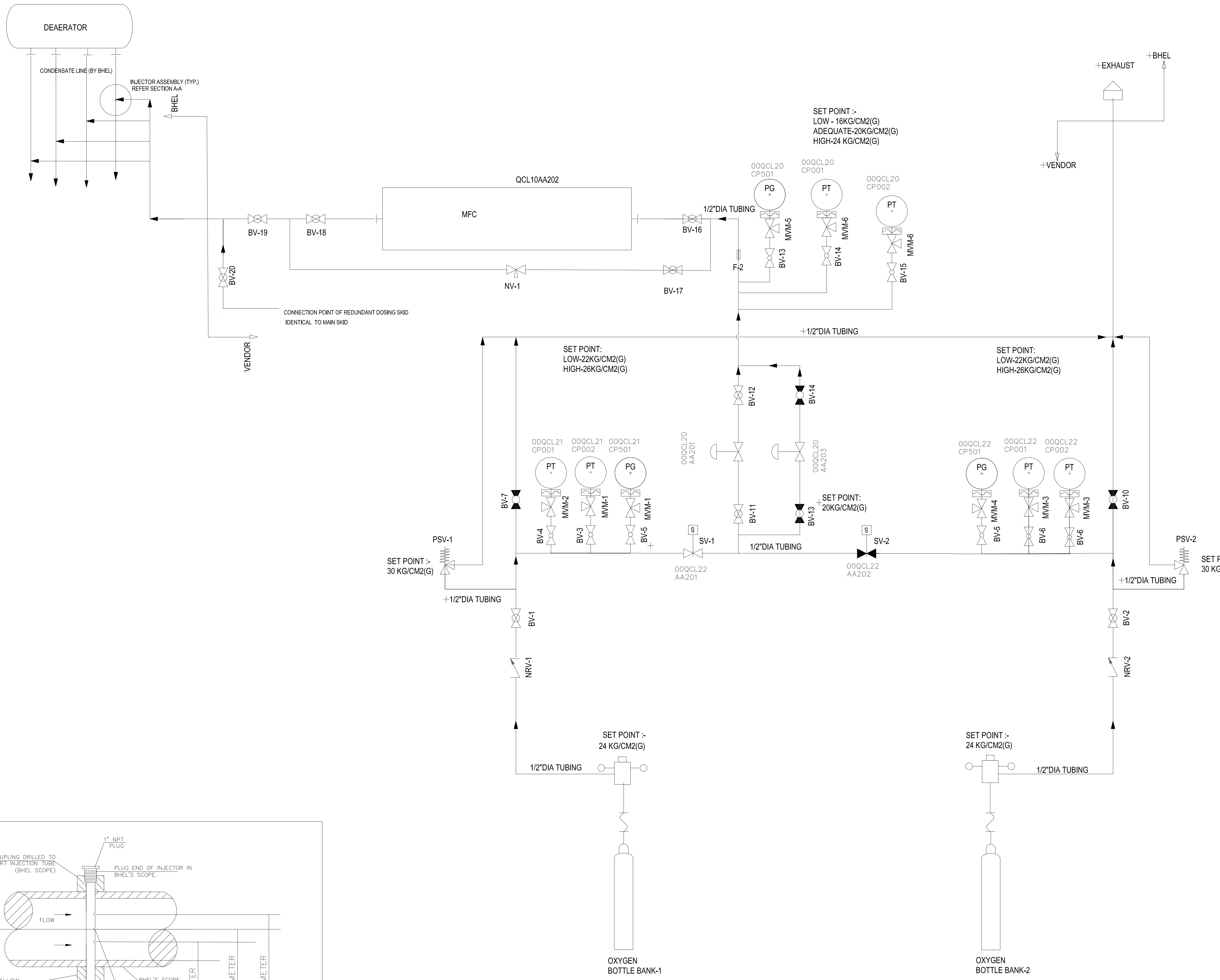
TITLE
EQUIPMENT LAYOUT CUM CIVIL INPUT OF CONDENSATE POLISHING UNIT (REG. AREA)

DEPT. | SCALE: 1:250 | DRAWING NO. PE–V0–390–155–A003
SIGN
DATE
SHEET 2 OF 2 | REV. 00

FORMAT SIZE A0

ELECTRONIC FILE NAME:

ड्राइंग संख्या/DRAWING NO.

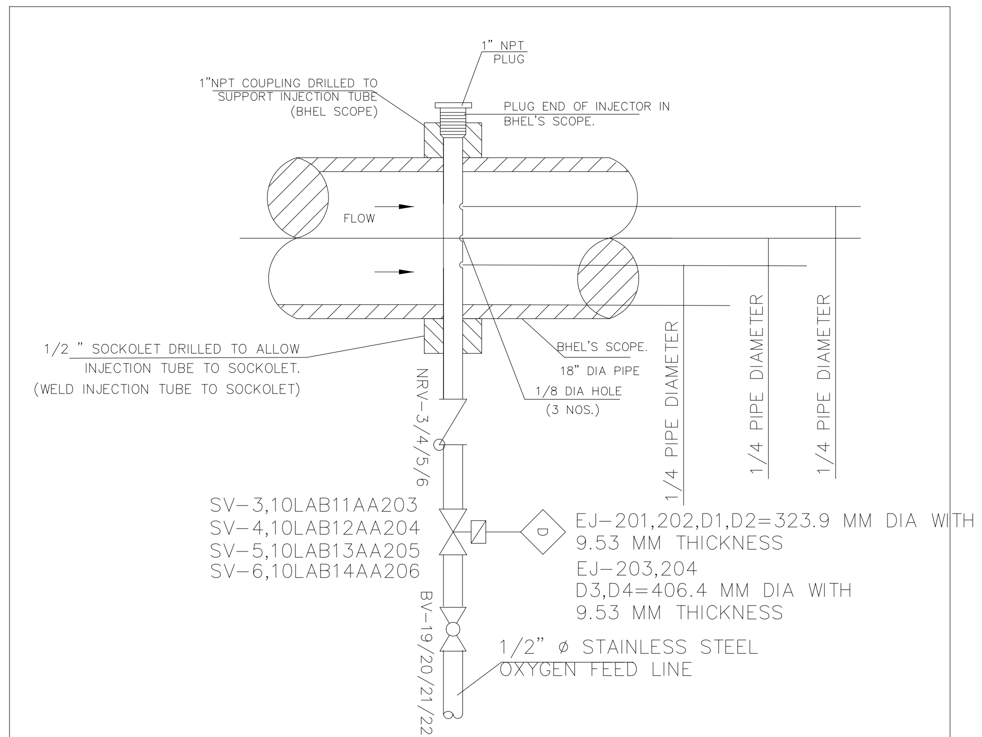


(Each Oxygen cylinder volume 10 m3 at NTP and pressure 204 Kg/cm2)

LEGEND

Symbol	Description
	PRESSURE REDUCING VALVE
	NEEDLE VALVE
PT	PRESSURE TRANSMITTER
	SOLENOID ACTUATED VALVE
PG	PRESSURE GAUGE
	NON RETURN VALVE
	FLOW METER WITH TRANSMITTER
	BALL VALVE
	PRESSURE REGULATOR
	PRESSURE SAFETY VALVE
	DISCHARGE TO ATMOSPHERE FOR GAS/SYSTEM
	PNEUMATIC CONTROL VALVE
	MULTI–VALVE MANIFOLD(SEE NOTES)
	FILTER FINENESS– 2 MICRON
MFC	THERMAL MASS FLOW CONTROLLER (INCLUDING FLOW CONTROL VALVE)

1 THE ENTIRE SYSTEM INCLUDING THE JUNCTION BOX SHALL BE SKID MOUNTED.
2 TWO NUMBER SKIDS PER UNIT SHALL BE PROVIDED FOR DOSING AT DEAERATOR OUTLET (TOTAL=4 NOS FOR STATION).
3 FOUR NUMBERS INJECTION ASSEMBLY PER UNIT SHALL BE SUPPLIED LOOSE (TOTAL =8 NOS FOR STATION).
4. ALL THE VALVES SHALL BE OF SS 316, 1/2" OD SUITABLE FOR 1/2" OD TUBE.
5 ALL TUBING SHALL BE OF SS 316, 15 NB AND 18 BWG.



INJECTOR ASSEMBLY DETAILS-AA
TOTAL QUANTITY 4 Nos
(EJ-201,EJ-202,EJ-203,EJ-204)

कॉपीराइट और गोपनीय
इस दस्तावेज पर उपलब्ध जानकारी भारत हेवी इलेक्ट्रिकल्स लिमिटेड की संपत्ति है।
इसका उपयोग प्रत्यक्ष या अप्रत्यक्ष रूप से किसी भी तरह से कंपनी के लिए अहितकर नहीं होना चाहिए।
COPY RIGHT AND CONFIDENTIAL/
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED/
it must not be used directly or indirectly in any way deterimental to the interest of the company./

D:\Drawing\library\TALCHER FORMAT A1

पुनरीक्षण REV.	दिनांक DATE	परिवर्तितकर्ता ALTD	जाचकर्ता CHD	अनुमोदनकर्ता APPD

ग्राहक ड्राइंग संख्या CUSTOMER DRAWING NO.

ग्राहक/CUSTOMER: DAMODAR VALLEY CORPORATION

कार्य संख्या- JOB NO. 528

स्थिति STATUS CONTRACT

मुद्रण स्केल मीटर में PRINT SCALE IN METRE 0 2 4 6 8 10 20 30 40 50

परियोजना PROJECT: RAGHUNATHPUR THERMAL POWER STATION PHASE-II (2x660 MW)

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LTD
पावर सेक्टर /POWER SECTOR
परियोजना अभियांत्रिकी प्रबंधन
PROJECT ENGINEERING MANAGEMENT
नोएडा (उ॰प्र॰) /NOIDA (U.P.)

DEPT CODE

	नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
तैयारकर्ता/DRN			
डिजाइनकर्ता/DESN			
जाचकर्ता/CHD			
अनुमोदनकर्ता/APPD			

शीर्षक/TITLE

P&ID FOR OXYGEN DOSING SYSTEM AT DEARATOR OUTLET

एमपीएल MPL	सिविल CIVIL	इलेक्ट्रिकल ELEC	सीएण्डआई C&I	एमएसई MSE	मैक्स MAX	विभाग DEPT.	स्केल – SCALE-
						हस्ताक्षर SIGN / दिनांक DATE	

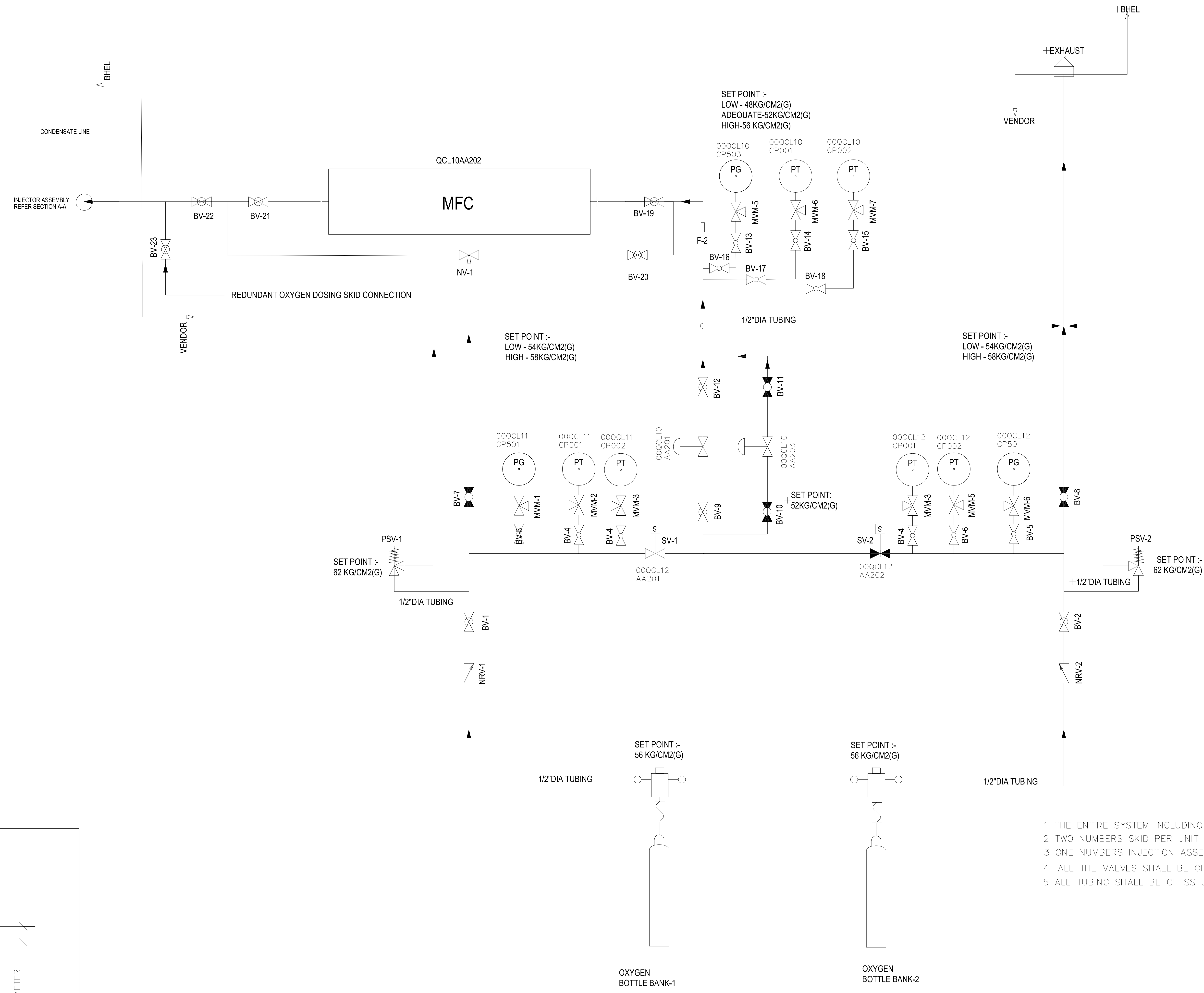
ड्राइंग संख्या / DRAWING NO. PE-DG-528-154-W101

शीट SHEET 2 OF 2 — पुनरीक्षण REV. 00

फॉर्मेट साइज A1
FORMAT SIZE A1

कॉपीराइट और गोपनीय
इस दस्तावेज पर उपलब्ध जानकारी भारत हेवी इलेक्ट्रिकल्स लिमिटेड की संपति है।
इसका उपयोग प्रत्यक्ष या अप्रत्यक्ष रूप से किसी भी तरह से कंपनी के लिए अहितकर नहीं होना चाहिए।
COPY RIGHT AND CONFIDENTIAL/
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED/
it must not be used directly or indirectly in any way deterimental to the interest of the company./

D:\Drawing\library\TALCHER FORMAT A1

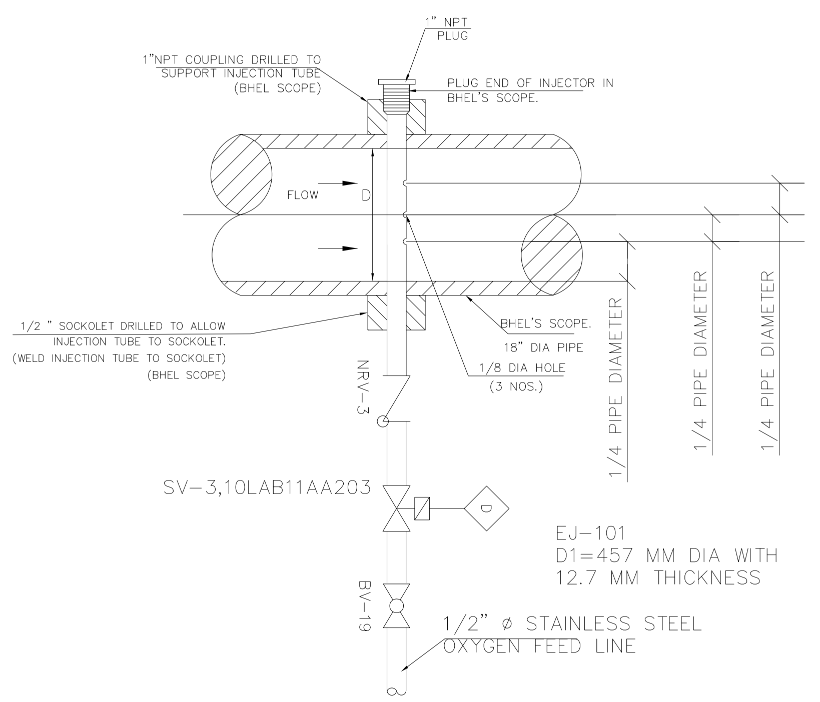


(Each Oxygen cylinder volume 10 m3 at NTP and pressure 204 Kg/cm2)

L E G E N D

	PRESSURE REDUCING VALVE
	NEEDLE VALVE
PT	PRESSURE TRANSMITTER
	SOLENOID ACTUATED VALVE
PG	PRESSURE GAUGE
	NON RETURN VALVE
	FLOW METER WITH TRANSMITTER
	BALL VALVE
	PRESSURE REGULATOR
	PRESSURE SAFETY VALVE
	DISCHARGE TO ATMOSPHERE FOR GAS/SYSTEM
	PNEUMATIC CONTROL VALVE
	MULTI–VALVE MANIFOLD(SEE NOTES)
	FILTER FINENESS– 2 MICRON
MFC	THERMAL MASS FLOW CONTROLLER (INCLUDING FLOW CONTROL VALVE)

1 THE ENTIRE SYSTEM INCLUDING THE JUNCTION BOX SHALL BE SKID MOUNTED.
2 TWO NUMBERS SKID PER UNIT SHALL BE PROVIDED FOR DOSING AT CPU OUTLET (TOTAL=4 NOS FOR STATION).
3 ONE NUMBERS INJECTION ASSEMBLY PER UNIT SHALL BE SUPPLIED LOOSE (TOTAL = 2 NOS FOR STATION).
4. ALL THE VALVES SHALL BE OF SS 316, 1/2" OD SUITABLE FOR 1/2" OD TUBE.
5 ALL TUBING SHALL BE OF SS 316, 15 NB AND 18 BWG.



INJECTOR ASSEMBLY DETAILS-AA
TOTAL QUANTITY 1 Nos
(EJ-101)

पुनरीक्षण REV.	दिनांक DATE	परिवर्तितकर्ता ALTD	जाचकर्ता CHD	अनुमोदनकर्ता APPD

ड्राइंग संख्या/DRAWING NO.

ग्राहक ड्राइंग संख्या CUSTOMER DRAWING NO.

ग्राहक/CUSTOMER: DAMODAR VALLEY CORPORATION

कार्य संख्या- JOB NO. 528
स्थिति STATUS CONTRACT
मुद्रण स्केल मीटर में PRINT SCALE IN METRE 0 2 4 6 8 10 20 30 40 50

परियोजना PROJECT: RAGHUNATHPUR THERMAL POWER STATION PHASE–II (2x660 MW)

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LTD
पावर सेक्टर /POWER SECTOR
परियोजना अभियांत्रिकी प्रबंधन
PROJECT ENGINEERING MANAGEMENT
नोएडा (उ॰प्र॰) /NOIDA (U.P.)

DEPT CODE		नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
	तैयारकर्ता/DRN			
	डिजाइनकर्ता/DESN			
	जाचकर्ता/CHD			
	अनुमोदनकर्ता/APPD			

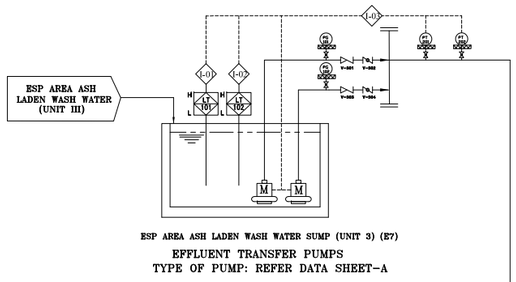
शीर्षक/TITLE

P&ID FOR OXYGEN DOSING SYSTEM AT CPU OUTLET

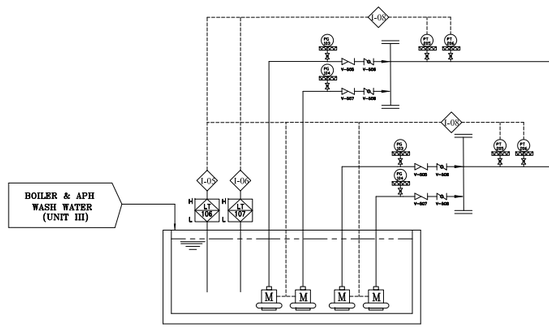
एमपीएल MPL	सिविल CIVIL	इलेक्ट्रिकल ELEC	सीएण्डआई C&I	एमएसई MSE	मैक्स MAX	विभाग DEPT.	स्केल – SCALE-
						हस्ताक्षर SIGN / दिनांक DATE	

ड्राइंग संख्या / DRAWING NO. PE-DG-528-154-W101
शीट SHEET 1 OF 2
पुनरीक्षण REV. 00

फॉर्मेट साइज A1
FORMAT SIZE A1



ESP AREA ASH LADEN WASH WATER SUMP (UNIT 3) (E7)
EFFLUENT TRANSFER PUMPS
TYPE OF PUMP: REFER DATA SHEET-A



BOILER AREA WASH WATER SUMP (UNIT III) (E5)
EFFLUENT TRANSFER PUMPS
TYPE OF PUMP: REFER DATA SHEET-A

CS PIPE SIZES

NB	O.D.(MM) MAX.	THK.(MM)
15	21.8	3.2
25	34.2	4.0
50	60.8	4.5
100	115.0	5.4
150	166.5	5.4
200	219.1	6.0
250	273.0	6.0
300	323.9	6.0
350	355.6	6.0
400	406.4	6.0
450	457	6.0
500	508.0	6.0
600	610.0	6.0
700	711.0	7.0

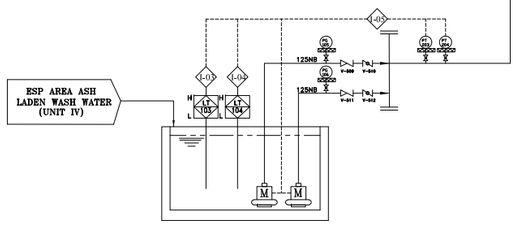
NOTE:-

1) BOILER AREA & ESP AREA ASH LADEN WASH WATER SHALL BE SENT TO ASH SLURRY SUMP, PUMP HEAD SHALL BE PROVIDED CONSIDERING TRANSFER OF WASTE WATER TO ASH SLURRY SUMP.

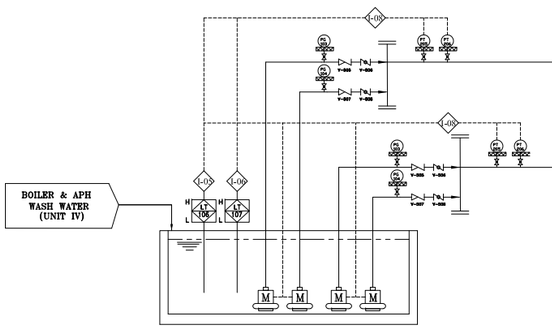
2) THE EQUIPMENT/INSTRUMENTS/PIPE SIZE SHOWN IN THIS P&ID IS MINIMUM REQUIREMENT.

3) FOR CAPACITY & TYPE OF PUMPS AND SUMPS/PITS REFER DATA SHEET-A

TO ASH SLURRY SUMP



ESP AREA ASH LADEN WASH WATER SUMP (UNIT IV) (E8)
EFFLUENT TRANSFER PUMPS
TYPE OF PUMP: REFER DATA SHEET-A



BOILER AREA WASH WATER SUMP (UNIT IV) (E6)
EFFLUENT TRANSFER PUMPS
TYPE OF PUMP: REFER DATA SHEET-A

LINES SYMBOLS

LINES	LEGEND
CONTINUITY LINE	
PROCESS LINE	
CONTROL SIGNAL	
DIRECTION	

VALVES SYMBOLS

GATE VALVE	
BUTTERFLY VALVE	
NON RETURN VALVE (NRV)	
BALL VALVE	

EQUIPMENT SYMBOLS

PUMP (TYPICAL)	M

INSTRUMENTS SYMBOLS

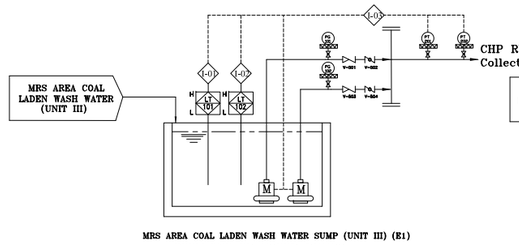
INSTRUMENTS	LEGEND
PRESSURE GAUGE	PG
LEVEL TRANSMITTER	LT
PRESSURE TRANSMITTER	PT

PIPING SYMBOLS

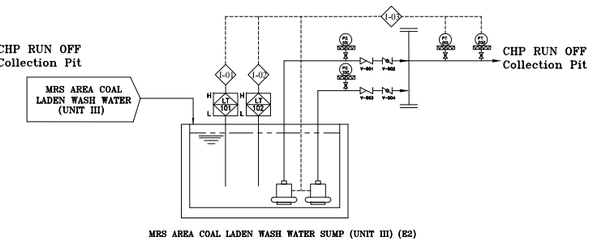
BLIND FLANGE	

FUNCTIONAL SYMBOLS

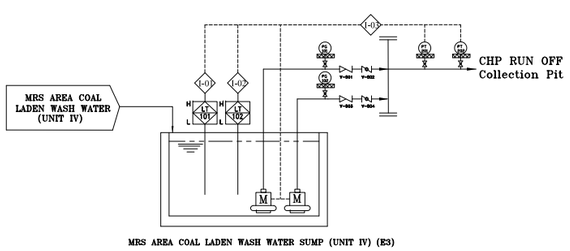
FIELD MOUNTED INSTRUMENT	
DCS INDICATION	
INTERLOCK	I



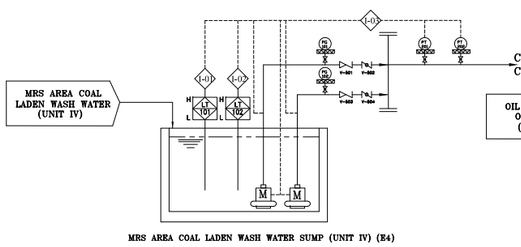
MRS AREA COAL LADEN WASH WATER SUMP (UNIT III) (E1)
EFFLUENT TRANSFER PUMPS
TYPE OF PUMP: REFER DATA SHEET-A



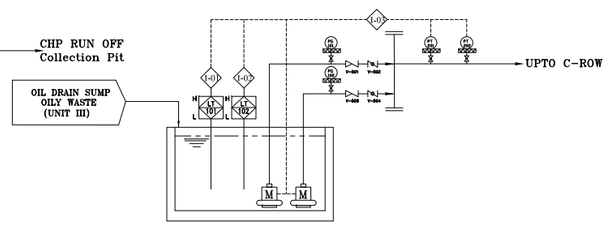
MRS AREA COAL LADEN WASH WATER SUMP (UNIT III) (E2)
EFFLUENT TRANSFER PUMPS
TYPE OF PUMP: REFER DATA SHEET-A



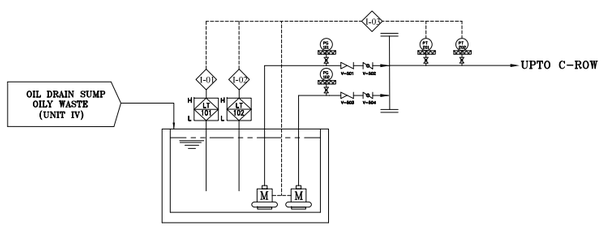
MRS AREA COAL LADEN WASH WATER SUMP (UNIT IV) (E3)
EFFLUENT TRANSFER PUMPS
TYPE OF PUMP: REFER DATA SHEET-A



MRS AREA COAL LADEN WASH WATER SUMP (UNIT IV) (E4)
EFFLUENT TRANSFER PUMPS
TYPE OF PUMP: REFER DATA SHEET-A



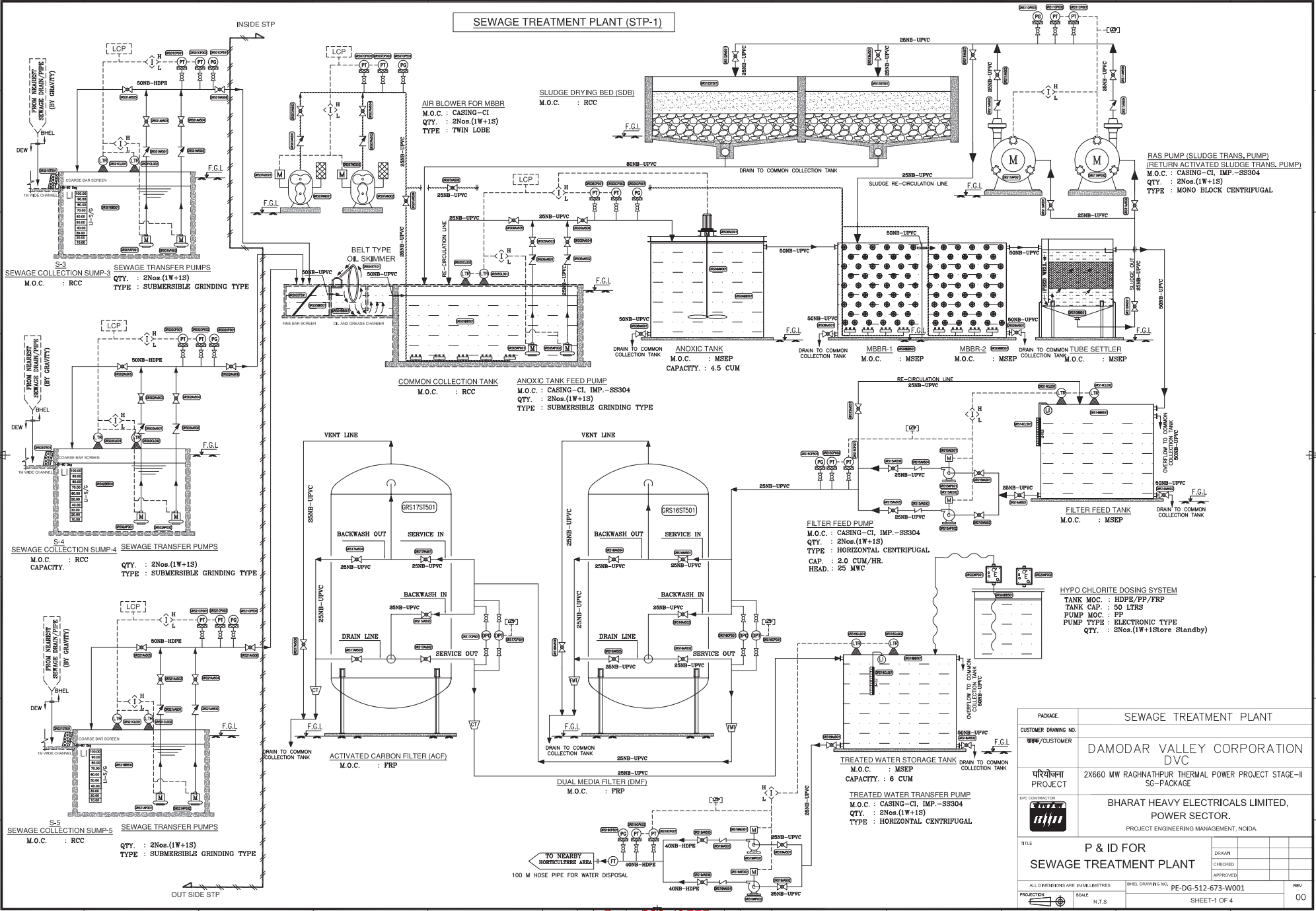
OIL DRAIN SUMP WITH ONE NO OIL SKIMMER (UNIT III) (E9)
EFFLUENT TRANSFER PUMPS
TYPE OF PUMP: REFER DATA SHEET-A



OIL DRAIN SUMP WITH ONE NO OIL SKIMMER (UNIT IV) (E10)
EFFLUENT TRANSFER PUMPS
TYPE OF PUMP: REFER DATA SHEET-A

OWNER :	DVC
CLIENT :	BHARAT HEAVY ELECTRICALS LIMITED. POWER SECTOR PROJECT ENGINEERING MANAGEMENT,NOIDA.
PROJECT :	2x660 MW RAGHUNATHPURP PHASE-II (SG PACKAGE)
TITLE:	P&ID FOR EFFLUENT TRANSFER SYSTEM SG (UNIT-III AND IV)
SCALE	NTS
DATE	
DRAWING NO:	PE-DG-528-164-A001
SHEET NO	1 OF 1
REV NO	00

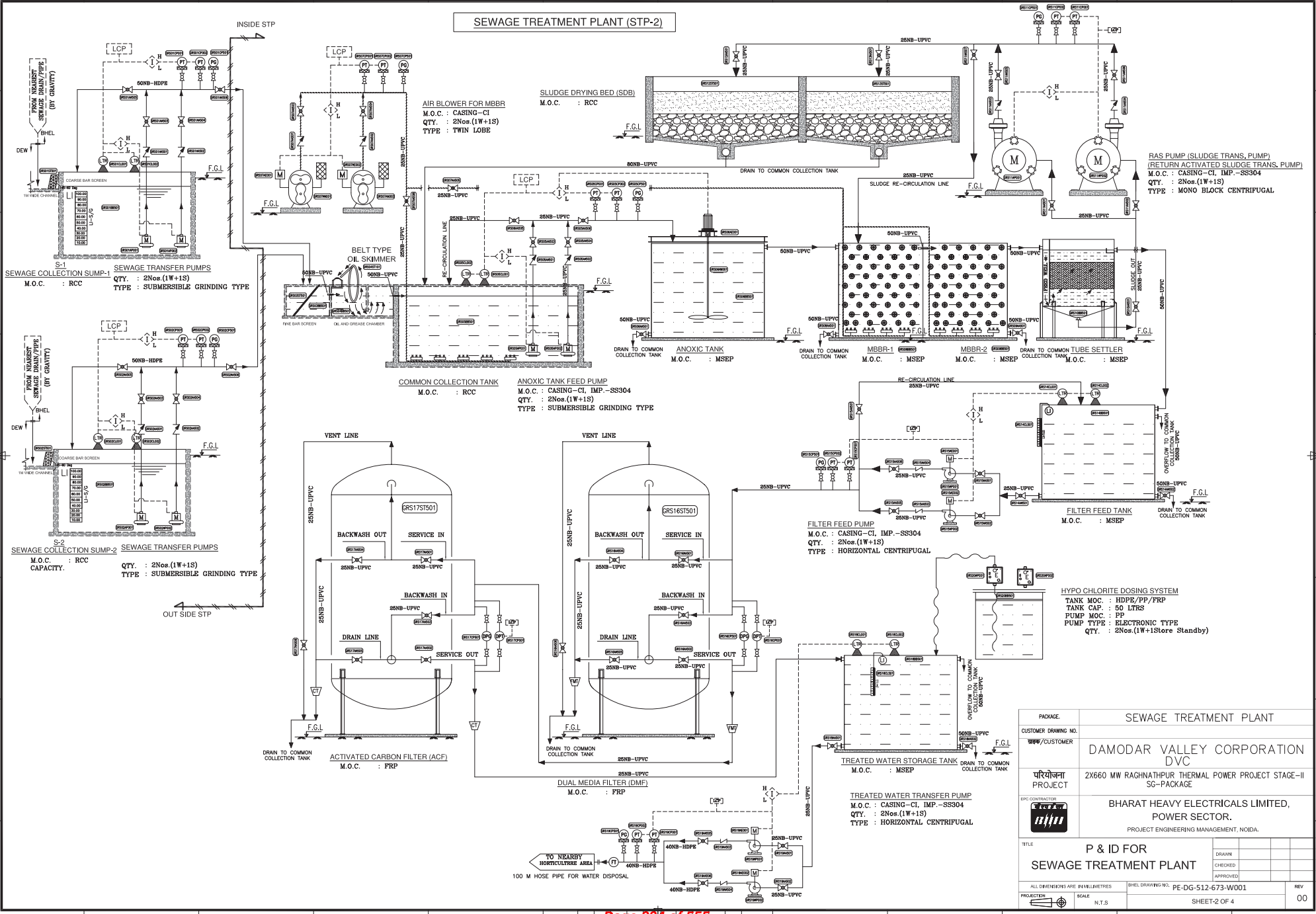
SEWAGE TREATMENT PLANT (STP-1)



PACKAGE.	SEWAGE TREATMENT PLANT
CUSTOMER DRAWING NO.	
ग्राहक/CUSTOMER	DAMODAR VALLEY CORPORATION DVC
परियोजना PROJECT	2X660 MW RAGHNATHPUR THERMAL POWER PROJECT STAGE-II SG-PACKAGE
EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR. PROJECT ENGINEERING MANAGEMENT, NOIDA.
TITLE	P & ID FOR SEWAGE TREATMENT PLANT
DRAWN / CHECKED / APPROVED	
ALL DIMENSIONS ARE IN MILLIMETRES	BHEL DRAWING NO. PE-DG-512-673-W001
PROJECTION / SCALE N.T.S	SHEET-1 OF 4
	REV 00

Size A3

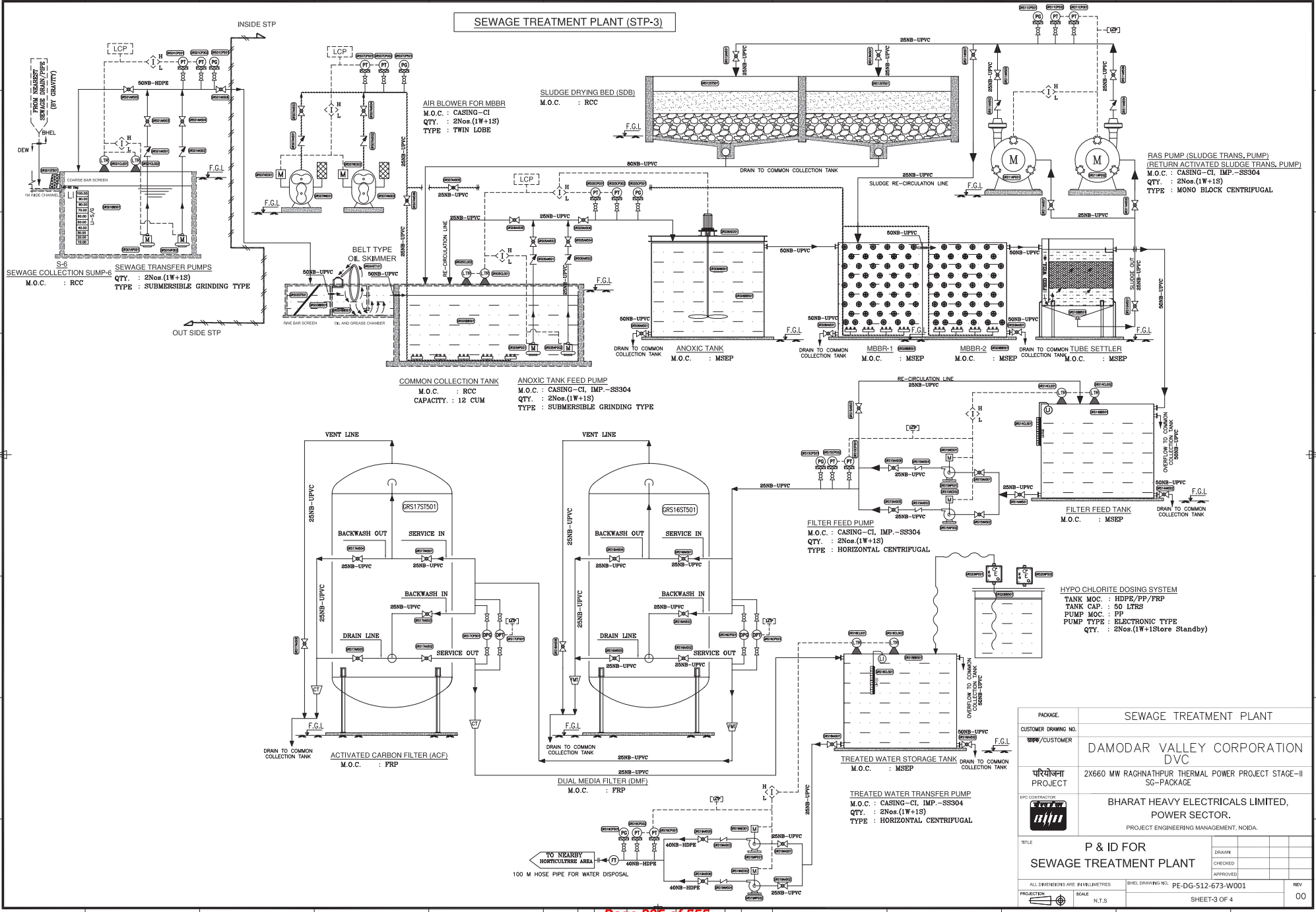
SEWAGE TREATMENT PLANT (STP-2)



PACKAGE.	SEWAGE TREATMENT PLANT
CUSTOMER DRAWING NO.	
ग्राहक/CUSTOMER	DAMODAR VALLEY CORPORATION DVC
परियोजना PROJECT	2X660 MW RAGHNATHPUR THERMAL POWER PROJECT STAGE-II SG-PACKAGE
EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR. PROJECT ENGINEERING MANAGEMENT, NOIDA.
TITLE	P & ID FOR SEWAGE TREATMENT PLANT
DRAWN / CHECKED / APPROVED	
ALL DIMENSIONS ARE IN MILLIMETRES	BHEL DRAWING NO. PE-DG-512-673-W001 REV 00
PROJECTION / SCALE N.T.S	SHEET-2 OF 4

Size A3

SEWAGE TREATMENT PLANT (STP-3)



PACKAGE.	SEWAGE TREATMENT PLANT
CUSTOMER DRAWING NO.	
ग्राहक/CUSTOMER	DAMODAR VALLEY CORPORATION DVC
परियोजना PROJECT	2X660 MW RAGHNATHPUR THERMAL POWER PROJECT STAGE-II SG-PACKAGE
EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR. PROJECT ENGINEERING MANAGEMENT, NOIDA.
TITLE	P & ID FOR SEWAGE TREATMENT PLANT
DRAWN / CHECKED / APPROVED	
ALL DIMENSIONS ARE IN MILLIMETRES	BHEL DRAWING NO. PE-DG-512-673-W001 REV 00
PROJECTION / SCALE N.T.S	SHEET-3 OF 4

Size A3

NOTE: THE EQUIPMENT/INSTRUMENTS/PIPE SIZE SHOWN IN THIS P&ID IS MINIMUM REQUIREMENT.

INSTRUMENT LEGEND

SYMBOL	DESCRIPTION
LTR	LEVEL TRANSMITTER (RADAR TYPE)
PG	PRESSURE GAUGE
LI-F&B	LEVEL INDICATOR (FLOAT & BOARD)
LI-S/G	LEVEL INDICATOR (STAFF GAUGE TYPE)
PT	PRESSURE TRANSMITTER
DPT	DIFFERENTIAL PRESSURE TRANSMITTER
DPG	DIFFERENTIAL PRESSURE GAUGE

LEGENDS FOR ITEMS

SYMBOL	DESCRIPTION
	BALL VALVE
	NON RETURN VALVE
	DIAPHRAGM VALVE
	GATE VALVE
	PRV (PRESSURE RELIEF VALVE)
	HOSE PIPE
	AGITATOR
	CENTRIFUGAL BLOWER
	HORIZONTAL CENTRIFUGAL PUMP
	ELECTRONIC PUMP
	MONOBLOCK PUMP
M	MOTOR
	BELT TYPE OIL SKIMMER
	DIAPHRAGM SEAL (CHEMICAL APPLICATION)

KKS NUMBERING PHILOSOPHY

X	X	X	A	A	Y	Y	B	B	B

- FIRST THREE DIGITS INDICATE THE SUB–SYSTEM
- FOURTH AND FIFTH DIGITS ARE THE NUMERICAL KEYS AT SYSTEM CODE LEVEL AD UED TO DISTINGUISH BETWEEN MAIN SYSTEM HAVING SAME AIPHA CODES

SIXTH AND SEVENTH DIGITS ARE THE EQUIPMENT/APPARATUS/MEASURING CIRCUIT CODE, THE CODE OF VARIOUS EQUIPMENT/APPARATUS/MEASURING CIRCUIT. EIGHT, NINE AND TENTH DIGITS ARE THE NUMERICAL KEYS AT EQUIPMENT/APPARATUS/ MEASURING CIRCUIT CODE AND USED TO DISTINGUISH BETWEEN VARIOUS INSTRUMENT IN THE SAME SUB– GROUP NUMERICAL KEYS AT SYSTEM/ EQUIPMENT/APPARATUS/MEASURING CIRCUIT.

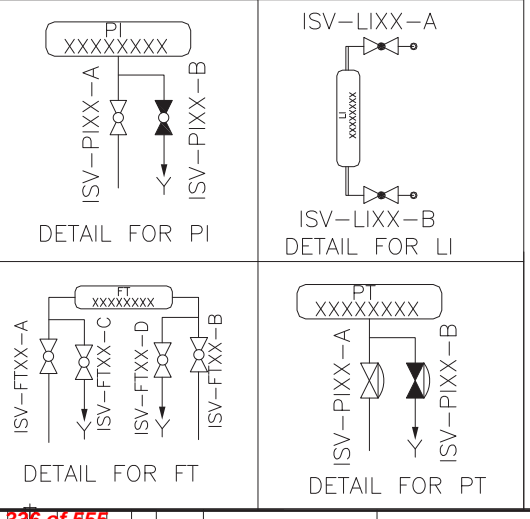
EQUIPMENT / INST.KEY	
AP	PUMPS
AN	BLOWERS
AA	VALVES
AM	MIXER/AGITATOR
AE	MOTOR
BB	SUMP/PIT/TANK
AN	BLOWER
AT	STRAINER
AF	FILTER/SKIMMER

FUNCTION KEY	
GNA	ETP/LET

INSTRUMENT	
CP	PRESSURE
CF	FLOW
CQ	ANALYSER
CL	LEVEL
CD	DENSITY MEASUREMENT

EQUIPMENT /INST. NO.KEY	
M	EQUIPMENT
101 – 150	PNEU, ACTUATED VALVES
501 – 599	MANUAL VALVES
001 – 099	ANALOG INSTRUMENT

TYPICAL DETAIL FOR VALVE/INSTRUMENT ISOLATION



PACKAGE.	SEWAGE TREATMENT PLANT
CUSTOMER DRAWING NO.	
ग्राहक/CUSTOMER	DAMODAR VALLEY CORPORATION DVC
परियोजना PROJECT	2X660 MW RAGHNATHPUR THERMAL POWER PROJECT STAGE–II SG–PACKAGE
EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR. PROJECT ENGINEERING MANAGEMENT, NOIDA.
TITLE	P & ID FOR SEWAGE TREATMENT PLANT
DRAWN / CHECKED / APPROVED	
ALL DIMENSIONS ARE IN MILLIMETRES	BHEL DRAWING NO. PE-DG-512-673-W001 REV 00
PROJECTION / SCALE N.T.S	SHEET-4 OF 4

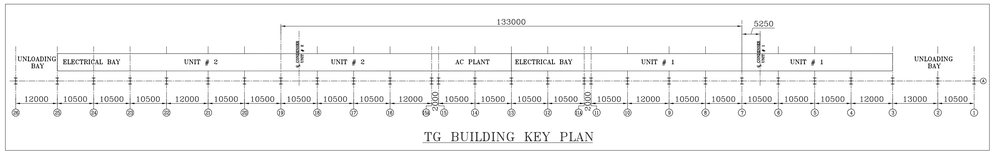
Size A3

COPYRIGHT AND CONFIDENTIAL
BHARAT HEAVY ELECTRICALS LIMITED
The information on this document is the property of BHEL
It must not be used directly or indirectly in any way detrimental to the interest of the company.

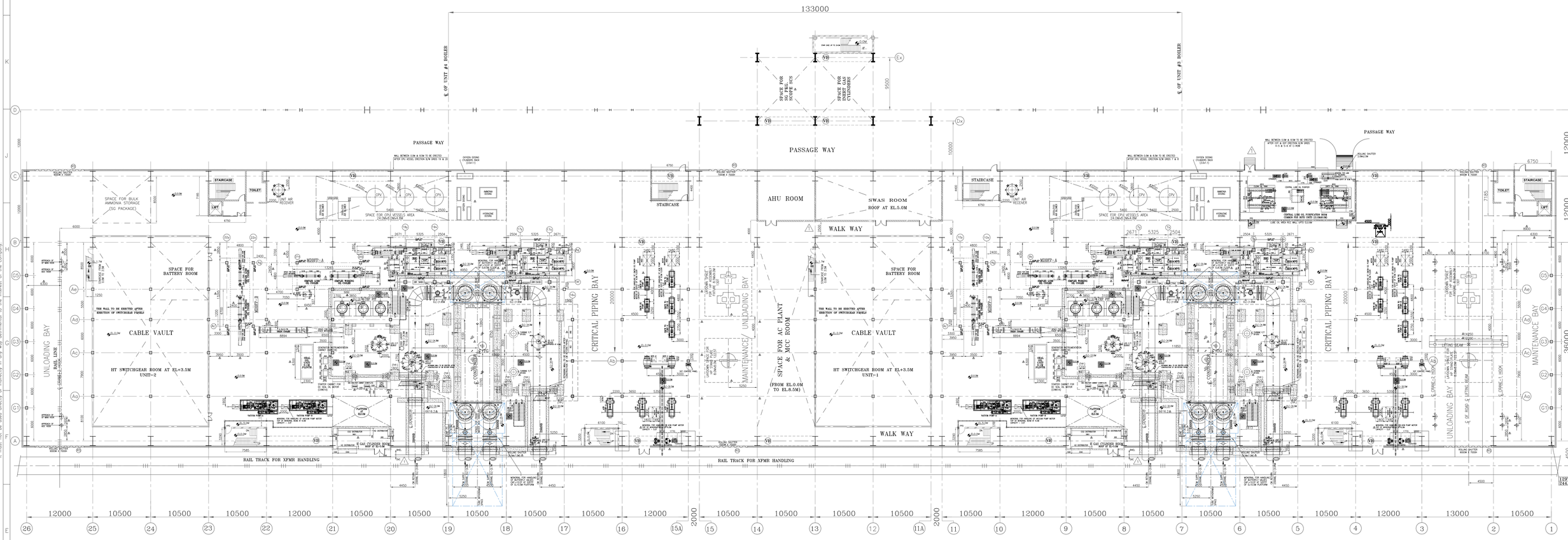
DRAWING NO. PE-DG-390-100-M003

FIRST ANGLE PROJECTION — ALL DIMENSIONS ARE IN MM

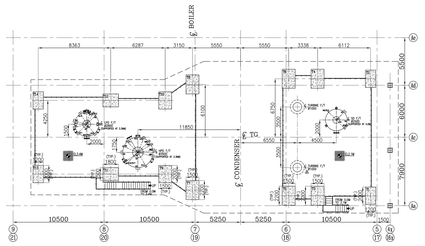
PLANT NORTH



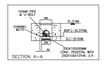
TG BUILDING KEY PLAN



PLAN AT EL0.0M



TG STRUCTURE PLATFORMS



REFERENCE DRAWING:

▲ 1.	TG EQUIPMENT PLAN AT MEZZANINE FLOOR	2115-110-002-PVM-F-030 (PEM)
▲ 2.	TG EQUIPMENT PLAN AT OPERATING FLOOR	2115-110-002-PVM-F-031 (PEM)
▲ 3.	TG EQUIPMENT PLAN AT MISC FLOORS ABOVE OPEARTING FLOOR IN BC BAY	2115-110-002-PVM-F-032 (PEM)
▲ 4.	CROSS SECTION – TG HALL	2115-110-002-PVM-F-033 (PEM)
▲ 5.	CONDENSER ASSEMBLY – GENERAL ARRANGEMENT	2115-110-005-PVM-B-011 (HWR)
▲ 6.	GENERAL ARRANGEMENT OF WASTE OIL TANK	2115-110-005-PVM-B-017 (HWR)
▲ 7.	FOUNDATION PLAN	2115-110-005-PVM-V-002/003 (HWR)
▲ 8.	FOUNDATION DETAILS OF GENERATOR AUX. EQUIPMENTS	2115-110-005-PVE-V-001 (HWR)
▲ 9.	GA OF DRAIN COOLER	2115-110-006-PVM-B-027 (HYD)
10.	GENERAL ARRANGEMENT OF VACUUM PUMPS	---------- (HWR)
▲ 11.	GA OF CEP WITH FOUNDATION DATA	2115-110-006-PVM-B-041 (HYD)
12.	GENERAL ARRANGEMENT OF ACW PUMPS	---------- (PEM)
13.	GENERAL ARRANGEMENT OF DMCW PUMPS (TG)	---------- (PEM)
14.	GENERAL ARRANGEMENT OF DMCW PUMPS (SG)	---------- (PEM)
▲ 15.	WORKING OIL COOLER OF HYDRALIC COUPLING	2115-110-006-PVM-C-020 (HYD)
▲ 16.	LUBE OIL COOLER OF HYDRALIC COUPLING	2115-110-006-PVM-C-021 (HYD)
17.	GA OF SELF CLEANING STRAINER	---------- (PEM)
▲ 18.	ARRGT. & ASSY. OF OIL UNLOADING VESSEL	2115-110-030-PVM-B-009 (BPL)
▲ 19.	GENERAL ARRGT. OF CLEAN OIL TANK	2115-110-030-PVM-B-007 (BPL)
▲ 20.	GENERAL ARRGT. OF DIRTY OIL TANK	2115-110-030-PVM-B-008 (BPL)
▲ 21.	CRANE CLEARANCE DIAGRAM OF TG HALL EOT CRANE	2115-110-002-PVM-W-026 (PEM)
22.	BALL RECIRCULATION SKID	---------- (PEM)
▲ 23.	GENERAL ARRANGEMENT OF STEAM DRAIN F/T	2115-110-030-PVM-B-004 (BPL)
▲ 24.	GENERAL ARRANGEMENT OF UNIT F/T	2115-110-030-PVM-B-005 (BPL)
▲ 25.	GENERAL ARRANGEMENT OF LP DRAIN F/T	2115-110-030-PVM-B-003 (BPL)
▲ 26.	GENERAL ARRANGEMENT OF HP DRAIN F/T	2115-110-030-PVM-B-002 (BPL)
27.	GA OF CENTRAL LUBE OIL PURIFICATION UNIT	---------- (HWR)
▲ 28.	PLOT PLAN (TDBFP-LUBE OIL EQUIPMENT LAYOUT)	2115-110-006-PVM-F-003 (HYD)
▲ 29.	GA OF GLAND STEAM CONDENSER	2115-110-005-PVM-B-012 (HWR)
30.	GA OF UNIT AIR RECIEVER	---------- (DVC)
31.	CPU SKID	---------- (PEM)
32.	GA OF HYDRAZINE DOSING SYSTEM	---------- (PEM)
33.	GA OF AMMONIA DOSING SYSTEM	---------- (PEM)
34.	GA OF OXYGEN DOSING SYSTEM	---------- (PEM)
▲ 35.	TURBINE GENERATOR JUNCTION BOXES – LIST & LAYOUT	2115-110-005-PVI-F-064 (HWR)
▲ 36.	LAYDOWN SPACE FOR STEAM TURBINE COMPONENTS	2115-110-005-PVM-W-003 (HWR)
▲ 37.	GA FOR TURBINE- GENERATOR AUXILIARY CONTROL CABINETS	2115-110-005-PVI-B-044 (HWR)
▲ 38.	AUXILIARY EQUIPMENT FOUNDATION	2115-110-006-PVM-V-010 (HYD)
▲ 39.	GENERAL ARRANGEMENT OF LEAKAGE/DIRTY OIL TANK & PUMP	2115-110-005-PVM-B-018 (HWR)
▲ 40.	GENERAL ARRANGEMENT OF CLO PURIFICATION SKID	---------- (HWR)
▲ 41.	GENERAL ARRANGEMENT OF DIRTY & CLEAN OIL TRANSFER PUMPS	---------- (PEM)
▲ 42.	GENERAL ARRANGEMENT OF LUBE OIL DUPLEX STRAINER	---------- (PEM)

LEGENDS:

	PIPE HATCH
FPD	VERTICAL BRACING FIRE PROOF DOOR
	GRATING
R	CHEQUERED PLATE REMOVABLE
	HAND RAILING
	PIPE & CABLE TRESTLE
	RCC
	BRICK WALL
RS	ROLLING SHUTTER
VB	VERTICAL BRACING

NOTES

1. ALL DIMENSIONS ARE IN MM'S AND LEVELS ARE IN METRES.
2. ALL ELEVATIONS INDICATED IN THE DRG. ARE W.R.T. POWER HOUSE GROUND FLOOR ELEVATION AS EL0.0M WHICH CORRESPONDS TO RL(+)154.5M.
3. EQUIPMENTS & FACILITIES SHOWN FOR PACKAGES OTHER THAN TG PACKAGE ARE SUGGESTIVE ONLY HOWEVER IT IS PREFERRED THAT ⚠DETAILS OF THE SAME TO BE REFERRED FROM RESPECTIVE PACKAGE VENDORS.

REV.	DATE	ALTD	CHD	APPD
02	23.09.2026			
▲				

REV.	DATE	ALTD	CHD	APPD
01	15.04.14	VKS/RP	RP/BKA	BKA

1. Dwg revised in line with customer comments.
2. Dwg revised as marked ⚠1

OWNER	DVC DRAWING No. ▲2115-110-002-PVM-F-029
	DAMODAR VALLEY CORPORATION
JOB NO. 390	RAGHUNATHPUR THERMAL POWER PROJECT PHASE II (2X660MW)
STATUS CONTRACT	
DISTRIBUTION	
TO	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA
No. OF	

DEPT CODE		NAME	SIGN	DATE
M	DRN	RP		29/03/13
	DESN	RP		29/03/13
	CHD	RP/BKA		29/03/13
	APPD	AJ		29/03/13

TITLE: T.G. EQUIPMENT LAYOUT PLAN AT 0.0M

DEPT.	SCALE: 1:250	DRAWING NO.
SIGN		PE-DG-390-100-M003
DATE		SHEET 1 OF 1 REV. 01

FORMAT: SIZE A0

ELECTRONIC FILE NAME: 390_100_M003_R2P (20.03.2026).dwg

ANNEXURE XIV

PERCENTAGE BREAK UP OF PRICE FOR (COMMON FOR TG & SG)

Bidder to submit BBU during detailed engineering after approval of Basic documents. BBU shall be equal to BOQ for the package and there shall be no price and delivery implication is applicable to BHEL/ customer for the same. Incomplete BBU shall not be review by BHEL.

1. Break-up (%) of Supply prices of each water treatment package shall be strictly followed by bidder during detailed engineering as per below mentioned criteria:

1.1 CONDENSATE POLISHING UNIT (TG PACKAGES)

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lumpsum firm price for supply of Service vessels along with pre-filters	19% of Total supply Price of Condensate Polishing Unit.
2.	Lumpsum firm price for supply of Pressure vessels other than Service vessels & pre-filter	6% of Total supply Price of Condensate Polishing Unit.
3.	Lumpsum firm price for supply of Resin	14% of Total supply Price of Condensate Polishing Unit.
4.	Lumpsum firm price for supply of Atmospheric tank	10% of Total supply Price of Condensate Polishing Unit.
5.	Lumpsum firm price for supply of Low Pressure Valves	4% of Total supply Price of Condensate Polishing Unit.
6.	Lumpsum firm price for supply of High Pressure Valves	24% of Total supply Price of Condensate Polishing Unit.
7.	Lumpsum firm price for supply of Instruments & Analyser	9% of Total supply Price of Condensate Polishing Unit.
8.	Lumpsum firm price for supply of Rotary Equipment (Pumps, Blowers, Agitators etc.)	6% of Total supply Price of Condensate Polishing Unit.
9.	Lumpsum firm price for supply of Piping & Fittings	5% of Total supply Price of Condensate Polishing Unit.
10.	Lump sum firm price for preparation of drawings in 3D	1% of Total supply price of Condensate Polishing Unit.
11.	Lumpsum firm price for supply of Balance items	2% of Total supply Price of Condensate Polishing Unit.

1.2 SEWAGE TREATMENT PLANT (SG PACKAGES)

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lump sum firm price for supply of Valves and oil skimmer	8% of Total supply price of Sewage Treatment Plant
2.	Lump sum firm price for supply of Instruments & Analysers	8% of Total supply price of Sewage Treatment Plant

3.	Lump sum firm price for supply of Pumps with motors & blowers with motors	15% of Total supply price of Sewage Treatment Plant
4.	Lump sum firm price for supply of Decentralised STP units with respective motor and accessories	45% of Total supply price of Sewage Treatment Plant
5.	Lump sum firm price for supply of Piping & Fittings	15% of Total supply price of Sewage Treatment Plant
6.	Lump sum firm price for preparation of drawings in 3D	1% of Total supply price of Sewage Treatment Plant
7.	Lump sum firm price for supply of Balance items	8% of Total supply price of Sewage Treatment Plant

1.3 EFFLUENT TRANSFER SYSTEM (SG PACKAGES)

SL NO	TECHNICAL PARTICULARS	PERCENTAGE (%) OF SUPPLY BBU (To be used during contract execution for payment).
1.	Lump sum firm price for supply of Valves	8% of Total supply price of Effluent Treatment Plant.
2.	Lump sum firm price for supply of Instruments	25% of Total supply price of Effluent Treatment Plant.
3.	Lump sum firm price for supply of Piping & Fittings	30% of Total supply price of Effluent Treatment Plant.
4.	Lump sum firm price for preparation of drawings in 3D	1% of Total supply price of Effluent Treatment Plant.
5.	Lump sum firm price for supply of Pumps	25% of Total supply price of Effluent Treatment Plant.
6.	Lump sum firm price for supply of Balance items	11% of Total supply price of Effluent Treatment Plant.

1.4 CHEMICAL DOSING SYSTEM: SKID BASED SYSTEM (BOTH TG & SG PACKAGES)

1.5 OXYGEN DOSING SYSTEM: SKID BASED SYSTEM (SG PACAKGE)

DATA SHEET-A FOR CHEMICAL DOSING SYSTEM
(COMMON FOR TG & SG)

S. No.	Description	Ammonia	Hydrazine	NaOH
1.0	No. of skid(s)	Two (For SG)	Two (For SG)	Five (Two for SG & Three for TG)
2.0	Metering Tanks			
a	Number of tanks per skid	One	One	Not Applicable
b	Capacity in litres	125	30	Not Applicable
c	Type	Vertical cylindrical, dish end bottom tank	Vertical cylindrical, dish end bottom tank	Not Applicable
d	Material of the tank	SS-304	SS-304	Not Applicable
e	Thickness	Not less than 3 mm	Not less than 3 mm	Not Applicable
f	Design Standard	IS 803/API 650	IS 803/API 650	Not Applicable
g	Free Board	300 mm	300 mm	Not Applicable
3.0	Mixing cum storage tank			
a	Number of tanks per skid	One	One	One
b	Capacity in litres	2300	2300	500
c	Type	Vertical cylindrical, dish end bottom tank	Vertical cylindrical, dish end bottom tank	Vertical cylindrical, dish end bottom tank
d	Material of the tank	SS-304	SS-304	SS-304
e	Thickness	Not less than 3 mm	Not less than 3 mm	Not less than 6 mm
f	Free Board	300 mm	300 mm	300 mm
g	Motorised Stirrer	Propeller type with slow speed reduction gear unit		
h	Material of shaft and propeller	SS-316	SS-316	SS-316
i	RPM of stirrer	Below 150 rpm	Below 150 rpm	Below 150 rpm
j	Dissolving basket	NA	NA	Provided (30 mesh), SS-316
k	Design Standard	IS 803/API 650	IS 803/API 650	IS 803/API 650
4.0	Dosing pump			
a	Medium to be handled	Ammonia solution	Hydrazine solution	NaOH solution
b	Type of pump	Positive displacement Plunger type variable stroke control metering pump		
c	Make of pump	Reputed indigenous		
d	No. of pump-motor assembly	Two (2X100%)	Two (2X100%)	Two (2X100%)
e	Capacity	50 LPH	50 LPH	10 LPH
f	Discharge pressure	45 Kg/cm2 (g)	45 Kg/cm2 (g)	10 Kg/cm2 (g)
g	All Wetted parts of pumps	SS-316	SS-316	SS-316
h	Pulsation Dampener	One per each pump discharge	One per each pump discharge	One per each pump discharge
i	Connection at suction, position	1″ ANSI B16.5 #150, bottom	1″ ANSI B16.5 #150, bottom	1″ ANSI B16.5 #150, bottom
j	Connection at discharge, position	1″ ANSI B16.5 #300, top	1″ ANSI B16.5 #300, top	1″ ANSI B16.5 #300, top
k	Applicable standard	API 675	API 675	API 675
l	Type of stroke control	Local manual & automatic		
5.0	Strainers:			

5.1	No. of strainers	One	One	One
5.2	Type	Duplex type	Duplex type	Duplex type
5.3	MOC of body	SS-304	SS-304	SS-304
5.4	Material of screen	SS-316	SS-316	SS-316
5.5	Mesh Size	50 (BS)	50 (BS)	50 (BS)
6.0	Drain & Overflow:			
6.1	Material	ASTM A312 Gr. TP 304 Schedule 40 (seamless)		
6.2	Diameter	25 NB	25 NB	25 NB
7.0	Vent & Sampling Pipe			
7.1	Material	ASTM A312 Gr. TP 304 Schedule 40 (seamless)		
7.1.1	Diameter	15 NB	15 NB	15 NB
7.3	Drain Header:			
7.3.1	Material	ASTM A 312 GR TP 304 Sch 40	ASTM A 312 GR TP 304 Sch 40	ASTM A 312 GR TP 304 Sch 40
7.3.2	Diameter	40 NB	40 NB	40 NB
8.0	Valves:			
8.1	Body, Cover, Yoke & Trim Material	ASTM A182 Gr. TP 304	ASTM A182 Gr. TP 304	ASTM A182 Gr. TP 304
8.2	Design standard	ANSI B 16.34/API 602	ANSI B 16.34/API 602	ANSI B 16.34/API 602
8.3	Test standard	API 598	API 598	API 598
8.4	End Connections	SW ANSI B 16.11	SW ANSI B 16.11	SW ANSI B 16.11
8.5	Rating	---------Class ASA 800--------	---------Class ASA 800--------	---------Class ASA 800--------
8.6	Valve operation	Manual	Manual	Manual
8.7	Weld ends	Socket weld ends	Socket weld ends	Socket weld ends
8.8	Pressure relief valve			
8.8.1	Body, bonnet, disc, nozzle & spring	ASTM A182 Gr. TP 304	ASTM A182 Gr. TP 304	ASTM A182 Gr. TP 304
8.8.2	Inlet Connections	25 NB, Flanged, ANSI B16.5, 300#		
8.8.3	Outlet Connections	25 NB, Flanged, ANSI B16.5, 300#		
9.0	Fittings	Forged steel to A182 F304, Dimension to ANSI B 16.11 socket weld ends		
10.0	Structural steel	IS 2062	IS 2062	IS 2062
11.0	Flanges-Pump Suction/Discharge	ANSI B 16.5 CL150/ANSI B 16.5 CL 300	ANSI B 16.5 CL150/ANSI B 16.5 CL 300	ANSI B 16.5 CL150/ANSI B 16.5 CL 300
12.0	Hand pump (MOC SS-304) with accessories.	One no. per skid	One no. per skid	NA
13.0	Access ladder and platform	IS 2062	IS 2062	IS 2062
14.0	Nuts and Bolts	SS 304	SS 304	SS 304

Note: Checker plate shall be provided all over the skids.

DATA SHEET-A FOR CONDENSATE POLISHING UNIT (FOR TG)

1.0	**DESCRIPTION OF TURBO GENERATOR UNIT (TG) FOR WHICH CONDENSATE POLISHING IS TO BE PROVIDED:**	
(i)	No. of units	Two (2)
(ii)	Capacity of unit	660 MW
(iii)	Total flow in all the working service vessels (per unit)	1615 Tones per hour
2.0	**CONDENSATE POLISHER SERVICE VESSELS PER UNIT:**	
(i)	Number of condensate polisher service vessel	Three numbers (3X33.33%)
(ii)	Type of condensate polisher service vessel	Cylindrical / Spherical
(iii)	Capacity of each condensate polisher service vessel	33.33% of condensate flow
(iv)	Flow through each condensate polisher service vessel	538.33 Tones per hour
(v)	Operating pressure of each condensate polisher service vessel	29.0 kg./sq.cm (g)
(vi)	Design pressure of each condensate polisher service vessel	45.15 kg./sq.cm (g)
(vii)	Operating temperature of service vessel and their internals/ appurtenances including resin	50 degree Celsius.
(viii)	Design temperature of service vessel and their internals/ appurtenances	70 degree Celsius.
(ix)	Pressure drop	• 3.5 kg/sq. cm (max, including CPU service vessels, valves and fittings & resin traps connected with the unit) for clogged condition. • 2.1 kg/sq. cm (max, including CPU service vessels, valves and fittings & resin traps connected with the unit) for clean condition.
(x)	Design code of each condensate polisher service vessel	ASME sec VIII -div 1or acceptable equivalent international standard.
(xi)	Material of construction of each condensate polisher service vessel	• Carbon steel plates to SA - 515/ 516 Gr. 70 with rubber lining inside. The lining shall be of rubber having a hardness of 65 plus/minus 5 shore-A meeting the requirements of IS: 4682, Part-I (4.5 mm thick Rubber lining in three layers). • Inlet water distributor: - Hub and internals diffuser splash plate or header and perforated laterals. Material of construction shall be SS-316 • Under drains: - Same as above with screened laterals with internal perforated pipes and rubber lined flat bottom.
(xii)	Resin traps at the outlet of each condensate polisher service vessel	Rubber lined steel construction and internals (cord & screen) shall be of JOHNSON SCREENS IRELAND

		or equivalent (SS-316) construction
2.1	**AIR-BLOWERS FOR RESIN MIXING (SERVICE VESSELS AREA) PER 660 MW TG UNIT**	
(i)	Number of air blowers per 660 MW TG Unit	Two (2x100%)
(ii)	Type of each air blowers	Centrifugal/Twin lobe type, oil free, positive displacement
(iii)	Duty	Intermittent
(iv)	Capacity & Head	As required
(v)	Pressure gauge	One per blower
(vi)	Location of each air blowers	Indoor
(vii)	Material of Construction	Casing, cover and stator – Cast Iron GR FG 260 to IS 210 Lobe/ Impeller – Cast Iron GR FG 260 to IS 210 Shaft – Carbon steel BS:970 EN-8/ANSI-1045
(viii)	Accessories	Each blower shall be complete with motor, V-belt drive with belt guard, inlet filter/silencer, flexible couplings and discharge snubber, all mounted on a single base. Relief valve(s) shall also be provided.
3.0	**EXTERNAL REGENERATION FACILITIES (One (1) set of external regeneration system common for all the condensate polishing plants shall be provided by bidder)**	

3.1	**REGENERATION PRESSURE VESSELS**	
(i)	Resin Separation & Cation Regeneration Vessel	One (1) no.
(ii)	Anion Regeneration Unit	One (1) no.
(iii)	Mixed Resin Storage unit	Two (2) nos.
(iv)	Type	Vertical (Cylindrical)
(v)	Design code (pressure vessel other than service vessel)	ASME sec VIII div 1 (latest edition)
(vi)	Design pressure	8 Kg/cm2 (Minimum)
(vii)	Material of construction (shell & dished ends)	Carbon steel plates to SA - 515 / 516 Gr. 70 with rubber lining inside. The lining shall be of rubber having a hardness of 65 plus/minus 5 shore-A meeting the requirements of IS: 4682, Part-I
(viii)	Resin traps at the common outlet header of regeneration vessels	rubber lined steel construction and internals (cord & screen) shall be (SS-316) construction
(ix)	Accessories for each vessel	Lifting lugs and other structural works for each regeneration vessel to facilitate accessibility for operation and other equipments etc.

3.2	CHEMICAL HANDLING, PREPARATION & DOSING SYSTEM			
a)	**Chemical Tanks**	**Alkali Preparation Tank**	**Alkali Day Tank**	**Acid Measuring Tank**
(i)	Number required	One (1) Number	One (1) Number	Two (2) Number
(ii)	Type	-- Vertical Cylindrical with dish end at bottom and cover at top; Atmospheric --		
(iii)	Useful capacity (Each)	Minimum 10 Cu.m	Each tank shall be adequate to hold chemical for 125% of one regeneration	
(iv)	Material	---------- M.S. with 4.5 mm thick rubber lining inside----------		
(v)	External protection/ painting	As defined elsewhere in tender technical specification		
(vi)	Accessories Required	Vent, Overflow/ Overflow seal pot, drain connection, manhole (only for alkali preparation tank), motor driven stirrer (only for alkali preparation tank & alkali day tanks), dissolving basket in SS 316 construction (only for alkali preparation & alkali day tanks), fume absorber/ CO_2 absorber, lifting lugs etc.		
(vii)	Stirrer per tank	Slow speed stirrer driven by motor drive and reduction gear. Speed of stirrer = 200 RPM Max. Material of Construction of each stirrer and agitator = Stainless Steel – 316.		Not Applicable.
(viii)	Dissolving basket	One number per tank. Material of Construction of each dissolving basket – SS316.		Not Applicable.
b)	**Dosing Pumps**	**Acid**		**Alkali**
(i)	Number	Two (1Working +1Standby) (2X100%)		Two (1Working +1Standby) (2X100%)
(ii)	Type	---------- Simplex positive displacement type; hydraulically operated diaphragm type ----------		
(iii)	Whether suction strainer required	---------- Yes ----------		
(iv)	Accessories	----------As Required. ----------		
(v)	Pressure Dampener	----------Two (2) ----------		
(vi)	External safety relief valve (in addition to in-built safety valve)	----------Two (2) ----------		

(vii)	Maximum pump stroke speed per minute	----------100 per minute----------	
(viii)	Material of construction		
1)	Liquid End (Pump Head, Valves, Valve housing, valve spring etc.).	PVC	AISI:316
2)	Diaphragm	PT.F.E.	P.T.F.E.
3)	Packing	P.T.F.E.	P.T.F.E.
4)	Shaft	---------- Hardened steel EN 8 (BS:970) ----------	
5)	Worm & Worm Wheel (If Applicable)	----------Manganese Bronze----------	
6)	Connecting Rod	----------Manganese Bronze----------	
7)	Cross head Guide	---------- Bronze----------	
(ix)	Capacity & Head	----------As per system requirement ----------	

3.3 Activated Carbon Filter for Alkali

(i)	Number	One (1) number
(ii)	Type	Vertical cylindrical with dished end bottom
(iii)	Material of construction	Carbon steel plates to SA - 515 / 516 Gr. 70 with rubber lining inside. The lining shall be of rubber having a hardness of 65 plus/minus 5 shore-A meeting the requirements of IS: 4682, Part-I. Influent Distributor Material- SS 316
(iv)	Design code	ASME sec VIII div 1 (latest edition) or acceptable equivalent international standard.
(v)	Size	10 M3/hr. minimum (not less than the design capacity of alkali transfer cum recirculation pump)
(vi)	Bed depth of filter material	1 Meter (minimum)
(vii)	Flow velocity	12 m/hr. (max).
(viii)	Seal	Teflon diaphragm
(ix)	Manhole	Two (2) nos. minimum each of Davit type
(x)	Sight Windows	One (1) no. in backwash space
(xi)	Hand hole	One (1) no. of 150 mm dia. for removal of activated carbon

(xii)	Accessories	Manhole, vent, drain, sample connection, lifting lugs etc.
3.4 Alkali diluent water heating tank (Hot water tank)		
(i)	Number	One (1) number
(ii)	Type/Capacity (Each)	Vertical Cylindrical with dished end with Electric heater (2X50%) / 120% of max water required for regeneration
(iii)	Design code	ASME sec VIII div 1 (latest edition) or acceptable equivalent international standard.
(iv)	Temperature of alkali to be heated	To obtain temp. from 15 deg C to 50 deg C at alkali mixing feed out let within 5 hours.
(v)	Temp. Transmitter	Yes
(vi)	Burn out protection	Yes
(vii)	Material of construction of tank:	Carbon steel plates to SA - 515 / 516 Gr. 70 with rubber lining inside. The lining shall be of rubber having a hardness of 65 plus/minus 5 shore-A meeting the requirements of IS: 4682, Part-I.
(viii)	Accessories	Manhole, vent, drain, sample connection, level transmitter, lifting lugs, Pressure Relief Valve, Temperature Indicator, level indicator & temperature transmitter etc.

3.5	**DM water pumps**		
S. No.	Description / Data	DM Water (for Resin Transfer) Pumps	DM Water (for Regeneration) Pumps
(i)	Numbers. required	Two (1 working+1 standby) (2x100%)	Two (1 working+1 standby) (2x100%)
(ii)	Type	----------Horizontal, Centrifugal ----------	
(iii)	Pump Speed	----------Maximum 1500 rpm----------	
(iv)	Capacity & head of each pump	As required	As required
(v)	Liquid to be handled	DM Water	DM Water
(vi)	Type of Shaft sealing	Mechanical Seal	Mechanical Seal
(vii)	Material of construction		
a)	Casing & Impeller	----------ASTM A 351 CF 8M----------	
b)	Shaft	---------- SS 316----------	
c)	Shaft Sleeves	----------SS 410----------	
d)	Wearing Rings & Mechanical Seal	----------As Per manufacturer's Standard---------	

(viii)	Recirculation line with motor actuated regulating type butterfly valve	----------Required ----------
(ix)	Accessories	Coupling Guards, drain plug, Vent valve, Suction hoses, isolation valves, Y type Strainer etc.
3.6	**Air-blowers for Resin Mixing (Regeneration area) & N-PIT**	
(i)	Number	Two (1 working+1 standby)- (2X100%)
(ii)	Type	Centrifugal/Twin lobe type, oil free, positive displacement
(iii)	Duty	Intermittent
(iv)	Capacity & Head	As required
(v)	Pressure gauge	One per blower
(vi)	Location	Outdoor
(vii)	Material of Construction	Casing, cover and stator – Cast Iron GR FG 260 to IS 210 Lobe/ Impeller – Cast Iron GR FG 260 to IS 210 Shaft – Carbon steel BS:970 En-8/ANSI-I045
(viii)	Accessories	Each blower shall be complete with motor, V-belt drive with belt guard, inlet filter/silencer, flexible couplings and discharge snubber, all mounted on a single base. Relief valve(s) shall also be provided.
3.7	**DM Waste Water Collection Tank**	
(i)	Number	One (1) Number
(ii)	Type	--------- M.S. with 4.5 mm thick rubber lining inside----------
(iii)	Capacity	Holding capacity shall be 1.5 times the capacity of DM water required for transferring resins or 50 cum whichever is higher.
3.8	**DM Waste Water Transfer pumps**	
(i)	Number	Two (1 working+1 standby) (2x100%)
(ii)	Type	Horizontal centrifugal pump
(iii)	Pump Speed	Maximum 1500 rpm
(iv)	Capacity & head	Suitable to pump the total volume (Minimum 50 Cu.m/hr) &. Head to suit the requirement
(v)	Type of Shaft sealing	Mechanical Seal
(vi)	Material of construction	
•	casing, impeller	SS 316
•	Shaft	SS 316

•	shaft sleeve material	SS 316
(vii)	Recirculation line with pneumatic actuated regulating type diaphragm valve	Required
3.9	**Lime Tank for N Pit**	
(i)	Number	One (1)
(ii)	Material of construction	SS 316
(iii)	Type	Vertical Cylindrical Atmospheric with dished bottom and cover at top
(iv)	Useful capacity	Adequate to hold quantity of alkali required for neutralization of excess acid in waste effluent generated due to single regeneration of a condensate polisher mixed bed with 25% overall margin or 2 cum whichever is higher.
(v)	Accessories Required	Vent, Overflow, drain connection, motor driven stirrer, dissolving basket (SS316), CO2 absorber, manhole, lifting lugs etc.
(vi)	Stirrer per tank	Slow speed stirrer driven by motor drive and reduction gear. Speed of stirrer = 200 RPM Max. Material of Construction of each stirrer and agitator = Stainless Steel – 316.
(vii)	Dissolving basket	One number. Material of construction: AISI-316
3.10	**Alkali Transfer Cum Recirculation Pumps**	
(i)	Chemical to be used	Sodium Hydroxide (5-50% Conc)
(ii)	Type	Horizontal Centrifugal
(iii)	Numbers required	Two (1 working+1 standby)
(iv)	Duty	Intermittent
(v)	Capacity/ Head of Pump	As per process requirement or 10 Cum/hr (min.) / As per process requirement or 10 MWC whichever maximum.
(vi)	Maximum Pump Speed	1500 rpm
(vii)	Materials of construction	Stainless Steel-316
(viii)	Pressure gauge	One per pump with Teflon diaphragm seal
(ix)	Type of shaft sealing	Mechanical Seal
(x)	Reinforced Rubber hoses	Minimum two (2) nos. of size 80 mm NB of min. 10 m. with isolation valves

(xi)	'Y' type strainer	One number per pump (Material shall be SS316)	
(xii)	Accessories required for each pump	Coupling guard, drain plug, vent valve, Suction hoses, isolation valves, Y- type strainers, pressure gauges etc. as required	
3.11	**Acid & Alkali Unloading Pumps**		
Sr. No.	Description / Data	Acid Unloading Pumps	Alkali Unloading Pumps
(i)	Chemical to be used	30-33% HCl	5 to 50% NaOH
(ii)	Type	Horizontal, Centrifugal	Horizontal, Centrifugal
(iii)	Numbers required	Two (1W+1S) (2x100%)	Two (1W+1S) (2x100%)
(iv)	Duty / Location	Intermittent/ Outdoor	Intermittent/ Outdoor
(v)	Capacity/ Head of Pump	10 Cum/hr. & 10 MWC	10 Cum/hr. (min.) & 10 MWC (min.)
(vi)	Maximum Pump Speed	Maximum 1500 rpm	Maximum 1500 rpm
(vii)	Materials of construction	Polypropylene or equiv. for HCl	Stainless Steel-316
(viii)	Pressure gauge	One per pump with Teflon diaphragm seal	One per pump with Teflon diaphragm seal
(ix)	Type of shaft sealing	Mechanical Seal	Mechanical Seal
(x)	Reinforced Rubber hoses	Minimum two (2) nos. of size 80 mm NB of min. 10 m. with isolation valves	Minimum two (2) nos. of size 80 mm NB of min. 10 m. with isolation valves
(xi)	'Y' type strainer	One number per pump	One number per pump
(xii)	Accessories required for each pump	Coupling guard, drain plug, vent valve, Suction hoses, isolation valves, Y- type strainers, pressure gauges, pulsation dampener etc. as required.	
3.12	**Effluent re-circulation cum-disposal pumps:**		
(i)	Number	Three (1 working+1 standby+1Maint. Standby)	
(ii)	Type	Horizontal centrifugal single stage with priming system/ or vertical pump mounted on top of pit	
(iii)	Capacity & head	Suitable to pump the total volume of one section in 8 hours (Minimum 50 Cu.m/hr). Head to suit the requirement	
(iv)	Suction condition	Suction from priming chamber / submerge (suction from pit)	
(v)	Type of Shaft sealing	Mechanical Seal	
(vi)	Material of construction		

	casing, impeller	Rubber lined, CI IS: 210 FG 260	
	Shaft	SS 316	
(vii)	Number of priming chambers	Two (2)	
(viii)	Recirculation line with pneumatic actuated regulating type diaphragm valve	Required	
3.13	**Bulk Acid & Alkali Storage Tanks**		
S.No.	Description / Data	Acid Storage tanks	Alkali Storage Tanks
(i)	Numbers	Two (2)	Two (2)
(ii)	Dimensions (Diameter, length & thickness)	————As per BS: 2594 Latest Edition————	
(iii)	location	Outdoor	
(iv)	Useful capacity	Each tank to store one month's requirement of all the units	
(v)	Type & pressure class	Horizontal, with dished (Torospherical) ends/ Atmospheric	
(vi)	MOC	————Mild Steel ————	
(vii)	Internal Painting/ lining	———Rubber lining (4.5 mm thick) ————	
(viii)	External painting	As specified elsewhere in technical Specification	
(ix)	Concentration	30-33% HCl	48% NaOH
(x)	Accessories	Vent, overflow seal pot, drain, sample connections, fume / CO2 absorbers, manholes, operating platforms, handrails etc.	
4.0	**Piping**		
(i)	Resin Transfer piping material	Stainless steel type 304 Sch.10 (min.) seamless Velocity: 2.3-3 m/s	
(ii)	Service vessel Inlet piping material	ASTM A-106 Gr. B, seamless	
(iii)	Service vessel Outlet piping material	ASTM A-106 Gr. B, seamless	
(iv)	Service vessel rinse piping material	ASTM A-106 Gr. B, seamless	
(v)	Piping handling Acid Service	carbon steel Polypropylene lined	
(vi)	Piping material for Alkali	SS 316 Sch-10 (minimum)	
(vii)	Piping material handling DM Water	Stainless steel SS 316 Schedule 10 (minimum)	

(viii)	Piping material for DM waste water	SS 316 Sch-10 (minimum)
(ix)	Instrument Air & service air piping material	hot dip galvanized (heavy grade) steel
(x)	N pit piping	MSRL (Mild steel (heavy grade) Rubber lined)
5.0	**Valves**	
(i)	Resin Transfer Line	Eccentric plug type/ball valve (full bore type) of Stainless-steel construction (SS-316).
(ii)	Emergency bypass control valve	Emergency bypass control valve shall be of double flanged butterfly type. Isolation valves of wafer (lugged) type butterfly valves (resilient material seated, to ensure bubble-tight shut off) shall be provided on the upstream and downstream sides of the control valve. MOC shall be (Body: WCB Disc:CF8M/SS316) minimum.
(iii)	Condensate on service vessel area	All butterfly valves MOC used in service vessel area in condensate inlet line shall be (Body: WCB Disc:CF8M/SS316) and condensate outlet line will be (Body & Disc both: CF8M/SS316) minimum.
(iv)	Isolation Valves handling Chemicals (Acid, Alkali, Ammonia)	Isolation Valves handling Acid, Alkali, Ammonia etc shall be diaphragm type in MSRL (Mild Steel Rubber lined) construction.
(v)	Isolation Valves handling DM water	Isolation Valves handling DM water shall be Butterfly or gate or globe type and shall be of SS-316 construction.
(vi)	Non-return valves	Non-return valves shall be constructed of SS-316 for DM Water & SS-316 for alkali. For Hydrochloric acid, non-return valve shall be dual plate/swing check/lift ball check type of suitable material or as per manufacturer's standard practice.
(vii)	All valves in service vessels area where pressure may attain same as service vessel shall be designed for 300 lb. class minimum. However, Bidder to select the class/ pressure rating of the valves of service vessel area to meet the system design requirement. In case it has been found that the class/ pressure rating as required is higher than 300lb class then the same shall be considered by bidder in their scope.	
6.0	**SAFETY EQUIPMENT**	Four (4) sets of safety equipment [(Personal Protection Equipment (PPE)] comprising PVC protection suits with hoods, rubber boots, face visors and thick PVC gauntlets shall also be provided. Two (2) No. Personnel water drench shower/safety shower and eye bath shall also be provided.

DATA SHEET-A FOR OXYGEN DOSING SYSTEM (FOR SG)

Sl. No	Description	Parameter
Mechanical Items		
1.0	No. of skid(s)for project	EIGHT (FOUR NUMBERS PER UNIT)
2.0	**Cylinders:**	
2.1	Quantity of filled cylinder mounted on skid	Two per skid (Total 16)
2.2	Quantity of filled cylinder loose supply	44
2.3	Design Standard of oxygen cylinder	IS-7285 Part 1
2.4	Water Capacity	50 liters
2.6	Gas Capacity	10 m3
2.7	Max Working pressure at $15^{O}C$	204 Kg/cm2
2.8	Painting of oxygen cylinder	As per IS 4379
2.10	Accessories	Two number Cylinder storing racks (MS), with capacity to hold 32 cylinders per rack.
3.0	**All Tubing:**	
3.1	Material	SS 316
3.2	Diameter	15 NB (1/2” OD), 18 BWG
4.0	**Ball valves**	
4.1	Body, Bonnet, stem	SS 316
4.2	Trim Material	SS 316
4.3	Design standard	MSS-99-2010/ Equivalent
4.4	Test standard	MSS-99-2010/ Equivalent
4.5	Size	15 NB
4.6	End Connections	Ferruled
4.7	Rating	2000 PSI
4.8	Valve operation	Manual or pneumatic as per P&ID
5.0	**Check valves/ NRV**	
5.1	Body, cover, disc/piston & seat	SS 316
5.2	Design standard	MSS-99-2010/ Equivalent
5.3	Test standard	MSS-99-2010/ Equivalent
5.4	Size	15 NB
5.5	End Connections	Ferruled
5.6	Rating	2000 PSI
5.7	Valve operation	Manual
6.0	**Pressure relief valve**	
6.1	Type	Spring loaded, angle type
6.2	Body, bonnet, disc & nozzle	SS 316
6.3	Valve discharges to	Atmosphere (vent)
6.4	Back pressure	Constant
6.5	Set pressure	60 Kg/cm2 (g) for skid 1 and 35 Kg/cm2 (g) for skid 2
6.6	Inlet Connections	15 NB, Flanged/threaded, ANSI B16.5, 400# for skid at CPU outlet and 300# for skid at de aerator outlet
6.7	Outlet Connections	15 NB, Flanged/threaded, ANSI B16.5, 150#
6.8	Rating	2000 PSI
7.0	**Fittings**	Stainless steel to A276 or A479 F316, dimension to ANSI B 16.11 socket weld ends.
8.0	**Pressure Regulator**	
8.1	Quantity	Two per skid (total 16), each mounted on oxygen cylinder bank

8.2	Body & trim	SS 316/ Brass
8.3	Inlet connection	1/2"
8.4	Outlet connection	1/2"
8.5	Operating pressure	204 Kg/cm^2(g)
8.6	Set outlet Pressure	55 Kg/cm^2(g) for skid dosing at CPU outlet and 30 Kg/cm^2(g) for skid dosing at deaerator outlet
9.0	**Mass Flow Controller**	------SS 316, ANSI B 16.5 CL 400 -----
9.1	Expected Flow of O_2 in process	50-470 gm./ hr. (for skid dosing at deaerator outlet); 30-350 gm./ hr. (for skid dosing at CPU outlet)
9.2	**MOC-wetted parts**	SS 316
9.3	**Operating pressure**	Pressure reducing valve set pressure (refer P&IDs)
10.0	**Structural steel**	IS 2062
11.0	**Nuts & bolts**	SS 304
12.0	**Flanges**	SS 316, ANSI B 16.5 400# for skid at CPU outlet and 300# for skid at de aerator outlet

DATA SHEET-A FOR EFFLUENT TRANSFER SYSTEM (FOR SG)

1.	**DRAIN OIL WASTE WATER SUMP UNIT-3 (E9)**	
a)	Number required	One (1) nos. with one no belt type oil skimmer
b)	Effective Capacity, m3	10m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Oil waste from boiler Unit-3
2.	**DRAIN OIL WASTE WATER SUMP TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	Oil waste from boiler Unit-3
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements+12 Static Head for Pipe Rack or 35 M Head whichever is higher.
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
3.	**DRAIN OIL WASTE WATER SUMP UNIT-4 (E10)**	
a)	Number required	One (1) nos with one no belt type oil skimmer
b)	Effective Capacity, m3	10m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Oil waste from boiler Unit-3
1.	**DRAIN OIL WASTE WATER SUMP TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	Oil waste from boiler Unit-3
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements+12 Static Head for Pipe Rack or 35 M Head whichever is higher.
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
4.	**MRS WASTE WATER SUMP UNIT-3 (Pit E1 & Pit E2)**	
a)	Number required	Two (2) nos. per Sump
b)	Effective Capacity, m3	30 m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash waste (containing coal laden particles) from MRS area Unit-3 2. Waste water (containing coal laden particles) from Feeder and Tripper Floor Unit-3
5.	**MRS UNIT-3 OILY WASTE WATER TRANSFER PUMPS**	

a)	Number required	Two (1W+1S) nos for each sump
b)	Type	Vertical Centrifugal type
c)	Location	Outdoor
d)	Fluid to be handled	1.0 Floor wash waste (containing coal laden particles) from MRS area Unit-3 2.0 Waste water (containing coal laden particles) from Feeder and Tripper Floor Unit-3
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements+12 Static Head for Pipe Rack.
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260, S-0.1 (max.) P-0.15 (max.)
	• Stuffing box, Gland	2.5% Ni CI IS:210 GR. FG 260
	• Impeller	ASTM A351 CF8M
	• Shaft, Shaft coupling, shaft sleeves	SS 410
	• Column pipe & discharge pipe, shaft enclosing	CS as per IS:2062 or eq.
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
6.	**MRS WASTE WATER SUMP UNIT-4 (Pit E3 & Pit E4)**	
a)	Number required	Two (2) nos. per Sump
b)	Effective Capacity, m3	30 m3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash waste (containing coal laden particles) from MRS area Unit-3 2. Waste water (containing coal laden particles) from Feeder and Tripper Floor Unit-3
7.	**MRS UNIT-4 OILY WASTE WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos for each sump
b)	Type	Vertical Centrifugal type
c)	Location	Outdoor
d)	Fluid to be handled	3.0 Floor wash waste (containing coal laden particles) from MRS area Unit-3 4.0 Waste water (containing coal laden particles) from Feeder and Tripper Floor Unit-3
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements+12 Static Head for Pipe Rack.
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260, S-0.1 (max.) P-0.15 (max.)
	• Stuffing box, Gland	2.5% Ni CI IS:210 GR. FG 260
	• Impeller	ASTM A351 CF8M

	• Shaft, Shaft coupling, shaft sleeves	SS 410
	• Column pipe & discharge pipe, shaft enclosing	CS as per IS:2062 or eq.
	• Gland packing	TIWA
	• Gasket	Neoprene Rubber
	• Bolts & nuts	SS
	• Base plate and soleplate	CS (min. 10 thick)
8.	**SG UNIT-3 FLOOR WASH WATER SUMP (E5)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	170 M3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash from SG UNIT 3 containing oil traces 2. Floor wash from APH UNIT 3 containing ash traces
9.	**SG UNIT-3 FLOOR WASH WATER TRANSFER PUMPS-1&2**	
a)	Number required	Two (2W) nos. - SG UNIT-3 FLOOR WASH WATER TRANSFER PUMPS-1 Two (1W+1S) nos. - SG UNIT-3 FLOOR WASH WATER TRANSFER PUMPS-2
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash from SG UNIT 3 containing oil traces 2. Floor wash from APH UNIT 3 containing ash traces
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	SG UNIT-3 FLOOR WASH WATER TRANSFER PUMPS-1 – 340 m3/hr SG UNIT-3 FLOOR WASH WATER TRANSFER PUMPS-2 – 10m3/hr
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements+12 Static Head for Pipe Rack
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
10.	**SG UNIT-4 FLOOR WASH WATER SUMP (E6)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	170 M3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	1. Floor wash from SG UNIT 4 containing oil traces 2. Floor wash from APH UNIT 4 containing ash traces
11.	**SG UNIT-4 FLOOR WASH WATER TRANSFER PUMPS**	
a)	Number required	Two (2W) nos. - SG UNIT-4 FLOOR WASH WATER TRANSFER PUMPS-1 Two (1W+1S) nos. - SG UNIT-4 FLOOR WASH WATER TRANSFER PUMPS-2
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash from SG UNIT 4 containing oil

		traces 2. Floor wash from APH UNIT 4 containing ash traces
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	SG UNIT-4 FLOOR WASH WATER TRANSFER PUMPS-1 – 340 m3/hr SG UNIT-4 FLOOR WASH WATER TRANSFER PUMPS-2 – 10 m3/hr
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements+12 Static Head for Pipe Rack.
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
12.	**ESP UNIT-3 FLOOR WASH WATER SUMP (E7)**	
f)	Number required	One (1) nos.
g)	Effective Capacity, m3	50 M3
h)	Material of Construction	RCC (IN BHEL SCOPE)
i)	Type	Underground, Rectangular with Flat bottom
j)	Type of fluid to be handled	Floor wash from ESP UNIT 3 containing ash traces
13.	**ESP UNIT-3 FLOOR WASH WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	Floor wash from ESP UNIT 3 containing ash traces
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	50
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements+12 Static Head for Pipe Rack.
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
14.	**ESP UNIT-4 FLOOR WASH WATER SUMP (E8)**	
a)	Number required	One (1) nos.
b)	Effective Capacity, m3	50 M3
c)	Material of Construction	RCC (IN BHEL SCOPE)
d)	Type	Underground, Rectangular with Flat bottom
e)	Type of fluid to be handled	Floor wash from ESP UNIT 4 containing ash traces
15.	**ESP UNIT-4 FLOOR WASH WATER TRANSFER PUMPS**	
a)	Number required	Two (1W+1S) nos.
b)	Type	Vertical Screw type
c)	Location	Outdoor
d)	Fluid to be handled	1. Floor wash from ESP UNIT 4 containing ash traces
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	50
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements
i)	Material of Construction	

	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
16.	**TROLLEY MOUNTED SCREW PUMPS WITH SLOPE OIL TANK**	
a)	Number required	Two (2W) nos. (1 Set for each unit)
b)	Type	Trolley Mounted Screw type with Slope oil tank and Power station
c)	Location	Outdoor
d)	Fluid to be handled	Oily effluent from Transformers
e)	Duty	Intermittent
f)	Rated capacity, each m3/ hr.	10
g)	Pump Speed, RPM (max.)	1500
h)	Minimum Head to be developed at rated capacity, MLC	15 mwc
i)	Material of Construction	
	• Casing	2.5% Ni CI IS:210 GR. FG 260
	• Impeller/Rotor	ASTM A351 CF8M
	• Shaft	SS 316
j)	Slope Oil Tank	Capacity: 1m3 MOC: MSEP
17.	**PIPING**	All the piping shall generally be conforming to the requirements specified in the Chapter titled “General Technical Requirement of Low Pressure Piping” considering the following aspects as minimum requirement:
	Service water/ Raw water/ Clarified water piping	IS-2062 Gr.-E-250B/ASTM A-36/ASTM A-53 type 'E' Gr. B/IS-3589 Gr. 410 /IS-1239 Heavy.
18.	**VALVES**	All the valves shall generally be conforming to the requirements specified in the Chapter titled “General Technical Requirement of Low-Pressure Piping” considering the following aspects as minimum requirement:
19.	For normal water (portable/service water) & Waste Water	i. Type of Valves <u>For non-return / Check</u> a) Lift Check type/Swing Check /Dual Plate type for sizes upto 40 mm NB b) Swing Check or Dual Plate type valve for sizes 50 mm NB & above
		ii. Material of Construction Valves <u>Butterfly Valves</u> Butterfly valves shall be of Lugged-wafer type of low leakage rate confirming to AWWA-C-504 class 150 (min.) or BS:5155 PN 10 (min.) a) Body: ASTM A48, Gr. 40 with 2% Ni / IS: 210. Gr. FG-260, with 2% Ni / SG iron BSEN 1563, Gr EN GJS-400-15 with 2%Ni and epoxy coated. b) Disc: SS 316. c) Shaft: BS 970 431 S: 291 / EN 57, or AISI-410 or AWWA-permitted shaft material equivalent to EN-57/AISI-410 or better. d) Seat rings: 18-8 Stainless steel

		e) Seal: Nitrile rubber, EPDM, Hypalon All the butterfly valves shall be provided with Hand wheel or lever as per the requirements. All the butterfly valves shall be provided with an indicator to show the position of the disc. Flanges shall conform to ANSI B 16.5 Cl.150 (min). <u>Ball Valves</u> a) Type :Full bore b) Rating: PN 10 (min). c) Body: ASTM A216 Gr. WCB d) Ball: ASTM A276 TYPE 316 e) Seat ring: PTFE f) Stem: ASTM A276 TYPE 316 g) Seat: Nitrile rubber, PTFE <u>Check Valves</u> Body – Cast iron IS 210 Gr. FG 260 or equivalent Disc/ door –ASTM A351 Gr. CF8 Hinged pin – SS 316 Piston – SS 316

DATA SHEET-A FOR SEWAGE TREATMENT PLANT (FOR SG)

DATASHEET FOR DE-CENTRALISED SEWAGE TREATMENT PLANT -1 (NEAR AHP-COMBINED ASH SLURRY PUMP HOUSE)

S.No.	DESCRIPTION	
1.0	**Capacity of STP**	25m3/day
2.0	**Bar Screen Chamber**	
2.1	**Chamber**	
2.1.1	Quantity	1no. (1W)
2.1.2	MOC	RCC
2.1.3	Type	Below ground /above ground
2.1.4	Capacity	As per system requirement
2.2	**Bar Screen (Fine screen)**	
2.2.1	Quantity	1no. (1W)
2.2.2	MOC	SS316
2.2.3	Type	Below ground /above ground
2.2.4	Capacity	As per system requirement
3.0	**Oil & Grease chamber**	
3.1	Quantity	1 no. oil & grease chamber
3.2	Oil & grease chamber MOC	RCC
3.3	Oil & grease chamber capacity	As per process requirement
3.4	Oil Collection Can/tank	100 Ltrs. (MOC: HDPE)
4.0	**Oil Skimmer**	
4.1	Numbers Required	One (1) no. motor operated oil skimmer
4.2	Flow (m^3/hr)	As per process requirement
4.3	MOC	MS Epoxy painted
4.4	Type	As per process requirement
5.0	**DE-CENTRALISED STP MODULES/SKIDS**	
5.1	Capacity	25 m3/day
5.2	MOC	As per system requirement
6.0	**Sludge recirculation pump**	
6.1	**Option -I**	
6.1.1	Type	Submersible type
6.1.2	Quantity	2 Nos. (1W+1S)
6.1.3	Suction condition	Flooded.
6.1.4	Capacity	As per process requirement
6.1.5	Head	As per process requirement + 6M Static head
6.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
6.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
6.2	**Option -II**	
6.2.1	Type	Horizontal Centrifugal type
6.2.2	Quantity	2 Nos. (1W+1S), all connected.
6.2.3	Suction condition	Flooded.
6.2.4	Capacity	As per process requirement

6.2.5	Head	As per process requirement+6M Static head
6.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
6.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
7.0	**Air Blowers for sewage treatment skid**	
7.1	Numbers Required	2 nos. (1W+1S)
7.2	Type of Blower	Twin lobe type
7.3	Flow	As per process requirement
7.4	Head	As per process requirement
7.5	MOC	CI to IS 210 Gr. FG 260
7.6	Accessories	NRV, Safety valves, Silencer, PRV, Filter, etc
7.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS: 12615
7.8	Common Base plate/ mounting plate	MS as per IS 2062
7.9	Instrumentation	Pressure transmitters, Pressure gauges, Flow Transmitters etc.
8.0	**Filter Feed Tank**	
8.1	Numbers Required	One (1) no. and shall be in bidder's scope
8.2	Effective Capacity	6 hrs storage
8.3	MOC	As per supplier's recommendation
8.4	Instrumentation	Level indicating transmitters etc.
9.0	**Hypo Dosing System**	
9.1	**Hypo Dosing Tank**	
9.1.1	Numbers Required	One (1) no.
9.1.2	Effective Capacity	100 liters OR+ 24 hour storage requirement @ suitable dosing rate whichever is higher
9.1.3	MOC	FRP/HDPE/GRP
9.1.4	Instrumentation	Level indicator and level interlock for pumps.
9.2	**Hypo Dosing Pump for treated water tank**	
9.2.1	Quantity	Two (1W+1S) no.
9.2.2	Capacity	As per process requirement.
9.2.3	Type	Electronic dosing pump with auto stroke controller
9.2.4	MOC	PP
9.2.5	Instrumentation	Pressure transmitters, Pressure gauges etc.
10.0	**Filter Feed Pumps**	
10.1	**Option -I**	
10.1.1	Type	Submersible type
10.1.2	Quantity	2 Nos. (1W+1S)
10.1.3	Suction condition	Flooded.
10.1.4	Capacity	As per process requirement
10.1.5	Head	As per process requirement +6M Static head

10.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
10.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
10.2	**Option -II**	
10.2.1	Type	Horizontal Centrifugal type
10.2.2	Quantity	2 Nos. (1W+1S), all connected.
10.2.3	Suction condition	Flooded.
10.2.4	Capacity	As per process requirement
10.2.5	Head	As per process requirement+6M Static head
10.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
10.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
11.0	**Multi Grade Filter**	
11.1	Quantity	1 no.
11.2	Capacity	As per system requirement
11.3	Design pressure	Shut off head of Filter feed pump + 5% margin
11.4	MOC	As per supplier's recommendation
11.5	Media	To suit system requirement
11.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
12.0	**Activated Carbon Filter**	
12.1	Quantity	1 no.
12.2	Capacity	As per system requirement
12.3	Design pressure	Shut off head of Filter feed pump + 5% margin
12.4	MOC	As per supplier's recommendation
12.5	Media	Activated Carbon
12.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
13.0	**Treated Water Tank (Above Ground)**	
13.1	Number required	1 no. and shall be in bidder's scope
13.2	Capacity	6 hrs storage
13.3	MOC of tank	FRP/ HDPE
13.4	Instrumentation	Level indicator, Level transmitters etc.
14.0	**Common sewage collection inside STP 1**	
14.1	**Common sewage collection sump**	
14.1.1	MOC	RCC
14.1.2	Type	Covered at top, below ground
14.1.3	Capacity	25 m3
14.1.4	Instrumentation	Level indicator, Level transmitters etc.

14.2	**Common sewage transfer pumps**	
14.2.1	Type	Vertical submersible grinder type
14.2.2	Quantity per sump	2 X 100 % (1W+1S)
14.2.3	Capacity	As per system requirement
14.2.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
14.2.5	MOC impeller	Stainless Steel AISI 304
14.2.6	MOC shaft	SS 410
14.2.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS: 12615
14.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
15.0	**Sewage Sump S-3**	
15.1	MOC	RCC (Civil by BHEL)
15.2	Type	Covered at top, below ground
15.3	Capacity	8.0 m3
15.4	Accessories	Coarse bar screen (MOC: SS-316)
15.5	Instrumentation	Level indicator, Level transmitters etc.
16.0	**Sewage Sump S-3 Transfer Pumps**	
16.1	Type	Vertical submersible grinder type
16.2	Quantity per sump	2 X 100 % (1W+1S)
16.3	Capacity	5.0 m3/h (Minimum)
16.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
16.5	MOC impeller	Stainless Steel AISI 304
16.6	MOC shaft	SS 410
16.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
16.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
17.0	**Sewage Sump S-4**	
17.1	MOC	RCC (Civil by BHEL)
17.2	Type	Covered at top, below ground
17.3	Capacity	8.0 m3
17.4	Accessories	Coarse bar screen (MOC : SS-316)
17.5	Instrumentation	Level indicator, Level transmitters etc.
18.0	**Sewage Sump S-4 Transfer Pumps**	
18.1	Type	Vertical submersible grinder type
18.2	Quantity per sump	2 X 100 % (1W+1S)
18.3	Capacity	5.0 m3/h (Minimum)
18.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
18.5	MOC impeller	Stainless Steel AISI 304
18.6	MOC shaft	SS 410
18.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
18.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
20.0	**Sewage Sump S-5**	
	MOC	RCC (Civil by BHEL)
	Type	Covered at top, below ground
	Capacity	8.0 m3

	Accessories	Coarse bar screen (MOC : SS-316)
	Instrumentation	Level indicator, Level transmitters etc.
	Sewage Sump S-5 Transfer Pumps	
	Type	Vertical submersible grinder type
	Quantity per sump	2 X 100 % (1W+1S)
	Capacity	5.0 m3/h (Minimum)
	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
	MOC impeller	Stainless Steel AISI 304
	MOC shaft	SS 410
	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
	Instrumentation	Pressure transmitters, Pressure gauges etc.
19.0	**MATERIAL OF CONSTRUCTION OF PIPING AND FITTINGS**	
19.1	MOC of Piping and fittings of handling sewage and treated sewage	HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS: 4984 or Equivalent
19.2	MOC of Piping and fittings of Chemical dosing	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
19.3	MOC of service water piping	IS-2062 Gr.-E-250B/ ASTM A-36/ASTM A-53 type 'E' Gr.B/ IS-3589 Gr. 410 /IS-1239 Heavy.
19.4	MOC of compressed air piping (non submerged)	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent
19.5	MOC of compressed air piping (submerged)	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
20.0	**Material of Construction valves**	
20.1	MOC of valves (sewage water, treated water and chemical dosing)	CPVC as per ASTM F441 CPVC 4120 Schedule 80/ equivalent.
20.2	MOC of compressed air valves	Cast iron for sizes 65NB and above; gunmetal for sizes 50 NB and below.
20.3	MOC of service water	Cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.
21.0	**Chain Pulley Block**	
21.1	Quantity	1 No. Chain Pulley Block of adequate capacity with tripod arrangement, to meet the erection and maintenance requirements are to be provided by bidder

Note:
1. Sewage Lifting sump's depth may vary from 2.5 to 4.5 meters.
2. Bidder to adhere typical details shown for Sewage collection sumps (S1 to S7) included in Annexure XIII (Drawings).

DATASHEET FOR DE-CENTRALISED SEWAGE TREATMENT PLANT -2 (NEAR COMPRESSOR HOUSE)

S.No.	DESCRIPTION	
1.0	**Capacity of STP**	25 m3/day
2.0	**Bar Screen Chamber**	
2.1	**Chamber**	
2.1.1	Quantity	1no. (1W)
2.1.2	MOC	RCC
2.1.3	Type	Below ground /above ground
2.1.4	Capacity	As per system requirement
2.2	**Bar Screen (Fine screen)**	
2.2.1	Quantity	1no. (1W)
2.2.2	MOC	SS316
2.2.3	Type	Below ground /above ground
2.2.4	Capacity	As per system requirement
3.0	**Oil & Grease chamber**	
3.1	Quantity	1 no. oil & grease chamber
3.2	Oil & grease chamber MOC	RCC
3.3	Oil & grease chamber capacity	As per process requirement
3.4	Oil Collection Can/tank	100 Ltrs. (MOC: HDPE)
4.0	**Oil Skimmer**	
4.1	Numbers Required	One (1) no. motor operated oil skimmer
4.2	Flow (m^3/hr)	As per process requirement
4.3	MOC	MS Epoxy painted
4.4	Type	As per process requirement
5.0	**DE-CENTRALISED STP MODULES/SKIDS**	
5.1	Capacity	25 m3/day
5.2	MOC	As per system requirement
6.0	**Sludge recirculation pump**	
6.1	**Option -I**	
6.1.1	Type	Submersible type
6.1.2	Quantity	2 Nos. (1W+1S)
6.1.3	Suction condition	Flooded.
6.1.4	Capacity	As per process requirement
6.1.5	Head	As per process requirement+6M Static head
6.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
6.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
6.2	**Option -II**	
6.2.1	Type	Horizontal Centrifugal type
6.2.2	Quantity	2 Nos. (1W+1S), all connected.
6.2.3	Suction condition	Flooded.
6.2.4	Capacity	As per process requirement
6.2.5	Head	As per process requirement+6M Static head
6.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M

	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
6.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
7.0	**Air Blowers for sewage treatment skid**	
7.1	Numbers Required	2 nos. (1W+1S)
7.2	Type of Blower	Twin lobe type
7.3	Flow	As per process requirement
7.4	Head	As per process requirement
7.5	MOC	CI to IS 210 Gr. FG 260
7.6	Accessories	NRV, Pressure Gauge, Safety valves, Silencer, PRV, Filter, etc
7.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
7.8	Common Base plate/ mounting plate	MS as per IS 2062
7.9	Instrumentation	Pressure transmitters, Pressure gauges, Flow Transmitters etc.
8.0	**Filter Feed Tank**	
8.1	Numbers Required	One (1) no. and shall be in bidder's scope
8.2	Effective Capacity	6 hrs storage
8.3	MOC	As per supplier's recommendation
8.4	Instrumentation	Level indicating transmitters etc.
9.0	**Hypo Dosing System**	
9.1	**Hypo Dosing Tank**	
9.1.1	Numbers Required	One (1) no.
9.1.2	Effective Capacity	100 liters OR+ 24 hour storage requirement @ suitable dosing rate whichever is higher
9.1.3	MOC	FRP/HDPE/GRP
9.1.4	Instrumentation	Level indicator and level interlock for pumps.
9.2	**Hypo Dosing Pump for treated water tank**	
9.2.1	Quantity	Two (1W+1S) no.
9.2.2	Capacity	As per process requirement.
9.2.3	Type	Electronic dosing pump with auto stroke controller
9.2.4	MOC	PP
9.2.5	Instrumentation	Pressure transmitters, Pressure gauges etc.
10.0	**Filter Feed Pumps**	
10.1	**Option -I**	
10.1.1	Type	Submersible type
10.1.2	Quantity	2 Nos. (1W+1S)
10.1.3	Suction condition	Flooded.
10.1.4	Capacity	As per process requirement
10.1.5	Head	As per process requirement+6M Static head
10.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410

10.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
10.2	**Option -II**	
10.2.1	Type	Horizontal Centrifugal type
10.2.2	Quantity	2 Nos. (1W+1S), all connected.
10.2.3	Suction condition	Flooded.
10.2.4	Capacity	As per process requirement
10.2.5	Head	As per process requirement+6M Static head
10.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
10.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
11.0	**Multi Grade Filter**	
11.1	Quantity	1 no.
11.2	Capacity	As per system requirement
11.3	Design pressure	Shut off head of Filter feed pump + 5% margin
11.4	MOC	As per supplier’s recommendation
11.5	Media	To suit system requirement
11.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
12.0	**Activated Carbon Filter**	
12.1	Quantity	1 no.
12.2	Capacity	As per system requirement
12.3	Design pressure	Shut off head of Filter feed pump + 5% margin
12.4	MOC	As per supplier’s recommendation
12.5	Media	Activated Carbon
12.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
13.0	**Treated Water Tank (Above ground)**	
13.1	Number required	1 no. and shall be in bidder’s scope
13.2	Capacity	6 hrs storage
13.3	MOC of tank	FRP/ HDPE
13.4	Instrumentation	Level indicator, Level transmitters etc.
14.0	**Common sewage collection inside STP 2**	
14.1	**Common sewage collection sump**	
14.1.1	MOC	RCC
14.1.2	Type	Covered at top, below ground
14.1.3	Capacity	25 m3
14.1.4	Instrumentation	Level indicator, Level transmitters etc.
14.2	**Common sewage transfer pumps**	
14.2.1	Type	Vertical submersible grinder type
14.2.2	Quantity per sump	2 X 100 % (1W+1S)
14.2.3	Capacity	As per system requirement

14.2.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
14.2.5	MOC impeller	Stainless Steel AISI 304
14.2.6	MOC shaft	SS 410
14.2.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS: 12615
14.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
15.0	**Sewage Sump S-1**	
15.1	MOC	RCC (Civil by BHEL)
15.2	Type	Covered at top, below ground
15.3	Capacity	8.0 m3
15.4	Accessories	Coarse bar screen (MOC : SS-316)
15.5	Instrumentation	Level indicator, Level transmitters etc.
16.0	**Sewage Sump S-1 Transfer Pumps**	
16.1	Type	Vertical submersible grinder type
16.2	Quantity per sump	2 X 100 % (1W+1S)
16.3	Capacity	5.0 m^3/h (Minimum)
16.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
16.5	MOC impeller	Stainless Steel AISI 304
16.6	MOC shaft	SS 410
16.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
16.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
17.0	**Sewage Sump S-2**	
17.1	MOC	RCC (Civil by BHEL)
17.2	Type	Covered at top, below ground
17.3	Capacity	8.0 m3
17.4	Accessories	Coarse bar screen (MOC : SS-316)
17.5	Instrumentation	Level indicator, Level transmitters etc.
18.0	**Sewage Sump S-2 Transfer Pumps**	
18.1	Type	Vertical submersible grinder type
18.2	Quantity per sump	2 X 100 % (1W+1S)
18.3	Capacity	5.0 m^3/h (Minimum)
18.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
18.5	MOC impeller	Stainless Steel AISI 304
18.6	MOC shaft	SS 410
18.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
18.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
19.0	**MATERIAL OF CONSTRUCTION OF PIPING AND FITTINGS**	
21.1	MOC of Piping and fittings of handling sewage and treated sewage	HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS: 4984 or Equivalent
21.2	MOC of Piping and fittings of Chemical dosing	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
21.3	MOC of service water piping	IS-2062 Gr.-E-250B/ ASTM A-36/ASTM A-53

		type 'E' Gr.B/ IS-3589 Gr. 410 /IS-1239 Heavy.
21.4	MOC of compressed air piping (non submerged)	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent
21.5	MOC of compressed air piping (submerged)	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
20.0	**Material of Construction valves**	
22.1	MOC of valves (sewage water, treated water and chemical dosing)	CPVC as per ASTM F441 CPVC 4120 Schedule 80/ equivalent.
22.2	MOC of compressed air valves	Cast iron for sizes 65NB and above; gunmetal for sizes 50 NB and below.
22.3	MOC of service water	Cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.
21.0	**Chain Pulley Block**	
23.1	Quantity	1 No. Chain Pulley Block of adequate capacity with tripod arrangement, to meet the erection and maintenance requirements are to be provided by bidder
Note: 1. Sewage Lifting sump's depth may vary from 2.5 to 4.5 meters. 2. Bidder to adhere typical details shown for Sewage collection sumps (S1 to S7) included in Annexure XIII (Drawings).		

DATASHEET FOR DE-CENTRALISED SEWAGE TREATMENT PLANT -3 (NEAR AHP - SILO UTILITY BUILDING)

S.No.	DESCRIPTION	
1.0	**Capacity of STP**	25 m3/day
2.0	**Bar Screen Chamber**	
2.1	**Chamber**	
2.1.1	Quantity	1no. (1W)
2.1.2	MOC	RCC
2.1.3	Type	Below ground /above ground
2.1.4	Capacity	As per system requirement
2.2	**Bar Screen (Fine screen)**	
2.2.1	Quantity	1no. (1W)
2.2.2	MOC	SS316
2.2.3	Type	Below ground /above ground
2.2.4	Capacity	As per system requirement
3.0	**Oil & Grease chamber**	
3.1	Quantity	1 no. oil & grease chamber
3.2	Oil & grease chamber MOC	RCC (Civil by BHEL)
3.3	Oil & grease chamber capacity	As per process requirement
3.4	Oil Collection Can/tank	100 Ltrs. (MOC: HDPE)
4.0	**Oil Skimmer**	
4.1	Numbers Required	One (1) no. motor operated oil skimmer
4.2	Flow (m^3/hr)	As per process requirement

4.3	MOC	MS Epoxy painted
4.4	Type	As per process requirement
5.0	**DE-CENTRALISED STP MODULES/SKIDS**	
5.1	Capacity	25 m3/day
5.2	MOC	As per system requirement
6.0	**Sludge recirculation pump**	
6.1	**Option -I**	
6.1.1	Type	Submersible type
6.1.2	Quantity	2 Nos. (1W+1S)
6.1.3	Suction condition	Flooded.
6.1.4	Capacity	As per process requirement
6.1.5	Head	As per process requirement+6M Static head
6.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
6.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
6.2	**Option -II**	
6.2.1	Type	Horizontal Centrifugal type
6.2.2	Quantity	2 Nos. (1W+1S), all connected.
6.2.3	Suction condition	Flooded.
6.2.4	Capacity	As per process requirement
6.2.5	Head	As per process requirement+6M Static head
6.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
6.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
6.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
7.0	**Air Blowers for sewage treatment skid**	
7.1	Numbers Required	2 nos. (1W+1S)
7.2	Type of Blower	Twin lobe type
7.3	Flow	As per process requirement
7.4	Head	As per process requirement
7.5	MOC	CI to IS 210 Gr. FG 260
7.6	Accessories	NRV, Pressure Gauge, Safety valves, Silencer, PRV, Filter, etc
7.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
7.8	Common Base plate/ mounting plate	MS as per IS 2062
7.9	Instrumentation	Pressure transmitters, Pressure gauges, Flow Transmitters etc.
8.0	**Filter Feed Tank**	
8.1	Numbers Required	One (1) no. and shall be in bidder's scope

8.2	Effective Capacity	6 hrs storage
8.3	MOC	As per supplier's recommendation
8.4	Instrumentation	Level indicating transmitters etc.
9.0	**Hypo Dosing System**	
9.1	**Hypo Dosing Tank**	
9.1.1	Numbers Required	One (1) no.
9.1.2	Effective Capacity	100 liters OR+ 24 hour storage requirement @ suitable dosing rate whichever is higher
9.1.3	MOC	FRP/HDPE/GRP
9.1.4	Instrumentation	Level indicator and level interlock for pumps.
9.2	**Hypo Dosing Pump for treated water tank**	
9.2.1	Quantity	Two (1W+1S) no.
9.2.2	Capacity	As per process requirement.
9.2.3	Type	Electronic dosing pump with auto stroke controller
9.2.4	MOC	PP
9.2.5	Instrumentation	Pressure transmitters, Pressure gauges etc.
10.0	**Filter Feed Pumps**	
10.1	**Option -I**	
10.1.1	Type	Submersible type
10.1.2	Quantity	2 Nos. (1W+1S)
10.1.3	Suction condition	Flooded.
10.1.4	Capacity	As per process requirement
10.1.5	Head	As per process requirement+6M Static head
10.1.6	MOC	
	• MOC casing	Cast Iron
	• MOC impeller	Stainless Steel AISI 304
	• MOC shaft	SS 410
10.1.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.1.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
10.2	**Option -II**	
10.2.1	Type	Horizontal Centrifugal type
10.2.2	Quantity	2 Nos. (1W+1S), all connected.
10.2.3	Suction condition	Flooded.
10.2.4	Capacity	As per process requirement
10.2.5	Head	As per process requirement+6M Static head
10.2.6	MOC	
	• Casing	Cast Iron IS:210 Gr FG 260
	• Impeller	Stainless steel CF 8M
	• Shaft & Shaft sleeve material	Stainless steel SS Gr. 304 & SS316
	• Packing seal	Mechanical type
	• Common base plate	Carbon steel IS:2062
10.2.7	Drive motor	Induction Motor 415V, 3 Phase, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS : 12615
10.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
11.0	**Multi Grade Filter**	
11.1	Quantity	1 no.
11.2	Capacity	As per system requirement
11.3	Design pressure	Shut off head of Filter feed pump + 5%

		margin
11.4	MOC	As per supplier's recommendation
11.5	Media	To suit system requirement
11.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
12.0	**Activated Carbon Filter**	
12.1	Quantity	1 no.
12.2	Capacity	As per system requirement
12.3	Design pressure	Shut off head of Filter feed pump + 5% margin
12.4	MOC	As per supplier's recommendation
12.5	Media	Activated Carbon
12.6	Instrumentation	Differential Pressure transmitters, Pressure gauges etc.
13.0	**Treated Water Tank (Above ground)**	
13.1	Number required	1 no. and shall be in bidder's scope
13.2	Capacity	6 hrs storage
13.3	MOC of tank	FRP/ HDPE
13.4	Instrumentation	Level indicators, Level transmitters etc.
14.0	**Common sewage collection inside STP 3**	
14.1	**Common sewage collection sump**	
14.1.1	MOC	RCC
14.1.2	Type	Covered at top, below ground
14.1.3	Capacity	25 m3
14.1.4	Instrumentation	Level indicator, Level transmitters etc.
14.2	**Common sewage transfer pumps**	
14.2.1	Type	Vertical submersible grinder type
14.2.2	Quantity per sump	2 X 100 % (1W+1S)
14.2.3	Capacity	As per system requirement
14.2.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
14.2.5	MOC impeller	Stainless Steel AISI 304
14.2.6	MOC shaft	SS 410
14.2.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS: 12615
14.2.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
15.0	**Sewage Sump S-6**	
15.1	MOC	RCC
15.2	Type	Covered at top, below ground
15.3	Capacity	8.0 m3
15.4	Accessories	Coarse bar screen (MOC : SS-316)
15.5	Instrumentation	Level indicator, Level transmitters etc.
16.0	**Sewage Sump S-6 Transfer Pumps**	
16.1	Type	Vertical submersible grinder type
16.2	Quantity per sump	2 X 100 % (1W+1S)
16.3	Capacity	5.0 m^3/h (Minimum)
16.4	MOC casing	Cast Iron to IS 210 FG 260 / CS ASTM A-216 Gr. WCB
16.5	MOC impeller	Stainless Steel AISI 304
16.6	MOC shaft	SS 410
16.7	Drive Motor	Induction motor, 415V, 3 Φ, 50 Hz, TEFC, Energy Efficiency Class IE-3 as per IS :

		12615
16.8	Instrumentation	Pressure transmitters, Pressure gauges etc.
17.0	**MATERIAL OF CONSTRUCTION OF PIPING AND FITTINGS**	
17.1	MOC of Piping and fittings of handling sewage and treated sewage	HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS: 4984 or Equivalent
17.2	MOC of Piping and fittings of Chemical dosing	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
17.3	MOC of service water piping	IS-2062 Gr.-E-250B/ ASTM A-36/ASTM A-53 type 'E' Gr.B/ IS-3589 Gr. 410 /IS-1239 Heavy.
17.4	MOC of compressed air piping (non submerged)	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent
17.5	MOC of compressed air piping (submerged)	CPVC as per ASTM D 1784 and F 441 & F 439 Schedule 80.
18.0	**Material of Construction valves**	
18.1	MOC of valves (sewage water, treated water and chemical dosing)	CPVC as per ASTM F441 CPVC 4120 Schedule 80/ equivalent.
18.2	MOC of compressed air valves	Cast iron for sizes 65NB and above; gunmetal for sizes 50 NB and below.
18.3	MOC of service water	Cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.
19.0	**Chain Pulley Block**	
19.1	Quantity	1 No. Chain Pulley Block of adequate capacity with tripod arrangement, to meet the erection and maintenance requirements are to be provided by bidder

Note:
1. Sewage Lifting sump's depth may vary from 2.5 to 4.5 meters.
2. Bidder to adhere typical details shown for Sewage collection sumps (S1 to S6) included in Annexure XII (Drawings).

ELECTRICAL EQUIPMENT SPECIFICATION

(SPECIFIC ELECTRICAL REQUIREMENT)

(COMMON FOR TG & SG)

SPECIFIC TECHNICAL REQUIREMENTS: ELECTRICAL

1.0 Scope for supply, and erection & commissioning of various equipment forming part of electrical system for this package shall be as per 'Electrical scope between BHEL & vendor'.

2.0 Make of all electrical equipment/ items supplied shall be reputed make. Same shall be subject to approval of BHEL/customer after award of contract without any commercial implications. Tentative make list of various Electrical items (Motors/ lugs/glands) is attached.

3.0 All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.

4.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

4.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated.

4.2 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.

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

(FOR TG)

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (RAGHUNTAHPUR -TG)

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC Starter cum control panel (if applicable)	DVC Vendor	DVC Vendor	415 V AC, 3 phase, 3 wire supply shall be provided by DVC based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
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 vendor's scope b) one end equipment in vendor's scope c) between DCS panel and equipment in vendor's scope (250m cabling distance from Equipment to DCS).	 Vendor DVC Vendor	 Vendor DVC Vendor	**For point b)** 1.Sizes of cables required shall be informed by DVC at contract stage (based on Load data inputs provided by Vendor) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL/DVC. **For all points**) 1. Vendor shall provide lugs & glands accordingly. 2. Cable termination at vendor equipment shall be by vendor.
4	Junction box for control & instrumentation cable	Vendor	Vendor	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, fibre optical etc.	Vendor	Vendor	
6	Branch Cable trays, accessories & cable trays supporting system from main tray route(DVC scope) up to vendor's equipment (250m cabling distance from Equipment to DCS).	Vendor	Vendor	All type of Cable Tray inside CPU Service Area and Regeneration area are in Vendor Scope.
7	Cable glands and lugs for equipment supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty copper lugs for power & control cables.
8	Conduit and conduit accessories for cabling between equipment supplied by vendor	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Lighting	DVC	DVC	

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (RAGHUNTAHPUR -TG)

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
10	Equipment grounding & lightning protection	DVC	DVC	
11	Below grade grounding	DVC	DVC	
12	LT Motors with base plate and foundation hardware	Vendor	BHEL	Makes shall be subject to customer/ BHEL approval at contract stage.
13	Mandatory spares	Vendor	-	Vendor to quote as per specification.
14	Recommended O & M spares	Vendor	-	As specified elsewhere in specification
15	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor	BHEL	
16	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Equipment layout drawings	Vendor	-	
18	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.
3. In case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

(FOR SG)

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (RAGHUNTAHPUR -SG)

PROJECT:

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC Starter cum control panel (if applicable)	BHEL Vendor	BHEL BHEL	415 V AC, 3 phase, 3 wire supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	 BHEL BHEL BHEL	 BHEL BHEL BHEL	1. For 3.b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Cabling/ termination by BHEL.
4	Junction box for control & instrumentation cable	Vendor	BHEL	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, fibre optical etc.	Vendor	BHEL	Refer scope/ C&I portion of specification for scope of fibre Optical cables if used between PLC/ micro processor & DCS.
6	Cable trays, accessories & cable trays supporting system	BHEL	BHEL	
7	Cable glands and lugs for equipment supplied by Vendor	Vendor	BHEL	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty copper lugs for power & control cables.
8	Conduit and conduit accessories for cabling between equipment supplied by vendor	Vendor	BHEL	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Lighting	BHEL	BHEL	
10	Equipment grounding & lightning protection	BHEL	BHEL	

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (RAGHUNTAHPUR -SG)

PROJECT:

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
11	Below grade grounding	BHEL	BHEL	
12	LT Motors with base plate and foundation hardware	Vendor	BHEL	Makes shall be subject to customer/ BHEL approval at contract stage.
13	Mandatory spares	Vendor	-	Vendor to quote as per specification.
14	Recommended O & M spares	Vendor	-	As specified elsewhere in specification
15	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor	BHEL	
16	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Equipment layout drawings	Vendor	-	For preparation of cabling layout drawings by BHEL, vendor shall furnish Electrical equipment layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling,
18	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.
3. In case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.

4. Supply and E&C for Power Cables, Ordinary Control Cables and Screened Control Cables, Cable Glands, Cable Lugs, Cable tray, LPBS, JB for Skid based system is in Vendor Scope.

DATA SHEET OF MOTOR AND ELECTRICAL ITEMS

(FOR TG)

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 11 kV, 3.3 kV 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 : Single phase 240V AC / 3 phase 415V AC

b) Above 0.2KW and upto 200KW : 3 phase 415V AC

c) Above 200KW and upto 1500 KW: 3.3 kV

d) Above 1500 KW : 11 kV

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 equipment.

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
iii)	Cable box-indoor area	-	IP 54
iv)	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:**

AC Motors:

a) Squirrel cage induction motor suitable for direct-on-line starting.

b) LT motors upto 50 KW Output rating (at 50 deg.C ambient temperature), shall be **super Premium Efficiency class-IE4, 50-200 KW shall be of Premium Efficiency class – IE3**, conforming to IS 12615, or IEC:60034-30. HT motors shall have minimum design efficiency of 95 %. However, tolerance on this efficiency value shall be applicable as per IEC 60034

c) Motor operating through variable frequency drives shall be suitable for inverter duty with VPI insulation. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable.

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.

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% up to 1500KW (except for AOP motor which is 80%) (b) 80% from 1501 KW to 4000KW (c) 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 (b) Hydrogen generation plant area : Group - IIC (or Group-I, Div-II as per NEC)
7.03.00	**Winding and Insulation** (a) Type : Non-hygroscopic, oil resistant, flame resistant (b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature. However the conveyor motor shall be suitable for 3 consecutive hot starts.

	(c) 11kV & 3.3 kV AC motors :	Thermal class 155 (F) insulation. 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
	(d) 240VAC, 415V AC & 220V DC motors :	Thermal Class(B) or better
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) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits prescribed in IS:12075 / IEC 60034-14 . 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 preferably 2 numbers duplex platinum resistance type temperature detectors.	
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 boxes. In case elastimould terminations are offered, then protective cover and trifurcating sleeves shall also be provided. In case cable box is offered, then Employer shall provide termination kit. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided in case of cable 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 the11 kV, 3.3kV /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.
7.14.00	11kV and 3.3 kV motor 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 suitable for the same.
8.00.00	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 (For AOP motor it shall be 8.0) (b) Above 110KW & upto 1500KW : 10.0 (c) Above 1500KW & upto 4000KW : 9.0 (d) Above 4000KW : 6 to 6.5
10.00.00	**TYPE TEST**
10.01.00	**HT MOTORS**
10.01.01	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.
10.01.02	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.

10.01.03 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 owner for waival 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 owner 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.

10.01.04 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 owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

10.01.05 **LIST OF TYPE TESTS TO BE CONDUCTED**

The following type tests shall be conducted on each type and rating of HT motor

(a) No load saturation and loss curves upto approximately 115% of rated voltage

(b) Measurement of noise at no load.

(c) Momentary excess torque 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 IEC-60034, part-15

(g) Surge-withstand test on interturn insulation shall be as per clause no. 5.1.2 of IEC 60034, part-15

10.01.06 **LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED**

The following type test reports shall be submitted for each type and rating of HT motor

(a) Degree of protection test for the enclosure followed by IR, HV and no load run test.

(b) Terminal box-fault level withstand test for each type of terminal box of HT motors only.

10.02.00 **LT Motors**

10.02.01 LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Owner'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.

10.02.02 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 owner either at third party lab or in presence of client/owners representative and submit the reports for approval.

10.02.03 **LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED**

The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only

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. Full load test to determine efficiency power factor and slip . 5. Temperature rise test . 6. Momentary excess torque test. 7. High voltage test . 8. Test for vibration severity of motor. 9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section) 10. Test for degree of protection and 11. Overspeed test.
10.03.00	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.
10.04.00	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.

TABLE – I

DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS

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

For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.

PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:

NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:

Motor MCR in KW	Clearance
UP to 110 KW	10mm
Above 110 KW and upto 150 KW	12.5mm
Above 150 KW	19mm

Technical specification of Cable lugs

Cable lugs/ferrules shall be solderless crimping type suitable for power and control cables as per the DIN 46239. Aluminium solderless crimping lugs/ ferrules shall be used for Aluminium cables and Copper lugs/ferrules shall be used for Copper cables. Bimetallic washers or bimetallic type lugs shall be used for bimetallic connections.

Technical specification of Cable glands

Cable shall be terminated using double compression type cable glands. Testing requirements of Cable glands shall conform to BS:6121 and gland shall be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected

Technical specification of Junction Boxes

Junction box shall be made of Fire retardant material. Material of JB shall be Thermoplastic or thermosetting or FRP type. The box shall be provided with the terminal blocks, mounting bracket and screws etc. The cable entry shall be through galvanized steel conduits of suitable diameter. The JB shall have suitable for installing glands of suitable size on the bottom of the box. The JB shall be suitable for surface mounting on ceiling/structures. The JB shall be of grey color RAL 7035. All the metal parts shall be corrosion protected. Junction box surface should be such that it is free from crazings, blisterings, wrinkling, colour blots/striations. There should not be any mending or repair of surface. JB's will be provided with captive screws so that screws don't fall off when cover is opened. JB's mounting brackets should be of powder coated MS. Type test reports for the following tests shall be furnished:
a) Impact resistance for impact energy of 2 Joules (IK07)as per BS EN50102

b) Thermal ageing at 70deg C for 96 hours as per IEC60068-2-2Bb

c) Class of protection shall be IP 55

d) HV test

Terminal blocks shall be 1100V grade, of suitable current rating, made up of unbreakable polyamide 6.6 grade. The terminals shall be screw type or screw-less (spring loaded) / cage clamp type with lugs. Marking on terminal strips shall correspond to the terminal numbering in wiring diagrams. All metal parts shall be of non-ferrous material. In case of screw type terminals the screw shall be captive, preferably with screw locking design. All terminal blocks shall be suitable for terminating on each side the required cables/wire size. All internal wiring shall be of cu. Conductor PVC wire.

Technical specification of Flexible conduit

Flexible conduit shall be water proof, rust proof, made of heat resistant steel with temperature rating of 150 deg C. Conduit diameter shall be uniform throughout its length. Internal surface of the conduit shall be free from burrs and sharp edges. Conduits shall be complete with necessary accessories for proper termination of the conduit with junction boxes and lighting fixtures.

CABLE TRAY AND CABLE TRAY SUPPORT

3.00.00	**EQUIPMENT DESCRIPTION**
3.01.00	Cable trays shall be ladder/perforated type as specified complete with matching fittings (like brackets, elbows, bends, reducers, tees, crosses, etc.) accessories (like side coupler plates, etc. and hardware (like bolts, nuts, washers, G.I. strap, hook etc.) as required. Cable tray shall be ladder type for power & control cables and perforated for instrumentation cables.
3.01.02	Cable trays, fittings and accessories shall be fabricated out of rolled mild steel sheets free from flaws such as laminations, rolling marks, pitting etc. These (including hardware) shall be hot dip galvanized as per relevant clause of this chapter.
3.01.03	Cable trays shall have standard width of 150 mm, 300 mm & 600 mm and standard lengths of 2.5 metre. Thickness of mild steel sheets used for fabrication of cable trays and fittings shall be 2 mm. The thickness of side coupler plates shall be 3 mm.
3.01.04	Cable troughs shall be required for branching out few cables from main cable route. These shall be U-shaped, fabricated of mild steel sheets of thickness 2 mm and shall be hot dip galvanised as per relevant clause of this chapter. Troughs shall be standard width of 50 mm & 75 mm with depth of 25 mm.
3.01.05	The tolerance for cable tray and accessories shall be as per IS 2102 (Part-1). Tolerance Class: - Coarse
3.02.00	**Support System for Cable Trays**
3.02.01	Cable tray support system shall be pre-fabricated out of single sheet as per enclosed tender drawings.
3.02.02	Support system for cable trays shall essentially comprise of the two components i.e. main support channel and cantilever arms. The main support channel shall be of two types : (i) C1:-having provision of supporting cable trays on one side and (ii) C2:-having provision of supporting cable trays on both sides. The support system shall be the type described hereunder: a) Cable supporting steel work for cable racks/cables shall comprise of various channel sections, cantilever arms, various brackets, clamps, floor plates, all hardwares such as lock washers, hexagon nuts, hexagon head bolt, support hooks, stud nuts, hexagon head screw, channel nut, channel nut with springs, fixing studs, etc. b) The system shall be designed such that it allows easy assembly at site by using bolting. All cable supporting steel work, hardwares fitings and accessories shall be prefabricated factory galvanized. c) The main support and cantilever arms shall be fixed at site using necessary brackets, clamps, fittings, bolts, nuts and other hardware etc. to form various arrangements required to support the cable trays. Welding of the components shall not be allowed. However, welding of the bracket (to which the main support channel is bolted) to the overhead beams, structural steel, insert plates or reinforcement bars will be

permitted. Any cutting or welding of the galvansied surface shall be brushed and red lead primer, oil primer & aluminium paint shall be applied.

d) All steel components, accessories, fittings and hardware shall be hot dip galvanised after completing welding, cutting, drilling and other machining operation.

e) The typical arrangement of flexible support system is shown in the enclosed drawings and described briefly below:
The main support channel and cantilever arms shall be fabricated out of 2.5 thick rolled steel sheet conforming to IS 1079.

f) Cantilever arms of 170mm, 320 mm, 620mm and 750 mm in length are required, and shall be as shown in the enclosed drawing. The arm portion shall be suitable for assembling the complete arm assembly on to component constructed of standard channel section. The back plate shall allow sufficient clearance for fixing bolt to be tightened with tray in position.

g) Support system shall be able to withstand
- weight of the cable trays
- weight of the cables (75 Kg/Metre run of each cable tray)
- Concentrated load of 75 Kg between every support span
- Factor of safety of minimum 1.5 shall be considered

3.02.03 The size of structural steel members or thickness of sheet steel of main support channel and cantilever arms and other accessories as indicated above or in the enclosed drawings are indicative only. Nevertheless, the support system shall be designed by the bidder to fully meet the requirements of type tests as specified. In case the system fails in the tests, the components design modification shall be done by the Bidder without any additional cost to the Employer. The bidder shall submit the detailed drawings of the system offered by him alongwith the bid.

3.02.04 Four legged structure shall be provided wherever there is change in elevation and change in direction

DATA SHEET OF MOTOR AND ELECTRICAL ITEMS

(FOR SG)

MOTORS

1.00.00 GENERAL REQUIREMENTS

1.01.00 This chapter has to be read in conjunction with sub-section B-0 "General electrical specification" of Technical specification Section- VI, Part-B and Sub-Section-IIB Electrical system/Equipment of Technical Specifications Section-VI, Part-A"

Degree of Protection

Degree of protection for various enclosures as per IEC60034-05 shall be as follows :-

i)	Indoor motors	-	IP 55
ii)	Outdoor motors	-	IP 55 (Additional Canopy to be provided)
iii)	Cable box-indoor area	-	IP 55
iv)	Cable box-Outdoor area	-	IP 55

2.00.00 CODES AND STANDARDS

1)	Three phase induction motors	:	IS15999/IEC:60034
2)	Single phase AC motors	:	IS 996/ IEC:60034
3)	Crane duty motors	:	IS:3177, IS/IEC:60034
4)	DC motors/generators	:	IS:4722, IS/IEC:60034
5)	Energy Efficient motors	:	IS 12615, IEC:60034-30

3.00.00 TYPE

3.01.00 **AC Motors:**

a) Squirrel cage induction motor suitable for direct-on-line starting.

b) LT motors upto 50 KW Output rating (at 50 deg.C ambient temperature), shall be **super Premium Efficiency class-IE4, 50-200 KW shall be of Premium Efficiency class – IE3**, conforming to IS 12615, or IEC:60034-30. HT motors shall have minimum design efficiency of 95 %. However, tolerance on this efficiency value shall be applicable as per IEC 60034

c) Motor operating through variable frequency drives shall be suitable for inverter duty with VPI insulation. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable.

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 or driven equipment 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 (AC &DC)

70 deg. C by resistance method for thermal class 155(F) insulation.

Water cooled

80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for thermal class 155(F) insulation.

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 rated torque.
6.02.02	Pull out torque at rated voltage shall not be less than 205% of rated torque. It shall be 275% for crane duty motors.
6.03.00	NOT USED
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). The method of movement of primary and secondary coolant shall be self-circulated by fan or pump directly mounted on the rotor of the main motor as per IEC 60034-6. However VFD driven motors can be offered with forced cooling type with machine mounted fan or pump driven by separate electric motor. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below (a) Fuel oil area : Group – IIB (b) Hydrogen generation : Group - IIC or (Group-I, Div-II as per plant area NEC) or (Class-1, Group-B, Div-II as per NEMA /IEC60034)
7.03.00	Winding and Insulation (a) Type : Electrolytic grade Copper conductor, Non-hygroscopic, oil resistant, flame resistant Insulation. (b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature. However , conveyor motors shall be suitable for 3 consecutive hot starts (c) 11kV, 6.6 KV & 3.3 kV AC motors : Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Presure Impregnated i.e resin poor method. The lightning Impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15. (d) 240VAC, 415V AC & 220V DC motors : Thermal Class (F) or better
7.04.00	Motors rated above 1000KW shall have insulated bearings/housing 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 85 dB(A) except for BFP motor for which the maximum limit shall be 90dB(A) (Tolerance limits as per IS/IEC shall be applicable on specified values). Vibration

	shall be limited within the limits prescribed in IS:12075 / IEC 60034-14 . 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 vibration pads. Contractor shall ensure the adequate size of vibration pads for mounting of suitable vibration sensors.
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 3 numbers duplex RTDs connected to three numbers dual input transmitters with display. However for air compressor, being high speed drive, each motor bearing shall be provided with minimum two numbers of duplex RTDs connected to two numbers dual input transmitters with display unit.
7.08.00	Motor body shall have two earthing points on diagonally opposite sides.
7.09.00	11 KV motors shall be offered with: i) Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds. OR ii) Dust tight phase segregated double walled (metallic as well as insulated barrier) Terminal box PSTB shall be suitable for fault level of 50KA/40KA for 0.12 seconds (Fault level shall be as per system fault level for 11 KV system defined elsewhere in the specification). Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non-magnetic material for single core cables) shall be provided.
7.10.00	3.3/6.6 KV motors shall be offered with dust tight phase segregated double walled (metallic as well as insulated barrier) Terminal box. Alternately Elastimold type Terminal box should also be accepted as per OEM standard proven practice. Contractor shall provide termination kit for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA/500MVA for 0.12 sec for3.3/6.6KV respectively. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided.
7.11.00	The spacing between gland plate & centre of bottom terminal stud shall be as per Table-I.
7.12.00	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.
7.13.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 6.6 KV, 3.3 kV /415V systems without any injurious effect on its life.
7.14.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.
7.15.00	NOT USED.
8.00.00	NOT USED.
9.00.00	NOT USED.
10.00.00	**TYPE TEST**
10.01.00	**HT MOTORS** **LIST OF TYPE TESTS TO BE CONDUCTED** **The following type tests shall be conducted on each type and rating of HT motor** (a) No load saturation and loss curves upto approximately 115% of rated voltage (b) Measurement of noise at no load. (c) Momentary excess torque 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.

LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED

The following type test reports shall be submitted for each type and rating of HT motor

(a) Degree of protection test for the enclosure followed by HV and no load run test.

(b) Terminal box-fault level withstand test for each type of terminal box (phase side only) of HT motors only.

(c) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15

(d) Surge-withstand test on inter-turn insulation shall be as per clause no. 4.2 of IEC 60034, part-15

10.02.00 **LT Motors**

LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED

The following type test reports shall be submitted for each type and rating of LT motor of above 100 KW only

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. Full load test to determine efficiency power factor and slip
5. Temperature rise test
6. Momentary excess torque test.
7. High voltage test
8. Test for vibration severity of motor.
9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section)
10. Test for degree of protection and
11. Overspeed test.
12. Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1

10.03.00 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.

10.04.00 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.

TABLE - I

DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS

Motor MCR in KW	**Minimum distance between centre of bottom terminal 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	385/203 (For Single core cables only)

For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.

PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:

NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:

Motor MCR in KW	**Clearance**
UP to 110 KW	10mm
Above 110 KW and upto 150 KW	12.5mm
Above 150 KW	19mm

Technical specification of Cable lugs

Cable lugs/ferrules shall be solderless crimping type suitable for power and control cables as per the DIN 46239. Aluminium solderless crimping lugs/ ferrules shall be used for Aluminium cables and Copper lugs/ferrules shall be used for Copper cables. Bimetallic washers or bimetallic type lugs shall be used for bimetallic connections.

Technical specification of Cable glands

Cable shall be terminated using double compression type cable glands. Testing requirements of Cable glands shall conform to BS:6121 and gland shall be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected

Technical specification of Junction Boxes

Junction box shall be made of Fire retardant material. Material of JB shall be Thermoplastic or thermosetting or FRP type. The box shall be provided with the terminal blocks, mounting bracket and screws etc. The cable entry shall be through galvanized steel conduits of suitable diameter. The JB shall have suitable for installing glands of suitable size on the bottom of the box. The JB shall be suitable for surface mounting on ceiling/structures. The JB shall be of grey color RAL 7035. All the metal parts shall be corrosion protected. Junction box surface should be such that it is free from crazings, blisterings, wrinkling, colour blots/striations. There should not be any mending or repair of surface. JB's will be provided with captive screws so that screws don't fall off when cover is opened. JB's mounting brackets should be of powder coated MS. Type test reports for the following tests shall be furnished:
a) Impact resistance for impact energy of 2 Joules (IK07)as per BS EN50102

b) Thermal ageing at 70deg C for 96 hours as per IEC60068-2-2Bb

c) Class of protection shall be IP 55

d) HV test

Terminal blocks shall be 1100V grade, of suitable current rating, made up of unbreakable polyamide 6.6 grade. The terminals shall be screw type or screw-less (spring loaded) / cage clamp type with lugs. Marking on terminal strips shall correspond to the terminal numbering in wiring diagrams. All metal parts shall be of non-ferrous material. In case of screw type terminals the screw shall be captive, preferably with screw locking design. All terminal blocks shall be suitable for terminating on each side the required cables/wire size. All internal wiring shall be of cu. Conductor PVC wire.

Technical specification of Flexible conduit

Flexible conduit shall be water proof, rust proof, made of heat resistant steel with temperature rating of 150 deg C. Conduit diameter shall be uniform throughout its length. Internal surface of the conduit shall be free from burrs and sharp edges. Conduits shall be complete with necessary accessories for proper termination of the conduit with junction boxes and lighting fixtures.

LOAD DATA FORMAT

(COMMON FOR TG & SG)

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)

2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (dc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V

: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

	LOAD DATA (ELECTRICAL)	JOB NO.		ORIGINATING AGENCY	PEM (ELECTRICAL)
		PROJECT TITLE		NAME	DATA FILLED UP ON
		SYSTEM / S		SIGN.	DATA ENTERED ON
		DEPTT. / SECTION		SHEET 1 OF 1 REV. 00	DE'S SIGN. & DATE

SECTION- IC

SPECIFIC TECHNICAL REQUIRMENT-CONTROL & INSTRUMENTATION
(COMMON FOR TG & SG)

1. **Complete Control & Instrumentation system along with necessaries fittings & accessories** for Water Packages is in bidder scope of supply. Items not specifically mentioned however required for the completeness of the system shall be supplied by bidder without any commercial and time implication. The requirements given are to be read in conjunction with detailed Technical specification. Further in case of any discrepancy in the requirement, the more stringent requirement as per interpretation of customer shall prevail without any commercial and time implication.

2. Scope of Instrumentation cables (Screened Control Cables), Fibre Optic cable & Control cables shall be as per Electrical Cable scope matrix in Electrical portion of specification. Any cable in Bidder's scope shall be as per specification.

3. The control system for Water packages **shall be as per C&I Annexure-I (enclosed with this specification).** Conventional controls (hardwired 4-20mA/DI/DO) are envisaged for these packages.

4. The quantity of instruments for the system shall be as per tender P &ID wherever provided of the respective system as a minimum. However, Bidder shall also include all the instruments and devices that are needed for the completeness of the plant auxiliary system/ equipment supplied by the bidder, even if the same is not specifically appearing in the P & ID. During detail engineering if any additional instruments are required for safe & reliable operation of plant, bidder shall supply the same without any price implication.

5. All the primary Instruments as indicated in enclosed flow schemes/diagrams and relevant tender drawings/ BOQ, corresponding Mechanical sections and meeting redundancy and other requirements specified under technical specifications are to be provided as a minimum. Scope of supply of PG instrument, if applicable, shall be in bidder's scope.

6. All Instruments which are Integral to equipment like pumps, motors etc. which are not indicated in enclosed P&IDs but are required for control. monitoring and operation of the equipment/plant/system are to be provided.

7. Electronic transmitters with 4-20 mA DC HART output signal shall be provided by the bidder.

8. STANDARDISATION AND UNIFORMITY OF HARDWARE: Bidder shall ensure that various C&I instruments /equipment like 4-20mA electronic transmitters / transducers, Temperature elements and other instruments/ local devices etc. that are being furnished by the Bidder, are of the same make, series and family of hardware to the extent possible so as to ensure smooth and optimal maintenance, easy interchangeability and efficient spare parts management.

9. The contacts of equipment mounted instruments, sensors, switches etc. for external connection including spare contacts shall be wired out in flexible/rigid conduits, independently to suitably located common junction boxes.

10. Power supply derived for Transmitters, contact interrogation, interposing relay and solenoid shall generally be ungrounded 24V D.C only. In all cases redundancy in power modules shall be considered.

11. The solenoid operated valves shall have limit switches for open/close feedback.

11. The solenoid operated valves shall have limit switches for open/close feedback.

12. All motorized valves shall be in bidder's scope and shall be supplied with Non-Intrusive type Electric Actuator (with integral starter) along with necessary interface units for linking to corresponding Control System as applicable. Further details regarding electric actuators are covered in the detailed specification.

13. Diaphragm seal shall be provided with Instruments having contact with corrosive, viscous media.

14. The redundancy in sensor, cable, control system component, power supply system component shall be designed by the Contractor to ensure that malfunction of any single sensor/ cable / Control system component/ power supply system component etc. shall not lead to loss of any Major Auxiliary (all HT Drives and Critical LT drives) or loss of Generation or loss of control function or loss of protection function.

15. Current measurement (4-20mA) of all critical LT drives shall be connected hardwired in respective DDCMIS.

16. Redundancy of instruments to be provided by bidder shall be as follows: -

    (i) Triple redundancy for all analog and binary inputs required for protection of system/drives.
    (ii) For all other control functions dual redundancy of the sensors shall be provided by the bidder.

17. Bidder to provide all the instruments envisaged for below applications, with wetted parts made of Monel/ Hastelloy C
    For Chlorine application: Instruments shall be provided with wetted parts (e.g. diaphragm seal, etc.) made of Hastelloy C. Also, filled liquid shall be Fluorolube oil/ Inert Hydrocarbon /CTFE etc., for these applications.
    For applications of FECL3 solution: Instruments shall be provided with wetted parts (e.g. diaphragm seal, etc.) made of Tantalum. Diaphragm seal shall be provided with Instruments having contact with corrosive media.

18. All instruments shall be terminated on JB/LIE/LIR/LCP in field. Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 12-15 mtrs) and trunk cable. In case grouping is not possible and these are to be installed individually, canopy with suitable mounting arrangement shall be provided.

19. Temperature transmitter shall be provided for all temperature measurement applications (as applicable). All temperature transmitters shall be suitably grouped together and mounted inside

    (i) Enclosures in case of open areas of the plant
    (ii) Racks in case of covered areas on as required basis.
    (iii) In case grouping is not possible and temperature transmitter is to be installed individually, canopy with suitable mounting arrangement shall be provided.

20. All transmitters and switches shall be suitably grouped together and mounted inside (i) Local Instruments Enclosures (LIE) in case of Open Areas of the Plant (ii) Local Instrument Racks (LIR) in case of covered areas (iii) Local Indicators/Gauges shall also be suitably grouped in Local Instrument Racks. In case grouping is not possible and these are to be installed individually, canopy with suitable mounting arrangement shall be provided.

21. In case of multiple measurements of temperature for any application, resulting in trip / protection, where logic implementation tolerates failure of one TE (e.g.2v3, 2v4 etc.), for only one of the TE, dual TT is to be provided.

22. All the outdoor field instruments such as analysers/transmitters/meters etc. shall be provided with suitable Free-standing cabinet(s)/panel/rack so that the equipment is protected against rain/ sunlight etc.

23. All electric actuators, pneumatic control valves, Junction Boxes, Solenoid boxes and Local control panels which are not installed inside building, suitable canopy shall be provided and design of canopy shall be approved by Employer during detailed engineering.

24. Bidder to provide Junction Boxes & SOV box in field for termination of all the instruments & solenoids respectively. For termination of single transmitters 5 nos. of TB to be used & for termination of switch 9 TBs to be used in Junction box.

25. Provision for separate Terminal block/wiring diagram for power and control blocks of control panel to be ensured.

26. Bidder to provide temperature sensor along with temperature transmitter for HT drives i.e. Pump and Motor for bearing and winding temp measurement.

27. The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg./sq.cm.

28. Bidder to provide erection hardware including junction boxes, canopies, structural steel as required.

29. 230 V AC UPS Power supply shall be provided by BHEL at CPU Regeneration control room and CPU Service Vessel area, further distribution to various instruments/equipment of the system shall be in bidder scope. Bidder to include necessary power distribution board in his scope. Any power supply other than the above, if required by any instrument/equipment has to be derived by the bidder from the above supply & all necessary hardware for the same shall be in bidder scope.

30. Bidder to furnish electrical load/UPS load data during bidding stage on not to exceed basis.

31. Vibration monitoring system is envisaged for HT Motors which is in BHEL scope. However, mounting of vibration sensors/probe, bidder to provide vibration pad for mounting of sensors and a notch/slot for mounting of key phasor.

32. Local control panel and VFD panel, if any required for operation shall be in bidder's scope.

33. Instrument air filters cum regulator set with mounting accessories shall be provided for pneumatic device requiring air supply.

34. Bidder shall furnish Instrument Schedule, Control Schemes, I/O list, Drive list, Root valve schedule, JB grouping (including Solenoid valve grouping), Cable Schedule, Cable interconnection (for local cabling & from JB to DCS, DCS end TB detail shall be provided to the successful bidder

during detail engineering to incorporate in cable interconnection), Instrument/SOV/Analyzers Installation diagram, Instrument/Analyzer datasheets, Annunciation list, List of Instruments/devices in BHEL approved format. Also, editable database format like MS Excel, MS Access etc. of these documents shall also be provided by Bidder. Soft copy of the formats shall be provided to the successful bidder.

35. Where ever in the specification, Bidder's offering as per his "standard and proven practice" are identified to be acceptable, the same shall be accepted (with project/plant specific customisation as necessary) based on the documentary evidence of the reference project/plant indicated in the bid document. Any other reference project, if proposed by the bidder during detailed engineering, shall be strictly as agreed by the employer during detailed engineering.

36. All field equipment including local instruments, transducers, valves, actuators, sensors, junction boxes and cabinets shall have nameplates with the instrument tag number and descriptor in English language. The nameplates shall be fixed to the mounting plate, the mounting brackets or junction box. Loosely attached nameplates by wires are not acceptable. Label material and writing shall be selected to withstand the environmental conditions where they are mounted. The label size and fixing place shall be selected to allow easy reading.

37. Bidder to provide mandatory spares as per mandatory spares list.

38. At least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures, termination/marshalling cabinets, etc.

39. Number of pairs to be selected for Screen /Control cable (Size : 0.5 mm2)
    a) F-Type: 2P/4P/8P/12P
    b) G-Type: 4P/8P/12P

40. Number of cores to be selected for Control cable:
    a) 3 Core (Size: 2.5 mm2):
    b) 5 Core (Size: 2.5 mm2):
    c) 10 Core (Size: 1.5 mm2):
    d) 12 Core (Size: 1.5 mm2):

.

Specific Points applicable for CPU package:

1) Condensate polishing unit packages shall be operated from DCS (DCS is in BHEL's scope) through operator work stations located in CPU Regeneration control room.

2) The bidder shall provide complete Instrumentation for control, monitoring and operation of entire system for CPU package. The requirements given are to be read in conjunction with detailed Technical specification.

3) All weather Local Panel fitted with integral Air Conditioner shall be provided by bidder for housing analyzers etc if the same are not kept in AC rooms. The enclosure of all analyzers shall provide protection from dust, humidity, precipitations, sunlight and environmental pollution. The material for the enclosure shall be of steel plate (SS304) with minimum 2 mm thick frame and minimum 2 mm thick steel (SS-304) sheet of protection IP 65 or better with safety lock of good quality. The lighting provision in the cabinet is to be provided. The cabinets shall be designed such that the wet section and dry section are separate, the exact

details shall be finalized during detailed engineering. The panel shall be free standing type constructed of suitable 3 mm thick channel frame of SS and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel and extended beyond the ends of the rack. In order to ensure the healthy operation of the installed electronic modules, cards, analyzers, etc. inside the enclosure during continuous operation, the enclosure shall be provided with Air conditioner unit.

4) All the instruments/drives shall be terminated on JBs/LIRs in field. JBs/LIRs shall be in Bidder's scope. Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 12-15 mtrs) and trunk cable

5) Bidder's presence is required at EDN Bangalore during FAT of DDCMIS for certifying correctness & completeness of implementation of Control logic in DCS. Bidder's presence is required in multiple visits at site during commissioning of DDCMIS for assistance related to process correctness. All the expenses like boarding, lodging and travel, air fare etc. shall be in bidder's scope.

Specific Points applicable for CHEMICAL DOSING System:

1) Chemical Dosing System shall be operated from Plant DCS (DCS-BHEL Scope of supply) through operator work stations located in CCR. Bidder to provide local control panel for each dosing systems. This will act as interface between the DCS and the field devices for commands & feedbacks. In addition, LCP shall have the provision of START command, Emergency Stop, Indications & feedback interface with plant DCS as well as MCC.

2) The Contractor shall provide complete Instrumentation for control, monitoring and operation of entire Chemical dosing system. The requirements given are to be read in conjunction with detailed Technical specification enclosed in the specification.

3) All instruments shall be terminated on JB/LIR in field and both instrument and JB/LIR are in bidder scope.

4) Cabling within the skid shall be prewired and terminated at skid mounted JB/Panel.

5) PG/DPT/PT/LT/LG etc. shall have chemical/diaphragm seal for chemical applications.

6) Every panel-mounted instrument, requiring power supply, shall be provided with a pair of easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.

7) 415 V AC supply shall be provided by BHEL at a single point, further distribution to various instruments/equipments of the system shall be in bidder scope. Isolation Transformers & autochangeover circuit shall be considered for each skid. Bidder to include necessary power distribution board in his scope. Any power supply other than the above, if required by any instrument/equipment has to be derived by the bidder from the above supply & all necessary hardware for the same shall be in bidder scope. Bidder to submit the power requirement along with the bid.

Specific Points applicable for Effluent Transfer System:

1) Control of Effluent Transfer System shall be operated through its Relay based control panel (bidder's scope).

2) Push buttons, indication lamps and annunciation for operation of drives/equipment's shall be provided on the panel. Remote and local indication, indicating lamps / LED cluster for instruments/drives/equipment's status and critical alarms shall be provided on the panel. Nos. shall be decided during detailed engineering.

3) The Contractor shall provide complete Instrumentation for control, monitoring and operation of entire system for Effluent transfer system. The requirements given are to be read in conjunction with detailed Technical specification.

4) All weather Local Panel fitted with integral Air Conditioner shall be provided for housing analyzers etc if the same are not kept in AC rooms.

5) Bidder to consider the provision for interface of system with DCS. In LCP. IPR shall be provided in LCP for DCS interface

6) All the instruments/drives shall be terminated on JBs/LIRs in field. JBs/LIRs shall be in Bidder's scope. Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 12-15 mtrs) and trunk cable.

Specific Points applicable for STP package:

1) Sewage treatment packages shall be operated through its Relay based control panel (bidder's scope).

2) Push buttons, indication lamps and annunciation for operation of drives/equipment's shall be provided on the panel. Remote and local indication, indicating lamps / LED cluster for instruments/drives/equipment's status and critical alarms shall be provided on the panel. Nos. shall be decided during detailed engineering.

3) The Contractor shall provide complete Instrumentation for control, monitoring and operation of entire system for Sewage treatment packages. The requirements given are to be read in conjunction with detailed Technical specification.

4) Bidder to consider the provision for interface of system with DCS. In LCP. IPR shall be provided in LCP for DCS interface

5) All the instruments/drives shall be terminated on JBs/LIRs in field. JBs/LIRs shall be in Bidder's scope. Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 12-15 mtrs) and trunk cable.

6) All weather Local Panel fitted with integral Air Conditioner shall be provided for housing analyzers etc if the same are not kept in AC rooms.

7) 415 V AC supply shall be provided by BHEL at a single point, further distribution to various instruments/equipments of the system shall be in bidder scope. Isolation Transformers &

autochangeover circuit shall be considered for each skid. Bidder to include necessary power distribution board in his scope. Any power supply other than the above, if required by any instrument/equipment has to be derived by the bidder from the above supply & all necessary hardware for the same shall be in bidder scope. Bidder to submit the power requirement along with the bid.

Specific Points applicable for OXYGEN DOSING System:

1) Oxygen dosing system shall be controlled from DCS through operator work stations located in central control room (in BHEL Scope). The operation and control philosophy of Oxygen dosing system shall be as per design memorandum given elsewhere in the specification.

2) The Contractor shall provide complete Instrumentation for control, monitoring and operation of entire Oxygen dosing system. The requirements given are to be read in conjunction with detailed Technical specification enclosed in the specification.

3) The solenoid valves shall have limit switches for open/close feedback. The solenoid valve and mass flow controller with read out shall operate at 24V DC from DCS.

4) The junction boxes required for termination of instruments, Solenoid valve and Mass flow controller up to junction box are in bidder's scope.

TYPE TEST GENERAL REQUIREMENT:

1) Submission of type test results and certificate shall be acceptable provided:

   a) The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment.

   b) There has been no change in the components from the offered equipment & tested equipment.

   c) The test has been carried out as per the latest standards along with amendments as on the date of Bid opening.

2) In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the Bidder/ sub-vendor within the quoted price and no extra cost will be payable by the Employer on this account.

3) The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.

4) For the type tests to be conducted, Contractor shall submit detailed test procedure for approval by Employer. This shall clearly specify test setup, instruments to be used, procedure, acceptance norms (wherever applicable), recording of different parameters, interval of recording, precautions to be taken etc. for the tests to be carried out.

CONTROL SYSTEM FOR WATER TREATMENT PACKAGES

(COMMON FOR TG & SG)

CONTROL SYSTEM FOR MECHANICAL AUXILIARY PACKAGES (2 X 660 MW RAGHUNATHPUR-SG) REV 02

Sl. No.	System / Package	Scope of supply (Control system)	Common / per unit	Control System				Type of Interface with Main plant DCS		GIU (Location)	Control from		Primary Operating point	Secondary operating point	Communication with Main plant with DDCMIS			Remarks	Rev
				Type	Block	Location	RIO location	Link	Purpose		Local	Remote			Cable Type	Redundant (Y/N)	Protocol		
5	Condensate Polishing Unit	EDN	Service vessel is unitised and regeneration is common	TG DDCMIS	BOP-TG block	CPU Regeneration Area (Common)	RIO FOR SERVICE VEESEL AREA (CER-8.5m)	#	MONITORING	GIU((i) 1no. Regeneration Area (ii)1no. in each unit Service vessel Area	Y	Y	OWS (CPU Regeneration Control Room)	GIU((i) 1no. Regeneration Area (ii)1no. in each unit Service vessel Area	TP/FO**	Y	VALMET NET	Supervisory control from CCR OWS	02
9	Chemical Dosing System	EDN	Per unit	BOP-TG DDCMIS	BOP-TG block	CER	NA	NA	NA	NA	Y	Y	OWS (CCR)	Local Control Panel	NA	NA	NA		00
10	Oxygen Dosing System	EDN	Per unit	BOP-TG DDCMIS	BOP-TG block	CER	NA	NA	NA	NA	N	Y	OWS (CCR)	NA	NA	NA	NA		00
11	Effluent Transfer System	PEM Vendor	Common	Relay based control panel	-	Near ETS	NA	NA	NA	NA	Y	N	Relay based control panel	NA	NA	NA	NA		00
12	Sewage Treatment Plant	PEM Vendor	Common	Relay based control panel	-	Near STP	NA	NA	NA	NA	Y	N	Relay based control panel	NA	NA	NA	NA		00

LEGEND:

1 MP - MICROPROCESSOR
2 H/W - Hard Wired
3 FO - Fibre Optic
4 RIO - Remote Input/Output
5 CCR- Common Control room
6 LCR- Local control room

DATA SHEET FOR INSTRUMENT & ANALYZER

(COMMON FOR TG & SG)

CLAUSE NO.	TECHNICAL REQUIREMENTS
	BASIC DESIGN CRITERIA
1.00.00	GENERAL REQUIREMENTS
1.01.00	In addition to requirements specified under this Section-VI, Part-B, all C&I systems/ sub-systems/ equipment/ devices shall also meet other requirements stipulated under other Sub-sections/ parts/ sections of specification.
2.00.00	**PROVENNESS CRITERIA**
2.01.00	All equipment, systems and accessories furnished under this specification shall be from the latest proven product range of a reputed experienced manufacturer whose successful performance has been established by a considerable record of satisfactory operation in coal fired utility power stations.
2.02.00	Also refer sub section IA, Part A of technical specification.
3.00.00	**RELIABILITY AND AVAILABILITY**
3.01.00	Each component and system offered by the Bidder shall be of established reliability. The minimum target reliability of each piece of equipment like each electronic module/card, Power supply, Peripheral etc. shall be established by the Bidder, considering its failure rate/mean time between failures (MTBF), meantime to repair (MTTR), such that the availability of the complete DDCMIS is assured for 99.7%.
3.02.00	When more than one device uses the same measurement or control signal, the transmitter and other components/ module shall be fully equipped to provide all signal requirements. All the 4-20 mA output signals from transmitters/other control system shall be able to drive minimum 500 Ohms load resistance. The system shall be arranged so that the failure of any monitoring device or control components or spurious intermediate grounding in the signal path shall not open the signal loop nor cause the loss or malfunction of signal to other devices using the same signal.
3.03.00	To ensure availability, adequate redundancy in system design shall be provided at hardware, software and sensor level to satisfy the availability criterion mentioned above. For the protection system, independent sensing devices shall be provided to ensure adequate safety of plant equipment.
4.00.00	**STANDARDISATION AND UNIFORMITY OF HARDWARE**
4.01.00	Bidder shall ensure that various C&I instruments /equipment like vibration monitoring system, 4-20mA electronic transmitters / transducers, Temperature elements and other instruments/ local devices etc. that are being furnished by the Bidder, are of the same make, series and family of hardware to the extent possible so as to ensure smooth and optimal maintenance, easy interchangeability and efficient spare parts management.
5.00.00	**OPERABILITY & MAINTAINABILITY**
5.01.00	The design of the control systems and related equipment shall adhere to the principle of 'Fail Safe' Operation wherever safety of personnel / plant equipment is involved. 'Fail Safe' operation signifies that the loss of signal, loss of excitation or failure of any component shall

not cause a hazardous condition. However, it shall also be ensured that occurrence of false trips are avoided / minimized.

5.02.00 The types of failure that shall be taken into account for ensuring operability of the plant shall include but not be limited to:

—	Failure of sensor or transmitter.
—	Failure of main and/or redundant controller/other modules.
—	Loss of motive power to final control element.
—	Loss of control power.
—	Loss of instrument air.

5.03.00 The choice of hardware shall also take into account sound maintainability principles and techniques. The same shall include but shall not be limited to the following:

—	Standardization of parts.
—	Minimum use of special tools.
—	Grouping of functions.
—	Interchangeability.
—	Malfunction identification facility/self-surveillance facility.
—	Easy modular replacement.
—	Fool proof design providing proper identification and other features to preclude improper mounting and installation.
—	Appropriate de-rating of electronic components and parts.

5.04.00 The equipment shall employ latest state of the art technology to guard against obsolescence. In any case, Contractor shall be required to ensure supply of spare parts in line with relevant clause of GCC for spares. In case, the Bidder feels that certain equipment/component *(barring HMI hardware and networking components)* is likely to become obsolete, the Bidder shall clearly bring out the same in his Bid and indicate steps proposed to deal with such obsolescence. For HMI hardware and networking components, refer sub section IIC , Part A of technical specification. Further For HMI hardware and networking components bidder *shall inform the Employer in case of obsolesce so that Employer can take appropriate actions as necessary (outside the tenure of the contract).*

6.00.00 ENVIRONMENTAL CONDITIONS

6.01.00 Instruments, devices and equipment for location in outdoors/indoor/air-conditioned areas shall be designed to suit the environmental conditions indicated below and shall be suitable for continuous operation in the operating environment of a coal fired utility station and also

during periods of air conditioning failure without any loss of function, or departure from the specification requirements covered under this specification.

Ambient Temperature(outside cabinets)	Pressure	Relative humidity#	Atmosphere	Required protection Class of panels/ cabinets / desks to be provided by contractor.
Outdoor Location				
55 degree C max. / 4 degree C min.	Atmosphere	100 % Max./ 5 % min.	Air (dirty)	IP 55
Indoor Location				
55 degree C max. / 4 degree C min.	Atmosphere	95 % Max./5 % min.	Air	IP 54**
Air Conditioned Areas				
24 +/- 5 degree C normal/50 degree C max.*	Atmosphere	90% Max. / 10%min.	Air	IP 22***

* During air conditioning failure for a short period of time.

**For non-ventilated equipment/ control system enclosures. For ventilated equipment/ control system enclosures, protection class shall be IP 42.

***With a suitable canopy at the top to prevent ingress of dripping water.

For instruments: as per OEM standard for intended application.

For Hazardous areas the protection class shall be in accordance with the requirements of the relevant NEC code for the location.

CLAUSE NO.	TECHNICAL REQUIREMENTS
6.02.00	All equipment / instruments envisaged for sea water applications, shall be provided with wetted parts made of Monel/ Hastelloy C or any other material (if provenness experience of the proposed material for such applications is established by contractor).
6.03.00	For coastal areas, all equipment / instruments/ accessories shall be provided with durable epoxy coating for housings and all exposed surfaces of the equipment / instruments/ accessories.
6.04.00	For coastal areas, all impulse piping / air supply piping / local instrument enclosures and racks/ accessories shall be provided with durable epoxy coating fo rall exposed surfaces.
6.05.00	For coastal areas, all conduits / cable sub trays / cabling accessories shall be provided with durable epoxy coating forall exposed surfaces.
7.00.00	**GROUNDING SYSTEM** All panels, desks, cabinets shall be provided with a continuous bare copper (or chromated steel for DDCMIS panels, as per OEM Standard practice)ground bus. The ground bus shall be bolted to the panel structure on bottom on both sides. The bolts shall face inside of panels. The system ground shall be isolated from the panel ground with suitable isolators. All internal component grounds or common shall be connected to the system ground, which shall be fabricated of copper flat (size 25mm x 6mm min., length as applicable). Shield on instrumentation cables shall be grounded on panel side. Suitable shielding terminals shall be furnished on Copper flat forming system ground. Alternatively, Manufacturer's standard & proven solution, which is functionally equivalent shall also be acceptable subject to employer's approval. The Bidder shall submit with the offer recommended grounding scheme required for his system. The exact grounding scheme shall be finalized during detailed engineering.
8.00.00	**It is preferred that Instruments to be supplied under this package not to be of nucleonic type. However if it is required to provide Radioactive source based equipments/ Nucleonic devices/ Nucleonic gauges by the Contractor, following shall be met:-** 1. Contractor shall be responsible for selecting the proper type of nucleonic Source and sizing of the source for the specified application. 2. The Nucleonic gauge (source container) must be type approved by AERB. 3. Source housing shall have a statutory warning sign printed on it which shall be visible from distance. 4.(i) The supplier of radioactive source based equipments/ nucleonic devices/ nucleonic gauges shall clearly indicate the nucleonic source used in such equipment/ device, strength of source, half-life of source, useful life of the instrument and any other details related to source required for AERB NOC. (ii) Contractor/ Supplier of nucleonic device/gauge should facilitate all support required by Employer for timely acquiring required valid license from the regulatory authority AERB. Contractor/ Supplier of nucleonic device/gauge should provide documents which are required by Employer in the AERB NOC process of nucleonic source.

(iii) The complete procedure for submitting the electronic application on eLORA portal of AERB should be provided by the Contractor/ Supplier of nucleonic device/gauge.

(iv) Contractor/ Supplier of nucleonic device/gauge should provide the required source disposal undertaking letter/ agreements as per requirement of AERB.

(v) Contractor shall furnish agreement from OEM & their Indian counterpart to take back the disused nucleonic source/gauge after the useful life of nucleonic source/ gauge is served.

(vi) Letter for acceptance of disused Nucleonic source/gauge after useful life of source shall be furnished by the Contractor/supplier/OEM from Atomic Energy Regulatory Agency of respective country from where source is procured.

(vii) Complete procedure vetted by OEM should be submitted for taking back of the disused nucleonic source/gauge after the useful life of nucleonic source/ gauge is served.

(viii) Also, No objection certificate from the corresponding Atomic Energy Regulator Agency for export of radioactive source to India shall be obtained by Contractor, OEM/their Indian counterpart.

5. The Contractor shall supply all essential tools, suitable radiation survey meters and accessories as per regulatory guidelines of AERB.

6. The Contractor shall submit plot plan of the site clearly marking the source location on the plot plan. The Contractor shall also submit a suggested security plan.

CLAUSE NO.	TECHNICAL REQUIREMENTS
1.00.00	**MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)**
1.01.00	Measuring instruments/equipment and subsystems offered by the Bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Refer Sub-section Basic Design Criteria. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards and shall be subject to Employer's approval.
1.02.00	Every panel-mounted instrument requiring power supply shall be provided with easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.
1.03.00	All transmitters, sensors, switches and gauges for parameters like pressure, temperature, level, flow etc. as required for the safe and efficient operation and maintenance as well as for operator and management information (including all computation) of equipment in the system under the scope of specification shall be provided on as required basis with in quoted lump sum price. The Contractor shall furnish all Instrumentation / Control equipment & accessories under this specification as per technical specification, ranges, makes & model as approved by the Employer during detailed engineering.
1.04.00	The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. The contacts of equipment mounted instruments, sensors, switches etc. for external connection including spare contacts shall be wired out in flexible/rigid conduits, independently to suitably located common junction boxes. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg./sq.cm.
1.05.00	All instruments envisaged for sea water applications, shall be provided with wetted parts made of Monel/ Hastelloy C or any other material (if provenness experience of the proposed material for such applications is established by contractor). For Chlorine application: Instruments shall be provided with wetted parts (e.g. diaphragm seal, etc.) made of Hastelloy C. Also, filled liquid shall be Fluorolube oil/ Inert Hydrocarbon / CTFE etc., for these applications. For applications of FECL3 solution: Instruments shall be provided with wetted parts (e.g. diaphragm seal, etc.) made of Tantalum. For limestone and gypsum slurry application instruments shall be provided with wetted parts MOC of Hastelloy or better.
1.06.00	For coastal areas, all instruments shall be provided with durable epoxy/ polyurethane coating for housings and all exposed surfaces of the instruments.
1.07.00	The instruments which are proposed to be used for PG test as indicated in the tender P&IDs shall meet the minimum requirements specified in ASME PTC or subsequent clauses in this chapter whichever is better.

2.00.00 **SPECIFICATION FOR ELECTRONIC TRANSMITTERS**

2.01.00 **SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF PRESS AND DP BASED FLOW / LEVEL MEASUREMENTS**

Microprocessor based 2 wire loop powered electronic transmitter with 4-20 mA DC HART output signal shall be provided.

Range	Accuracy (For calibrated Range)	Turndown (For span)	Stability (% of Calibrated range)
<=400mmwc	0.1%	20:1	+/-0.2% for 1 year
>400mmwc	0.060%	50:1	+/-0.25 % for 10 year
>250 kg/cm2	0.065%	10:1	+/- 0.15 % for 5 years
static pressure >420 kg/cm2	0.1%	10:1	+/- 0.2 % for 5 years

Above parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only.

Transmitter shall have weatherproof IP-67 metallic housing with durable corrosion resistant coating, integral digital display with self-indicating diagnostics, Plug and socket type electrical connection for HART, calibration using HART, 2/3/5 Valve non integral manifold and rack with canopy. For HART transmitter SIL 2 certification is required. Overpressure shall be 150% of max. operating pressure.
For primary air and flue gas applications, DPT shall be provided for pressure measurement below range of 2000 mmWC.
For corrosive, viscous, solid bearing, slurry type process fluids, suitable diaphragm seal shall be provided. Parts below seal shall be removable for cleaning. Entire volume shall be completely filled with inert liquid suitable for instruments. LVDT type transmitter is not acceptable.

2.02.00 **GUIDED WAVE RADAR TYPE LEVEL TRANSMITTER**

Type	Microprocessor based 2 wire type (loop powered), HART protocol compatible Guided wave radar transmitter.
Principle	TDR (Time domain reflectometry)
Probe Type & Material	(i) Coaxial probe of SS316/316L. If required, probe shall be suitable for overfill prevention. (ii) Rod probe, cable probe of SS316/SS316L can be used for applications wherever coaxial probe is not suitable.
Output signal	4-20 mA DC along with superimposed digital signal (based on HART protocol), suitable for over fill prevention.
Accuracy	+/- 0.5% of calibrated span or minimum 5mm.
Power supply	24 VDC +/- 10%.
Housing	Weatherproof as per IP-65, metallic housing with durable corrosion resistance coating.

Adjustment/ calibration	Using handheld HART calibrator/ centralized PC based system (as applicable).
Zero & span adjustment	Continuous, temper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument without any level in the tank/sump etc.
Display	Integral digital display.
Load Impedance	500 ohms (minimum).
Electromagnetic compatibility	Shall meet EN 61326-1 (2021) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2
Mounting	(i) External cage shall be provided wherever side mounting is required. External cage and other mounting accessories to be provided by the contractor. (ii) Wherever top mounting is required, all mounting accessories, stilling well (as required) etc., shall be provided by the contractor. (iii) All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations.

Note: Four wire type transmitters can also be provided for applications where 2- wire transmitter has some technical limitations, subject to employer's approval during detailed engineering stage. However, in such cases isolated 4-20 mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 240V AC / 24V DC.

2.03.00 Ultrasonic Type level Transmitter

S.No.	Features	Essential/Minimum requirement
1.	Type of Transmitter	Non-contact Microprocessor based 2 wire type (loop powered), HART protocol compatible Ultrasonic transmitter.
2.	Output signal	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol).
3.	Accuracy	+/- 0.5% of calibrated span or minimum 5mm.
4.	Power supply	24 V DC +/- 10%.
5.	Temperature compensation	To be provided within transducer.
6.	Housing	Weatherproof as per IP-65, metallic housing with durable corrosion resistance coating.
7.	Adjustment/calibration/ maintenance	Using handheld HART calibrator/ centralized PC based system (as applicable).
8.	Zero and Span adjustment	Continuous, tamper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument without any level in the tank/sump etc.
9.	Sensor Material	Corrosion resistant material to suit individual application requirement.

10.	False signal tolerance	Transmitter shall be capable of ignoring false echoes from internal tank/sumps obstructions such as pipes, heating coils or agitator blades. Also, transmitter shall have adjustable damping circuitry.
11.	Range	Range of transmitter shall be capable of covering the complete level span of tank taking care of blocking distance, frequency attenuation due to surface, obstructions, vapors etc.
12.	Display	Integral digital display
13.	Diagnostics	Loss of echo alarm etc.
14.	Load Impedance	500 ohms (minimum).
15.	Electrical Connection	Plug and socket
16.	Accessories	• All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations. • All mounting accessories required for erection and commissioning shall be provided. • For hazardous area, explosion proof enclosure as described in NEC article 500

Note:

1) Contractor can also provide Radar type transmitter as per above specification in place of ultrasonic transmitter subject to approval by Employer during detailed Engineering. Sonic frequency-based transmitters can also be provided under "ultrasonic transmitters" category for fly ash silo level.

2) Four wire type transmitters can also be provided for applications where 2- wire transmitter has some technical limitations, subject to employer's approval during detailed engineering stage. However, in such cases isolated 4-20 mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 240V AC / 24V DC.

3) For applications where transmitter location is not accessible, the transmitter shall have separate sensor unit and electronic unit for such applications. It shall be possible to mount the electronic unit at accessible location.

2.04.00

3.02.00 **Resistance Temperature Detector (RTD)**

Sr. No.	Features		Essential/Minimum Requirements
1	Type of RTD.	:	Four wire, Pt-100 (100 Ohms resistance at zero degree Centigrade).
2	No. of element	:	Duplex
3	Housing/Head	:	IP-65/Diecast Aluminum. Head of TE to be

			provided with sufficient space and arrangement to mount head mounted temperature transmitter (as applicable). Plug in connectors are to be provided for external signal cable connection. TE terminal head shall be spring loaded for positive contacts with the thermo well
4	Insulation and sheathing of RTD	:	Mineral (magnesium oxide) insulation and SS316 sheath,
5	Calibration and accuracy	:	As per As per IEC-751/ DIN-43760 Class-A for RTD
6	Accessories	:	Thermo well and associated fittings
7	Standard	:	IEC-751/ DIN-43760 for RTD and ASME PTC-19.3-2016 for Thermo-well.

NOTES :

1) The specifications for RTDs of winding/ bearings of motor/pump, can be as per their manufacturer standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice. However, the type of RTD shall be Pt100.

2) The specifications of temp elements for air conditioning & ventilation system / process can be as per system manufacturer's standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice.

3.03.00

3.04.00 **Thermo well** (for all process temp. elements)

(a) Shall be one-piece solid bored type of 316 SS of step-less tapered design. (As per ASME PTC 19.3, 2016)

(b) For Mill classifier outlet long life solid sintered tungsten carbide material of high abrasion resistance shall be provided.

(c) For Air & Flue gas 316 SS protecting tube with welded cap. (However, contractor shall provide better material for Flue gas service if required based on the specified boiler design parameters).

(d) For furnace zone, impervious ceramic protecting tube of suitable material along with Incoloy supporting tubes and adjustable flanges.

3.05.00 **Not Used**

3.06.00 **TEMPERATURE TRANSMITTER**

Minimum technical requirements shall be as follows:

Single input/Dual input temperature transmitter shall be 2-wire loop powered directly from 4-20mA input cards of DDCMIS. Transmitter shall be fully compatible with thermocouples and RTDs being provided. It shall be capable to handle Pt-100 RTD, Thermocouple –K, R & S types (selectable through HARTcalibrator). Temperature compensation for T/C shall be performed in the transmitter itself.

In case of failure (open or burn-out) of RTD/thermocouple, transmitter shall provide low temperature output. Transmitter shall be HART compatible, have EMC compatibility as per EN 61326, weather proof IP-67 metallic housing with durable corrosion resistant coating,

plug and socket type electrical connection for HART and 1/2" NPT(F) connection for , integral digital display with self-indicating diagnostics, operating ambient temperature of 85 deg C without display & 70 deg C with display, suitable for 2 inch pipe mounting in enclosure/rack . Composite Accuracy shall be as follows:. RTD =<0.25% of 0-250 deg C span, T/C -K type =<0.2 % of 0-600 deg C span, CJC accuracy (for T/C) shall be < 1 deg C.

Notes :

1. Dual input temperature transmitter shall have bump less changeover facility to second sensor in case first sensor fails. This changeover is to be alarmed in control system.
2. Composite accuracy is to be calculated as summation of all applicable accuracies of temperature transmitter for converting sensor input to output (e.g., A/D accuracy, basic accuracy, digital accuracy, etc.) and temperature effect on these accuracies at ambient temperature of 50 deg C, based on the figure/ formula given in the standard product catalogue for span as specified above for various types of temperature elements specified.

rd product catalogue for span as specified above for various types of temperature elements specified.

3. Above mentioned parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only.
4. Dual input temperature transmitters can also be accepted in place of single input TT.

3.07.00 **Din rail temperature transmitter** 4-20mA HART based suitable for mounting on DIN-rails in JBs. The specifications of the JBs shall be same as indicated in Subsection INST CABLE with additional DIN-rails and IP 65 Protection class. This temperature transmitter shall be the ones which are especially designed for DIN-rail mounting with IP 20 protection class. These shall have terminals for input/output provided on front side when mounted on DIN-rail. Head mounted temperature transmitter with clamps to make it suitable for DIN-rail mounting shall not be acceptable under this category. Accuracy of Din rail should be:. RTD =<0.4% of 0-250 deg C span, T/C -K type =<0.4 % of 0-600 deg C span, CJC accuracy (for T/C) shall be < 1 deg C. Oher specifications shall be as mentioned in clause 3.06.00. Exact applications shall be as defined in PART-A of specifications.

3.08.00 **Multi Input Temperature transmitter (Temperature Multiplexer)**

For only information related temperature inputs fieldbus based Multi input temperature transmitters can be provided. Transmitters shall be capable of withstanding ambient temperature up to 85 deg C. Maximum number of inputs per such temperature transmitter shall be eight. One (1) no. input shall be kept as spare wired up to TBs of field mounted panel in each multi-input TT. These shall be installed in field mounted panels with minimum IP 55 protection class. Exact applications shall be as defined in PART-A of specifications.

7.00.00 **SPECIFICATIONS FOR PR. GAUGE, D.P. GAUGE, TEMP. GAUGE AND LEVEL GAUGE.**

Sl. No	FEATURES	ESSENTIAL/MINIMUM REQUIREMENTS		
		Pr. Gauge/ DP Gauge/ Draught gauges	Temperature Gauge	Level Gauge
1	Sensing Element and material	Bourdon for high pressure, Diaphragm/Bellow for low pr. Of 316 SS	Mercury in steel for below 450°C and inert gas actuated for above 450°C of SS bulb and capillary.	Tempered * toughened Borosilicate gauge glass steel armoured reflex or transparent type.
2	Body material	Die-cast aluminium	Die-cast aluminium	Forged carbon steel/304 SS
3	Dial size	150mm	150 mm	Tubular covering entire range
4	End connection	1/2 inch NPT (M)	3/4" NPT (M)	Process connection as per ASME PTC and drain/vent 15 NB
5	Accuracy	±1% of span	± 1% of span	± 2%
6	Scale	Linear, 270° arc graduated in metric units	Linear, 270° arc graduated in °C	Linear vertical
7	Range selection	Cover 125% of max. of scale	Cover 125% of max. of scale	Cover 125% of max. of scale
8	Over range test	Test pr. for the assembly shall be1.5 to the max. Design pr. at 38°C.		
9	Housing	Weather and dust proof as per IP-55	Weather and dust proof as per IP-55	CS/304 SS leak proof
10	Zero/span adjustment	Provided	Provided	--
11	Identification	Engraved with service legend or laminated phenolic name plate		

12	Accessories	Blow out disc, siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	SS Thermowell	Gasket for all KEL-F shield for transparent type vent and drain valves of Steel/SS as per CS/Alloy process Requirement.
13	Material of Bourdon/ movement	316 SS / 304 SS	316 SS / 304 SS	

Notes:-

*Bicolour type level gauges will be provided for applications involving steam and water except for condensate and feed water services.

Length of gauge glass shall not be more than 1400 mm. If the vessel is higher, multiple gauge glasses with 50 mm overlapping shall be provided.

Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.

8.00.00 ROTAMETERS

SR. NO.	FEATURES	ESSENTIAL / MINIMUM REQUIREMENTS
1.	TYPE	VARIABLE AREA METAL TUBE
2.	FLUID MEDIA	WATER/OIL
3.	TUBE BODY	SS316
4.	MATERIAL OF FLOAT	316 SS
5.	INDICATOR	LINEAR SCALE
6.	ACCESSORIES	FLANGE, ORIFICE IN CASE OF BYPASS ROTA METER (FOR LINE SIZE ABOVE 100 MM)
7.	HOUSING PROTECTION CLASS	IP-55
8.	ACCURACY	± 2% OF MEASURED VALUE.

13.00.00 SPECIFICATION FOR FLOW ELEMENTS

13.01.00 Orifice Plate

Features	Essential/Minimum Requirements
Type	Concentric as per ASME PTC-19.5 (Part-II), ISA RP-3.2, 1960 or BS-1042, ISO 5167
Material	316 SS
Thickness	3 mm for main pipe diameter up to 300 mm and 6 mm for main pipe dia. above300 mm.
Tappings	Flanged weld neck or D & D/2 with 3 pairs of tapping (as applicable). Root valves to be provided in all the tappings. However, for flow elements in CPU, DM & PT plant- 2 Pairs of Tappings shall be provided as minimum.
Beta Ratio	0.34 to 0.7

13.02.00 Flow Nozzle

Features	Essential/Minimum Requirements
Type	Long radius, welded type as per ASME PTC-19.5 (Part-III) or BS-1042, ISO 5167
Material	ASME SA182-GRADE 316L. The material of Flow nozzle shall be A182F91/F92, where pipe material is A335P91/P92.
Tapping	Flanged weld neck or D & D/2 with 3 pairs of tapping (as applicable). Root valves to be provided in all the tappings. However, for flow elements in CPU, DM & PT plant- 2 Pairs of Tappings shall be provided as minimum.

Beta Ratio	Around 0.7

13.04.00 **NOT USED**

14.00.00 NOT USED

15.00.00 PROCESS ACTUATED SWITCHES

FEATURES	ESSENTIAL / MINIMUM REQUIREMENTS		
	Pressure/ Draft Switches/ DP Switches	Temperature switches	Level switches
Sensing Element	Piston actuated for high pressure and diaphragm or bellows for low pr./ vacuum	Vapor pressure sensing, liquid filled bellow type with SS bulb and capillary (5 m minimum, to suit application)	Capacitance types, float type, conductivity type, RF type, Ultrasonic type as per suitability to the application. .
Material	316 SS	Bulb 316 SS/ capillary 304 SS	316 SS
End connection	½ inch NPT (F)	½ inch NPT (F)	Manufacturer standard
Over range/ proof pressure	150% of maximum operating pr.	-	150% of maximum operating pr.
Repeatability	+/- 0.5% of full range		
No. of contacts	2 No.+2NC. SPDT snap action dry contact		
Rating of contacts	60 V DC, 6 VA (or more if required by DDCMIS)		
Elect. Connection	Plug in socket.		

Set point adjustment	Provided over full range.		
Dead band adjustment	Adjustable/ fixed as per requirement of application.		
Enclosure	Weather and dust proof as per IP-65, metallic housing.		
Accessories	Siphon, snubber, chemical seal, pulsation dampeners as required by process	Thermo well of 316 SS and packing glands	All mounting accessories
Mounting	Suitable for enclosure/ rack mounting or direct mounting	Suitable for rack mounting or direct mounting	-
Power Supply (wherever required)	As per Contractor's Standard practice.		

Notes :-

1) Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.

2) Pressure/ Diff pressure switches for very low press/ DP measurements can have sensor material other than SS316 in case of any technical limitation and the offered product is standard product of the manufacture for very low-pressure applications.

3) Repeatability can be upto +/-1% of full range in case of switches with diaphragm seals or very low pressure/DP range.

4) The specifications of switches for air conditioning & ventilation system / process can be as per system manufacturer's standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice.

5) For ESP Level Switches following requirements are to be met:
   i) ESP Level Switches calibration shall not be affected by changes in ambient temperature.
   ii) Active build up compensation to be provided to sense and auto correct the effect of ash deposition on level probe.
   iii) Self- -diagnostic features like health status, maintenance requirement, instrument failure, false alarm etc. to be provided.

   The manufacturer shall submit adequate supporting documents, catalogues for establishing the above features.

17.00.00 **SOLENOID VALVES**

Solenoid valves shall fulfil the following requirements:

a. Type 2/3/4-way SS 316/Forged Brass (depending on the application subject to Employer's approval during detailed Engg.)

b. Power supply: 24 V DC ± 10%.

c. Plug and socket electrical connection.

d. Insulation: Class 'H'

e. IP Class: IP65

18.00.00

19.00.00

19.01.00

19.03.00 All the outdoor field instruments such as analyzers/transmitters/meters etc. shall be provided with suitable Free-standing cabinet(s)/panel/rack so that the equipments are protected against rain/ sunlight etc.

19.05.00 **Electronic Flowmeter**

The electronic flow meter shall include flow sensor and flow indicator cum integrator / totaliser and shall include all required accessories for satisfactory operation. The flow meter shall be based on full bore electromagnetic principle and shall be electronic type of proven design, make and model acceptable to the owner.

The Bidder shall submit all necessary technical literature and details of selection criteria of the instrument offered to substantiate the model selected. The Bidder shall also furnish list of similar installation along with feedback on satisfactory performance of the instruments.

The flow meter shall meet or exceed the following requirement:

(a)	Output	:	4-20 mA DC Isolated output
(b)	Accuracy	:	± 0.5% of calibrated span or better *
(c)	Repeatability	:	± 0.2% of calibrated span or better
(d)	Power Supply	:	240V AC ± 10%, 50 HZ ± 5%/ 24 V DC, to be arranged by the contractor.
(f)	Protection class	:	IP-65
(e)	Flow tube		SS304
(f)	liner		Hard Rubber

The flow meter shall provide local indication for instantaneous flow. It should also be possible to get local display for daily and monthly discharge. The flow meter shall indicate totalizer/ integrator to get the daily and monthly discharge as stated above.

Limit Switch

For offsite plant (except PT, DM, Chlorination, chemical treatment, Liquid effluent treatment) application Limit switches shall be silver plated with high conductivity and non-corrosive type. Contact rating shall be sufficient to meet the requirement of DDCMIS subject to a minimum of 60 V, 6 VA rating. Protection class shall be IP 55.

For main plant application limit switches are to be provided as per contractor standard and proven practice.

For PT, DM, Chlorination system, chemical treatment, Liquid effluent treatment plant , limit switches of manual valves and solenoid operated on-off valves shall be of inductive proximity type and shall be mounted inside the enclosure: pl. refer the minimum specification requirement below .

Operating voltage Range	10-40 V DC
Sensing system	Inductive Proximity type, 2 Wire
Sensor Contact Type	NO
Reverse polarity and short circuit protection	Yes
IP Class-Sensor	IP67
IP Class-Enclosure(Switch box)	IP67
Cable entry-Enclosure(Switch box)	2no-1/2" NPT
Casing material-Sensor	Brass /SS
Enclosure(Switch box) Housing material	FRP or SS
Operating Ambient temp(sensors)	-5 to 70 deg C
Max allowed Voltage Drop across sensor	5 V
Standard applicable	EN 60947-5-2 or equivalent.

22.01.00 COMMON REQUIREMENTS FOR ALL ANALYSERS

Sno	Features	Minimum Requirement
1.	Output signals	Analog 4-20 mA DC galvanically isolated.
2.	Zero & span Adjustment	To be provided with range selection facility
3.	Ambient temp	50 degC
4.	Sample Temperature	40 degC
5.	Indication	Digital Alphanumeric Display of reading in engineering units shall be provided.
6.	Type of Electronics	Microprocessor based with self-diagnostic
7.	Others	All interconnection tubing and cabling between sensor and analyzer / analyzer panel etc to be provided. All chemical reagents required for EQMS analyzers for entire AMS period is to be supplied in phased manner depending on shelf life.
8.	Location of the Temp & flow measurement	Effluent Treatment plant outlet (Exact location to be decided by contractor in consultation with site)
9.	Location of the Analyzer cabinet/enclosure	
10.	Accessories	All the accessories required for mounting the

		sensor/analyzer are to be provided
11.	Digital Signal Transmission	Each analyzer shall have a provision for bidirectional soft connectivity over Modbus/RS232/RS485 with employer's central cloud server in addition to 4-20 ma connectivity to DDCMIS.
12.	Compliance to standards	Latest regulatory requirements of CPCB/SPCB/other regulatory/statutory body prevailing at the time of award of the contract.

22.02.00 CONDUCTIVITY ANALYSER

Type	Continuous flow through type
Measuring Range	0 – 60000 µS/cm for sea water application 0-5000 µS/cm for other application
Response Time	<= 5 sec (90% of full scale)
Temperature Compensation	Automatic
Power	To be arranged by the contractor
Accuracy	<= +/- 1 %

22.03.00 pH ANALYSER

Type	Cell flow through sample
Measuring Range	0-14 units of pH
Temperature Compensation	Automatic
Power	To be arranged by the contractor.
Accuracy	<= +/- 1 %

22.04.00

22.05.00

22.06.00

22.07.00 **ENCLOSURE/CABINETS / PANELS FOR EQMS AND ANALYSERS OF CPU PLANT**

The enclosure shall accommodate all Analyzers. The enclosure of all analyzers shall provide protection from dust, humidity, precipitations, sunlight and environmental pollution. The material for the enclosure shall be of steel plate (SS304) with minimum 2 mm thick frame and minimum 2 mm thick steel (SS-304) sheet of protection IP 65 or better with safety lock of good quality. The lighting provision in the cabinet is to be provided. The cabinets shall be designed such that the wet section and dry section are separate, the exact details shall be finalized during detailed engineering. The panel shall be free standing type constructed of suitable 3 mm thick channel frame of SS and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel and extended beyond the ends of the rack.

In order to ensure the healthy operation of the installed electronic modules, cards, analyzers, etc. inside the enclosure during continuous operation, the EQMS enclosure shall be provided with Air conditioner unit.

27.00.00 **ONLINE ORP MONITOR / ANALYSER**

ORP Sensor

S.no .	Feature	Details
a)	Type	: Cell - flow through
b)	Accuracy	: < ± 1mv
c)	Range	: -1400mv to +1400mv
d)	Electrode	: Platinum

Monitor / Analyzer Specification: -

S.no.	Feature	Details
1.	Type of electronics	Microprocessor based
2.	Zero & span Adjustment	To be provided
3.	Ambient temp.	50°C
4.	Display	LCD
5.	Enclosure Type / Material	Weather and Dust proof (IP 65.
6.	Output signals Analog	4-20 mA DC
7.	Error / fault Diagnostic	To be provided.
8.	Power supply	For power supply and distribution, refer scope / and terminal point part of the specification. Conversion / distribution from the terminal point shall be done by contractor.
9.	Load	500 Ohms minimum
10.	Mounting	All weather Local Panel fitted with integral Air Conditioner are to be provided by the Contractor.

28.00.00 **ORP/PH PORTABLE METER**

Sensor Probe Specification Requirement

S.no .	Feature	pH	ORP
b)	Electrode	: Glass	: Platinum
c)	Accuracy	:< ± 1% of reading	: < ± 1mv
d)	Range	: 0-14 pH	: -1400mv to +1400mv
e)	Temperature Compensation	Automatic	

Portable meter

S.no.	Feature	Details
1.	Type of electronics	Microprocessor based
2.	Measurement	Ph & ORP
3.	Ambient temp.	50°C
4.	Display	LCD
5.	Enclosure Type / Material	IP 67
6.	Power source	Batteries
7.	Battery life	>=200 hrs

6.00.00 **FIELD MOUNTED LOCAL JUNCTION BOXES (AS PER STANDARD AND PROVEN**

Practice of vendor

(i)	No. of ways	12/24/36/48/64/72/96/128 with 20% spares terminals.
(ii)	Material and Thickness	4mm thick Fiberglass Reinforced Polyester (FRP).
(iii)	Type of terminal blocks	Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm^2. A M6 earthing stud shall be provided.
(iv)	Protection Class	IP: 55 min. for indoor & IP-65 min for outdoor applications.
(v)	Grounding	To be provided.
(vi)	Color	RAL 7035

DATA SHEET FOR CONTROL VALVE

(COMMON FOR TG & SG)

CONTROL VALVES, ACTUATORS & ACCESSORIES

1.00.00	**CONTROL VALVES, ACTUATORS & ACCESSORIES**
1.01.00	**General Requirements**
1.01.01	The control valves and accessories equipment furnished by the Bidder shall be designed, constructed and tested in accordance with the latest applicable requirements of code for pressure piping ANSI B 31.1, the ASME Boiler & pressure vessel code, Indian Boiler Regulation (IBR), ISA, and other standards specified elsewhere as well as in accordance with all applicable requirements of the "Federal Occupational Safety and Health Standards, USA" or acceptable equal standards. All the Control Valves, their actuators and accessories to be furnished under this Sub-section will be fully suitable and compatible with the modulating loops covered under the Specification.
1.01.02	All the control valves and accessories offered by the Bidder shall be from reputed, experienced manufacturers of specified type and range of valves. Ceramic lined control valves shall be provided as per standard and proven practice of QFGDM.
1.01.03	For special type of control valves such as combined pressure and temperature control valves for Aux PRDS application, separator drain control valves, HPBP system refer to the corresponding mechanical sections.
1.01.04	Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.
1.02.00	**CONTROL VALVE SIZING & CONSTRUCTION**
1.02.01	The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.
1.02.02	The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall ensure that valves outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec. for steam services and 50% of sonic velocity for flashing services. Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which will be subject to Employer's approval during detailed engineering.
1.02.03	Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and down stream piping. Thus for cavitation service, only valve with anti cavitation trim shall be provided. Detailed calculations to establish whether cavitation will occur or not for any given application shall be furnished. For flashing services, valve with hardened trim shall be provided.
1.02.04	Control valves for application such as SH Spray Control, RH spray Control, Heavy Oil Heating, pressurizing and Control system, HP/LP heater Emergency level control, Emergency Make-up to condenser hotwell, GSC minimum flow, Deaerator Drain to Condenser Hotwell, Condensate spill to condensate reserve tank, condenser normal make-up and valve gland sealing supplying pressure control, CEPS minimum flow control, BFP circulation control valve shall have permissible leakage rate as per leakage Class V. All other

	control valves shall have leakage rate as per leakage Class-IV as per ANSI / FCI /70.2,2006 or equivalent.
1.02.05	The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers except for few cases as per contractor's standard and proven practice subject to employer's approval.
1.02.06	Control valves for steam and water application shall be provided with rangability of 30:1 for all services except for applications wherein control valves are envisaged to be operated in lower range like Reheater spray and superheater spray system wherein control valve with rangability of 50:1 shall be provided
2.00.00	**VALVE CONSTRUCTION**
2.01.00	All valves shall be of globe body design & straightaway pattern with single or double port, unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure and pressure drops permit.
2.02.00	Valves with high lift cage guided plugs & quick-change trims shall be supplied.
2.03.00	Cast Iron valves are not acceptable.
2.04.00	Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Employer. Bonnet joints of the internal threaded or union type will not be acceptable.
2.05.00	Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.
2.06.00	All valves connected to vacuum on down stream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing or with extra deep gland packing, which shall be equipped with lantern rings to admit pressurized water for gland sealing.)
2.07.00	Valve characteristic shall match with the process characteristics.
2.08.00	Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.
2.09.00	Flanged valves shall be in accordance to ANSI B 16.5.
3.00.00	**VALVE MATERIALS**

Sr. No.	Service	Body material	Trim Material
1	Non-corrosive, non-flashing and non-	Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C	316SS stellited with stellited faced guide posts and bushings.

		cavitation service except DM water	Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C
	2.	Severe flashing/cavitation services	Alloy steel ASTM-A217 Gr. WC9 — 440 C
	3.	Low flashing/cavitation service	Alloy steel ASTM-A217 Gr. WC6 — 17-4 PH SS
	4.	DM water service	316 SS — 316 SS

NOTE: (a) Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34.

(b) Severe flashing / cavitation services includes as a minimum all control valves whose downstream piping is connected to condenser or flash tank.

However, Bidder may offer valves with body and trim materials better than specified materials and in such cases Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified material for Employer's consideration and approval.

4.00.00 END PREPARATION

Valve body ends shall be either butt welded/socket welded, flanged (Rubber lined for condensate service) or screwed as finalized during detailed engineering and as per Employer's approval. The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per ANSI B 16.11. Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of the control valve body.

5.00.00 VALVE ACTUATORS

All control valves shall be furnished with pneumatic actuators except for pressure and temperature control valve for auxiliary PRDS application (electro-hydraulic / pneumatically operated) and separator drain control valve (electro-hydraulic type).The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg.C continuously.

Valve actuators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An

adequate allowance for stem force, at least 0.15 Kg/sq.cm. per linear millimeter of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified.

The travel time of the pneumatic actuators shall not exceed 10 seconds.

6.00.00 CONTROL VALVE ACCESSORY DEVICES

6.01.00 All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements.

7.00.00 SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER

1	Environment	a) Protection class.	IP-65 Minimum
2	EMC & CE Compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN50082 or equivalent.
3	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).

8.00.00	**TEST AND EXAMINATION**
	All valves shall be tested in accordance with the quality assurance programme agreed between the Employer and Contractor, which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following:
8.01.00	Non Destructive Test as per ANSI B-16.34.
8.02.00	Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test.
8.03.00	Valve closure test and seat leakage test in accordance with ANSI-B 16.34/ FCI 70.2 standard and as per the leakage class indicated above
8.04.00	Functional Test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position.
8.05.00	CV Test: Please refer Cl No. 1.00.00 & 3.00.00 OF Sub-section- IIIC-10 (Type test requirements), Control Valves.
	Bidder shall furnish all the control valves under this main plant package as finalized during detailed engineering stage without any price repercussions whatsoever depending on the process requirements. All the control valves provided by the Bidder for this project shall meet the specifications requirements specified herein. Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.

DATA SHEET FOR ELECTRICAL ACTUATOR

(COMMON FOR TG & SG)

ELECTRICAL ACTUATORS

1.00.00	**General Requirements**	Actuators shall be designed for valve operation to ensure proper function in accordance with specifications given below and complying to EN15714-2 or equivalent. All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions.
2.00.00	**Modulating duty electric actuators**	These shall be provided as per standard practice of OEM of equipment, meeting other requirements of specifications. The examples of such applications are Blade pitch actuators of ID/FD/PA Fans, Scoop tube actuator of BFPs etc. **For specific applications, refer Part A of technical specifications for which clause 5.00.00 of this section will apply.**
3.00.00	**Electrical actuators for valves / dampers / gates (other than covered in 2.00.00)**	These actuators shall be Non-Intrusive type electric actuators
4.00.00	**Common Requirements for Non-Intrusive Electric Actuators**	
4.01.00	**Type**	1. The actuators shall have integral starters with built in SPP (Single Phasing Preventer). 415 V, 3 phase 3 wire power supply shall be given to the actuator from switch board as applicable through a switch fuse unit. Control voltage of the motor starter shall be 110 V AC / 24 V DC, derived suitably from 415V power supply. 2. The actuators shall be Non- Intrusive electric actuator. All actuator settings including torque, limit shall be possible without opening the actuator cover and LCD indication shall be available integral to actuator body
4.02.00	**Rating**	1. Supply Voltage & frequency: 415V +/- 10%, 3 Phase, 3 Wire & 50HZ +/- 5%. 2. Sizing: Open/Close at rated speed against designed differential pressure at 90% of rated voltage. For ON/OFF type: Three successive open-close operations or 15 minutes, whichever is higher. For inching type: 150 starts per hour or required cycles, whichever is higher
4.03.00	**Construction**	1. Enclosure: Totally enclosed weatherproof, minimum IP-68 degree of protection. 2. Manual Wheel: Shall disengage automatically during motor operation.
4.04.00	**Motor**	Type: Squirrel cage induction motor suitable for Direct On-Line (DOL) starting Enclosure: Totally enclosed, self-ventilated Insulation: Class F. Temperature rise 70 Deg C. over 50 Deg C ambient. Bearings: Double shielded, grease lubricated antifriction Earth Terminals: Two Protection: Single Phasing Protection, Over-heating protection through Thermostat (as applicable) and wrong phase sequence protection shall be

		provided over and above other protection features standard to bidder's design. Suitable means shall be provided to diagnose the type of fault locally.
4.05.00	**Position / Torque Transmitter**	The Position/ Limit measurement shall be done using absolute encoders which will give information of position/ limit in both the directions. Electronic measurement of torque shall be provided.
4.06.00	**Local Operation**	It shall be possible to operate the actuator locally also. Lockable local/remote selection shall be provided on the actuator.
4.07.00	**LCD Display**	A local LCD display shall be provided to give information regarding actuator alarms, status and valve position indications as a minimum in local.
4.08.00	**Wiring**	Suitable voltage grade copper wire.
4.09.00	**Terminal Block**	For power cables, the grade of TBs shall be minimum 650V.
4.10.00	**Accessories**	All required accessories (if applicable) for calibration / settings/ configuration of various parameters of actuator shall be provided. For quantities, please refer Part A of technical specifications.
4.11.00	**SIL Certification**	
5.00.00	**Specific Requirements for Non- Intrusive Hardwired Actuators**	
5.01.00	**Interfaces**	For ON-OFF and INCHING type actuators interface with the control system shall be through hardwired signal only. • Open/Close command, open/ close status and disturbance monitoring signal (common contact for Overload, Thermostat, control supply failure, L/R selector switch at local & other protections operated) shall be provided hardwired. • The actuator shall be able to accept open/close command at 24V DC with max. 2.5VA load from control system. Accordingly, suitable isolated interface in the actuator shall be provided. • Open/close command termination logic shall be suitably built inside actuator. • For typical wiring diagram Refer Tender Drawing No. 0000-999-POI-A-063 (Except plug & socket connector, if not applicable) • For INCHING type actuators, hardwired analog position signal (4-20mA) derived from absolute encoder to be provided for actuator position.
5.02.00	**Terminal Box**	Suitable terminals/ connectors, integral to actuator, for terminating instrumentation & power cables shall be provided. Necessary glands for power cables and instrumentation cables shall be provided.
5.03.00	**Training**	Contractor shall provide training on Non-Intrusive hardwired Electric Actuator for Employer's personnel. The duration of the training shall be as elaborated in Part-C, Section-VI of technical specifications.
6.00.00	**Not used**	

7.00.00 **Specific Requirements for Modulating duty Electric Actuators**

Sl No.	Description	Requirement
1.	Duty	Continuous duty / Modulation,
2.	Operating Ambient Temperature	-20 to +60 Deg C or better
3.	Enclosure Protection	IP 68
4.	Resolution/ Precision	0.1%- 0.2% or better of total travel
5.	Supply Voltage & frequency	415V +/- 10%, 3 Phase, 50HZ +/- 5% or 230V +/- 10%, Single Phase, 50Hz +/- 5%
6.	Motor Suitable for	Continuous Duty
7.	Motor insulation Class	F
8.	Analog Control	4-20mA, (24VDC)
9.	Position Transmitter	4-20mA (24VDC)
10.	Integral Starter	Yes
11.	Terminal Block	For power cables, the grade of TBs shall be minimum 600V
12.	Accessories (if applicable)	for calibration / settings/ configuration of various parameters of actuator shall be provided
13.	Hand wheel	Yes
14.	Standard Compliance	EN 15714-2 Class D or equivalent

DATA SHEET FOR LOCAL CONTROL PANEL (LCP)

(COMMON FOR TG & SG)

1.0 SCOPE

This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site, supervision, erection, and commissioning at site of Local Panels required for control and monitoring of the Auxiliary Plant & Equipment.

2.0 CODES AND STANDARDS

2.1 All the equipments specified herein shall comply with the requirements of the latest issue of the relevant International standards as mentioned in codes and standard section of this specification.

3.0 TECHNICAL REQUIREMENTS

3.1 Panel Construction

3.1.1 The local panels shall house the secondary instruments, annunciation system, Single loop controller, Control switches / push buttons, indicating lamps/LED cluster, relays, timers and other devices required for operation and monitoring of the equipment locally.

3.1.2 The panels shall be of free standing type either welded construction on angle iron (minimum section of 50 x 50 x 4 mm) structure or folded construction by sheet metal formation depending upon the equipments to be mounted on it. The panels shall be robustly built and stiffeners as necessary shall be provided.

3.1.3 The panel shall be suitably reinforced to ensure adequate support for all instruments mounted thereon. All welds on exposed panel surfaces shall be ground smooth.

3.1.4 The salient features of construction shall be:

Sheet material: Cold rolled sheet steel
Frame thickness: Not less than 3.0mm
Enclosure thickness: Not less than 2.5 mm for load bearing sections (Mounted with instruments)
1.6 mm for doors and Not less than 2.0 mm for others
Gland plate thickness: 3.0mm
Base channel: ISMC 100 with anti-vibration mounting & foundation bolts.

3.1.5 The panel shall be provided with rear doors with integral lockable handle. The door when locked shall be held at minimum three places. The door width shall not be more than 550mm.The doors shall be provided with suitable stiffeners to prevent buckling. The handle shall be on the right side of the door. The door shall be removable type with concealed hinges to facilitate maintenance work. Suitable pocket inside the door shall be provided for keeping the drawings / documents. Double door shall be provided with suitable glass windows, as per the requirement.

3.1.6 Suitable neoprene gasket shall be provided on all doors and removable covers. Suitable ventilation system along with louvers shall be provided at bottom and top of the doors covered with removable wire mesh.

3.1.7 The class of enclosure protection: shall be as below:
For panels located in

i) Air conditioned areas : IP-32
ii) Other indoor areas : IP-52
iii) Outdoor areas : IP-55
iv) Dusty areas like : IP-65

3.1.8 All steel surfaces shall be cleaned by sand / pellet blasting, treated for pickling, degreasing and phosphating etc. by seven tank method. The panel shall have a high quality finish and appearance. The panel shall be painted with two coats of primer followed by two coats of epoxy / synthetic enamel based final paint of color shade and finish as given in data sheet-A (No. PES-145A-DS1-0). Minimum thickness of the paint shall be 85 microns for external paint and 70 microns for internal paint.

3.1.9 The cable glands of the required size and type as given in data sheet-A (No. PES-145A-DS1-0) shall be supplied alongwith the Panel.

3.1.10 All operable and indicating devices shall be mounted on the front of the panel while aux. Relays / timers MCBs etc. required for realization of control logics shall be mounted on a mounting plate inside the panel. Auxiliary relays and timers etc. shall be grouped according to the control function.
No operable or indicating devices shall be mounted below 750 mm and above 1800 mm (w.r.t. finished ground level). The devices shall be located in such a way so as to ensure easy access for operation / maintenance.

3.1.11 Single / dual control power supply feeders of voltage class as specified in data sheet-A (No. PES-145A-DS1-0) shall be provided by the purchaser. In case redundant power supply feeders are provided then auto changeover unit shall be mounted on the panel are in the panel supplier's scope. Where DC control power supply is specified an additional 240V, 50 Hz AC supply feeder for powering of space heater and lighting shall be provided by the purchaser. Suitable arrangement shall be provided inside the panel to receive and terminate the power supply feeder(s). For this purpose MCBs of suitable current rating shall be provided by the vendor. A supervisory relay along with a pilot lamp to indicate control supply 'ON' shall be provided on the panel. Any other power supply required for the operation of the devices mounted in the panel shall be arranged by the vendor.

3.1.12 The internal wiring shall be carried out with 1100 volt grade PVC insulated copper multi strand wire / flexible of 1.5mm2 size. AC & DC wires shall be kept separate from each other. Separate coloured wires to be used for AC and DC circuits. All wires shall be properly numbered and identified with ferrules as per the Control scheme / wiring diagram. Wires shall be routed and run through PVC troughs.

3.1.13 Terminal blocks shall be clip on type, 1100 volts grade. Separate terminal blocks shall be used for AC & DC circuits. The terminals shall be suitable for terminating 0.5 mm2 to 2.5mm2 external cables. The TB points in terminal block shall be cage clamp type / screw type. The terminal for ammeters shall be provided with removable links for shorting CTs. Each terminal strip shall be provided with identification strip. The terminal shall not be mounted below 250 mm height from finished floor. The panel shall have ten (20) percent spare terminal.

3.1.14 The interior of each panel shall be suitably illuminated through fluorescent lamps / tube lights with shrouded cover of minimum 15W operable on 240V 50 Hz AC power supply through panel door switch. A 15 Amp. 3-pin Power receptacle shall be provided.

3.1.15 Suitable space heaters operable on 240 Volts 50 Hz AC power system shall be provided at the panel bottom. These shall be designed to maintain the panel temperature five (5) deg. C above the ambient temperature during maintenance shutdown. Suitable isolating and control devices comprising of MCB, thermostat etc. shall be provided for the space heater.

3.1.16 The panel shall be provided with a copper earth bus of 25 x 6 mm size running throughout the width of the panel. It shall be terminated internally with 10 mm bolts at extreme ends for connection to; main station earth. The panel mounted equipments / devices shall be connected to earth bus through green coloured PVC insulated stranded copper conductor of 2.5 mm2 size.

3.1.17 Local Panel shall be provided with main name plate of 150 mm x 40 mm size having inscription of 20 mm height. The individual devices on the panels shall be as provided with separate name plate with inscription of 3 mm height. The instrument / devices shall be provided with stick on label plates inside the panel. The material of the main and individual labels shall be three (3) ply 3 mm thick Traffolyte Sheet / 2 mm Anodised Aluminium Plate. The inscription shall be with white letters on black background on traffolyte sheet. The labels shall be fixed by self tapping non-rusting screws.

3.1.18 Vendor shall furnish electric load and heat load list (in case panel is to be placed in ac environment) of each panel.

3.2 Hazardous Area Panel Requirement

3.2.1 The Local Panel located in hazardous area shall be pressurized as per NFPA-496 requirements to render it non-hazardous. Alarms shall be provided for local and remote annunciation when pressurisation falls below 2.5 mm of water column. Protection shall be of type Z of NFPA-496. It shall not be possible to switch ON the power of purged section unless it is purged as per the recommendation of NFPA-496. Vendor must provide a protective device on the panel to protect the panel from over pressurisation.

3.2.2 Vendor shall supply pressurisation kit consisting of valves, restriction orifices, dual filter regulation, pressure gauges, pressure switches, rotameter etc. Pressurisation kit shall be surface mounting on a metal board and located outside the local panel. Pressurisation kit shall further consist of solenoid valve flow switch, timer blow off safety device etc., so as to make purging fully automatic. However final start shall be manual. Panel protection against over pressure to be provided as per NFPA-496.

3.2.3 Pressurised local control panel pressurization kit assembly design shall provide minimum leakage flow through the Local Control Panel. Panel venting shall be as per NFPA-496.

3.2.4 All components in the local panel like indicating instruments, push buttons switches, lamps etc., which are required to be energized without panel pressurization or before completion of purge cycle shall be explosion proof as per NEMA-7 & suitable for area classification.

3.2.5 All push buttons etc. requiring frequent operation during machine running shall have good positive sealing. Weatherproof housing or cover to be provided wherever necessary. Vendor shall provide pressurisation bypass switch outside explosion proof enclosure of pressurized panel with lamp indication. This shall be used only during maintenance. All hinges, screws, other non-painted metallic parts shall be of stainless steel material.

3.2.6 Provision to switch off manually all types of power shall be provided in the panel. In addition, it shall also be possible to switch off power circuits / components which are powered from motor control centre or control room manually in case of pressurization failure. All such cables from MCC and main control room shall be terminated in explosion proof boxes (NEMA-7).

3.3 Control & Monitoring devices

3.3.1 Instruments like Indicators, recorders, single loop controllers etc. as applicable and specified elsewhere for the plant / equipment shall be supplied and mounted on the panel.

3.3.2 Alarm Annunciator System

It shall be solid state discrete facia type having a sequence of ISA-S18.1A or as specified, opaque facia windows of 70 mm x 50 mm size, having two (2) lamps per window, and hooter of 10W, and provision for repeat group alarm at remote. The annunciator shall be provided with ten (10) percent spare windows or minimum two (2) windows along with electronics.

3.3.3 Relays

The relays shall be electromagnetic type suitable for specified control supply. Its contact configuration and rating shall be suitable for the specified control function. However minimum contact rating shall be 5 Amp AC & 2 Amp DC as applicable. There shall be ten (10) percent spare contacts.

3.3.4 Timers

The timers shall be electronic type suitable for specified control supply. Its contact configuration and rating shall be suitable for the specified control function. However, minimum contact rating shall be 5 Amp AC & 2 Amp DC as applicable.

3.3.5 Control / Selector Switches

Switches shall be Rotary Cam type with minimum of 5 Amps AC & 2 Amp DC continuous current rating. Selector switches shall be stay put type while control switches shall be spring-return-to-neutral type. Contact configuration and rating shall be as per the control function requirement. The switches shall be

lockable type wherever specified. Each switch shall be provided with engraved plates indicating the switch position / functions.

3.3.6 Push Buttons / Indicating Lights

The push buttons shall be momentary action self-resetting type, however stop P.B. for unidirectional drives shall be provided with manual reset facility. Its contact configuration & rating shall be as required for the control function but minimum 2 NO + 2 NC of 5 Amp. AC rating. It shall have round coloured projecting tab and engraved escutcheon plate / inscription plate. Colour coding of push buttons shall be as under:

RED	Motor OFF / Valve CLOSE	YELLOW	Alarm acknowledge	Left Hand Side
GREEN	Motor ON / Valve OPEN	BLACK	Lamp test	Right Hand Side

Indicating lights shall be suitable for direct connections across specified power supplies. It shall be fitted with built in resistance to prevent circuit tripping on shorting of lamp filament. It shall be fitted with LED cluster type lamp replaceable from front.

GREEN	Motor OFF / Valve CLOSED condition	AMBER Motor tripped	Left Hand Side
RED	Motor ON / Valve OPEN condition	WHITE Normal / healthy	Right Hand Side

Ammeter shall be 96 x 96 mm size, 90 deg. deflection, 1.5% accuracy, 1 Amp. CT operated or with 4-20mA input and Flush mounting type as called for in the data sheet-A (No. PES-145-54A-DS1-0). Ammeters for motors shall have six (6) times folded scale at upper end to enable motor starting current indication

3.3.8 Miniature Circuit Breaker (MCB)

These shall be instantaneous magnetic trip type for short circuit in addition to current time inverse delayed thermal trip feature for over current protection. The housing of MCB shall be made of non-ignitable, high impact material. It shall have minimum short circuit rating of 9 KA for AC Voltages and 4 KA for DC Voltages.

3.3.9 Makes of various instruments / devices shall be as given below

1.	Alarm Annunciators	:	Procon / IIC
2.	Ammeters	:	AEP / IMP
3.	Control / Selector Switches	:	Alsthom / Kaycee / Siemens / L&T
4.	Push Buttons / Indicating Lamps	:	Siemens / L&T / Teknic / Alsthom
5.	Auxiliary Relays	:	Jyoti / Siemens / L&T / OEN
6.	Timers	:	L&T / Alsthom / Bhartiya Cutler Hammer
7.	MCBs	:	S&S Power Engg. / Indo Asian / MDS
8.	Terminal Blocks	:	Jyoti / Elmex

4.0 TESTING AND INSPECTION

4.1 The bidder shall adopt suitable quality assurance program to ensure that the equipments offered will meet the specification requirements in full.

4.2 BHEL's standard Quality Plan for LCP is enclosed with the specification. The bidder shall furnish his acceptance to BHEL's QP and submit the signed and stamped copy of QP along with the offer.

4.3 The vendor shall conduct the following tests as a minimum requirement:

4.3.1 Routine Tests

1. High Voltage (H.V.)
2. Insulation Resistance (I.R.)
3. Functional

4.3.2 Type Tests

1. Enclosure Class Test

5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables

The bidder shall supply all commissioning spares and consumables 'as required' during Start-up, as part of the main equipment supply.

5.2. Mandatory Spares

The bidder shall offer alongwith main offer, the Mandatory Spares as specified elsewhere in the specification. The Mandatory Spares offered shall be of the same make and type as the main equipment.

5.3. Recommended Spares

The bidder shall furnish a list of Recommended Spares indicating the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation alongwith unit rate against each item to enable BHEL/BHEL's Customer to place a separate order later, if required.

6.0 DRAWINGS AND DOCUMENTS

6.1 The bidder shall furnish the following documents in required number of copies along with the bid :

1. Data Sheet no. PES-145A-DS1-0
2. General Arrangement Drawing.
3. Catalogue and technical information for instruments and devices.
4. Quality Plan.

6.2 The vendor shall furnish the following documents in required number as agreed after the award of contract:

1. Data Shee No. PES-145A-DS2-0
2. GA Drawing indicating layout of instruments, construction details, foundation details, cable gland plate alongwith cable glands and all details mentioned in this specification.
3. Control Schematic Diagram along with grouping of different terminals for various functions.
4. Catalogue and technical information for instruments and devices with selected options clearly marked.
5. O&M Manuals.
6. "As Built" Drawing.
7. CDs.

7.0 MARKING AND PACKING

7.1 Panel with all instruments / devices mounted on it shall be suitably packed & protected for the entire period of despatch, storage and erection against impact, abrasion, corrossion, incidental damage due to vermin, sunlight, high temperature, rain moisture, humidity, dust, sea-water spray (where applicable) as well as rough handling and delays in Transit and storage in open.

8.0 APPLICABLE DATA SHEET FORMS

This document shall be read with one or more of the following data sheet forms :

- Data sheet A&B for Local Panels : Data sheet no. PES-145A-DS1-0
- Data sheet C for Local Panels : Data sheet no. PES-145A-DS2-0

FORM NO. PEM-69666-0

	DATA SHEET FOR LOCAL PANELS	SPECIFICATION NO.: PE-SS-999-145-054A
		VOLUME
		SECTION
		REV. NO. / DATE: 20.11.2017
		SHEET 1 OF 3

TAG No. ..... Qty.....

Data Sheet No.: **PES-145A-DS2-0**

Data Sheet A & B

			DATA SHEET-A FOR LOCAL PANEL (TO BE FILLED BY PURCHASER)	DATA SHEET-B (TO BE FILLED-UP BY BIDDER)
GENERAL	MANUFACTURER			
	CONSTRUCTION		■ FOLDED ☐ WELDED (As per requirement EDN)	
	ENCLOSURE SHEET THICKNESS	FRONT	■2.0 mm	
		OTHER	■ 2.0 mm	
		DOOR	■ 1.6 mm	
		HEIGHT	■ 2365 mm for stand alone panels. ☐ Other	
		OTHER	■ Load bearing sheet front shall have 3mm thickness	
TECHNICAL	INPUT POWER SUPPLY * (ANY OTHER POWER REQUIREMENT TO BE DERIVED FROM THIS SUPPLY ONLY)		☐ 415V 3 PHASE 4W / 240V AC ☐ 415V 3 PHASE 3W	
	NO. OF FEEDERS		☐ ONE ☐ TWO	
	STARTER WITH MCC (CHECK WITH MAUX/ELEC)		☐ REQUIRED ■ NOT REQUIRED	
	IPR POSITION		■ MCC ☐ RELAY PANEL	
	CONTACT RATING OF RELAY		☐ 5 Amp, 230 V AC ☐ 0.25 Amp, 220V DC	
	CONTROL SUPPLY		☐ 110V AC ☐ 220V AC ☐ 220V DC ☐ Other. (As per requirement)	
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)		Shall be decided in detailed Engg	
	TEMP SCANNER (IF REQUIRED –NO. OF CHANNELS TO BE SPECIFIED UNDER SEC-C)		☐ REQUIRED ■ NOT REQUIRED	
	MIMIC (TYPE OF MIMIC- MATERAIL, THICKNESS TO BE SPECIFIED DURING DETAILED ENGG.)		☐ REQUIRED ■ NOT REQUIRED	
	PAINT TYPE		Treatment as per IS: 8005. Two coats of lead oxide primer followed by powder painting with final paint shade of RAL 9002.	
	PANEL COLOUR (EXTERNAL)			
	FINISH (EXTERNAL)			
	PANEL COLOUR (INTERNAL)			
	FINISH (INTERNAL)			
	CLASS OF PROTECTION		As per specification	
	CONTROL HARDWARE		■ Local START & Emergency STOP along with status indications.	
	FOUNDATION ARRANGEMENT		■ SKID MOUNTED	
	WEIGHT OF PANEL (Kg.)		.....(Vendor to specify)	

FORM NO. PEM-00000-0

	DATA SHEET FOR LOCAL PANELS	SPECIFICATION NO.: PE-SS-999-145-054A
		VOLUME
		SECTION
		REV. NO. / DATE: 20.11.2017
		SHEET 2 OF 3

TAG No. …… Qty.....

Data Sheet No.: **PES-145A-DS2-0**

Data Sheet A & B

	DATA SHEET-A FOR LOCAL PANEL (TO BE FILLED BY PURCHASER)		DATA SHEET-B (TO BE FILLED-UP BY BIDDER)
	PANEL TYPE	☐ PRESSURISED ☐ UNPRESSURISED As per Requirement	
	CABLE GLAND	■ DOUBLE COMPRESSION	
	AMMETER (TYPE OF INPUT) *	☐ 1 Amp CT ☐ 4-20 mA	
	SCOPE OF SUPERVISION FOR ERECTION & COMMISSIONING	☐ APPLICABLE ☐ NA	
	* TO BE CO-ORDINATED WITH PEM ELECTRICAL		

FORM NO. PEM-6666-0

BHEL	**DATA SHEET FOR LOCAL PANELS**	SPECIFICATION NO.: PE-SS-999-145-054A
		VOLUME
		SECTION
		REV. NO. 02 / DATE: 04.05.2016
		SHEET 3 OF 3

TAG No. ……. Qty..... Data Sheet No.: PES-145A-DS2-0

Data Sheet C

DATA SHEET-C FOR LOCAL PANEL
(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

GENERAL	MANUFACTURER			
	CONSTRUCTION		☐ FOLDED ☐ WELDED (As per requirement EDN)	
	ENCLOSURE SHEET THICKNESS	FRONT		
		OTHER		
		DOOR		
		HEIGHT		
		OTHER		
TECHNICAL	INPUT POWER SUPPLY			
	NO. OF FEEDERS			
	CONTACT RATING OF RELAY			
	TEMP SCANNER			
	CONTROL SUPPLY			
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)			
	PAINT TYPE			
	PANEL COLOUR (EXTERNAL)			
	FINISH (EXTERNAL)			
	TYPE OF MIMIC MATERIAL OF MIMC THICKNESS OF MIMIC			
	PANEL COLOUR (INTERNAL)			
	FINISH (INTERNAL)			
	CLASS OF PROTECTION			
	CONTROL HARDWARE			
	FOUNDATION ARRANGEMENT			
	WEIGHT OF PANEL (Kg.)			

FORM NO. PEM-0806-0

	DATA SHEET FOR LOCAL PANELS	SPECIFICATION NO.: PE-SS-999-145-054A
		VOLUME
		SECTION
		REV. NO. 02 / DATE: 04.05.2016
		SHEET 3 OF 3

TAG No. ..... Qty..... Data Sheet No.: **PES-145A-DS1-0**

Data Sheet C

DATA SHEET-C FOR LOCAL PANEL
(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

PANEL TYPE		
CABLE GLAND		
AMMETER (TYPE OF INPUT)		
SCOPE OF SUPERVISION		

PROCESS CONNECTION AND HOOK UP DIAGRAM

(COMMON FOR TG & SG)

PROCESS CONNECTION AND PIPING

1.00.00 **PROCESS CONNECTION PIPING**

Process connection & piping including all impulse piping, sample piping, pneumatic piping/tubing, valves, valve manifolds, fittings and all other accessories required for proper installation & completeness of impulse piping system, sampling piping system and air supply system shall be provided by the Contractor on as required basis.

The rating of material of impulse pipes, tubes, fittings, valves and their installation thereof shall conform to the latest edition of standards as per following table:

Impulse Pipes, Tubes (Material, Rating)	ANSI B31.1, ANSI B31.1a, ANSI/ISA 77.70
Valves (Material, Pr. Class, Size)	ASTM A182/ASTM A105 as per ASME 16.34
Fittings (Size, Rating, Material)	ANSI B31.1, ANSI B31.1a, ASME B16.11-2009
Installation Schemes	BS 6739-2009, ANSI/ISA 77.70

Instrument air filters cum regulator set with mounting accessories shall be provided for pneumatic device requiring air supply.

1.01.00 All transmitters and switches (except for fuel oil applications) shall be suitably grouped together and mounted inside
(i) Local Instruments Enclosures (LIE) in case of Open Areas of the Plant like Boiler Area, Coal Handling, Chimney Area, FGD area, CW Pump House, DM Plant, PT Plant, Ash Handling Plant etc.
(ii) Local Instrument Racks (LIR) in case of covered areas like Turbine Area, Generator Area etc.
(iii) Local Indicators/Gauges shall also be suitably grouped in Local Instrument Racks

In case grouping is not possible and these are to be installed individually, canopy with suitable mounting arrangement shall be provided.

All electric actuators, pneumatic control valves, Junction Boxes, Solenoid boxes and Local control panels which are not installed inside building, suitable canopy shall be provided and design of canopy shall be approved by Employer during detailed engineering.

1.02.00 Local Instrument Enclosures (LIEs) and Local Instrument Racks (LIRs) complete with all fittings, mountings & accessories, drains and Utility Lighting, Cable & Grounding cable etc. shall be provided by the Contractor on as required basis. The Degree of Protection of LIE and JB of LIE/LIR shall be IP-55. The instrument racks shall be constructed from 1.6 mm sheet plate and shall be free standing type constructed of suitable 3 mm thick channel frame of steel and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel and extended beyond the ends of the rack.

1.03.00 All temperature transmitters shall be suitably grouped together and mounted inside (i) Enclosures in case of open areas of the plant like Boiler Area, Coal Handling, Chimney Area, FGD area, CW Pump House, DM Plant, PT Plant, Ash Handling Plant etc. and (ii) Racks in case of covered areas like Turbine Area, Generator Area etc. on as required basis. In case grouping is not possible and temperature transmitter is to be installed individually, canopy with suitable mounting arrangement shall be provided.

1.04.00 For skid mounted instruments and instruments integral to equipments, process connection and piping can be in line with bidder's standard and proven practice.

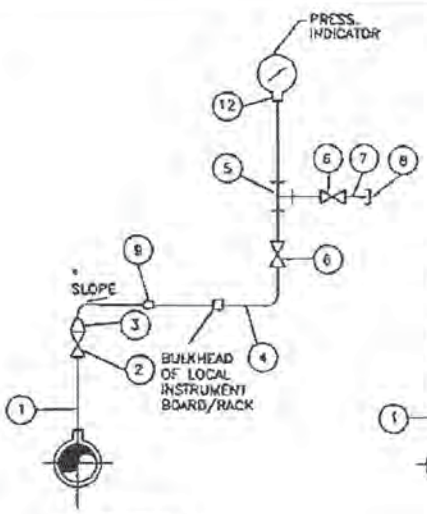
1.05.00 Contractor shall furnish "Certificate of Compliance" of erection of PCP as per NTPC approved documents.

1.06.00 PAINTING COLOR SCHEME FOR IMPULSE PIPING

S. No.	Area / Equipment	Impulse Pipe Ground Color		Identification Tag/Band		
		Color	RAL	Color	ISC No.	RAL
1)	Air	Grey	9002	Sky Blue	101	
2)	Water	Grey	9002	Sea Green	217	
3)	Steam	Aluminum		Signal Red	537	3001
4)	Air Steam Mixture	Aluminum		Sky Blue	101	
5)	Gas	Grey	9002	Canary Yellow	309	
6)	Oils	Grey	9002	Light Brown	410	
7)	Pulverized Fuel	Grey	9002	Silver Grey	628	
8)	Fire Installations	Fire Red	536 (ISC) 3001 (RAL)	White		9010
9)	HP Dosing	Grey	9002	Dark Admiralty Grey	632	
10)	LP Dosing / acid / alkali Piping	Grey	9002	Signal Red	537	
11)	Ash Piping	Grey	9002	French Blue	166	

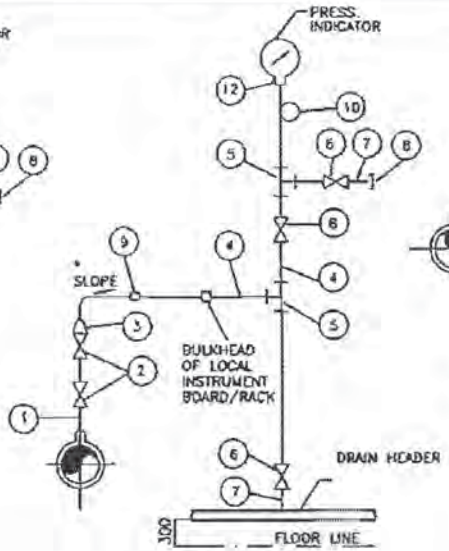
Note: Ground color indicated against each piping shall be followed in case piping is not insulated /cladded.

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

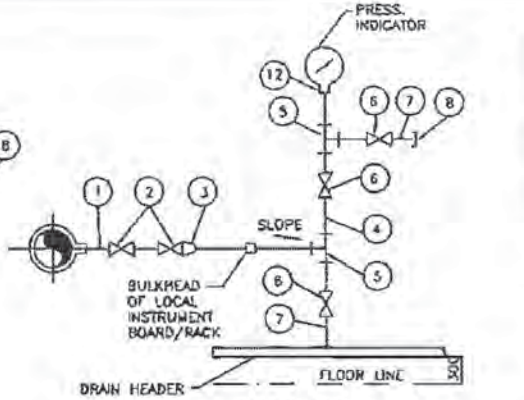


ELEVATION
INST./ SERVICE AIR

(PRESSURE INDICATORS MOUNTED REMOTE FROM INSTRUMENT SOURCE POINT)

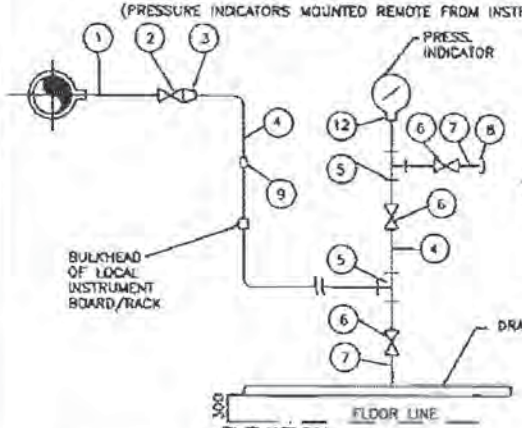


ELEVATION
STEAM SERVICE



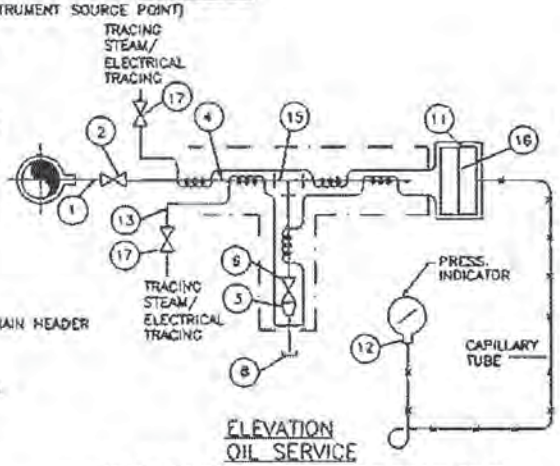
ELEVATION
LIQUID SOURCE

(GAUGE MOUNTED ABOVE INSTRUMENT SOURCE POINT)



ELEVATION
LIQUID SOURCE

(GAUGE MOUNTED BELOW INSTRUMENT SOURCE POINT)



ELEVATION
OIL SERVICE

(GAUGE MOUNTED BELOW INSTRUMENT SOURCE POINT)

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1/2", 3/4", 1" NPS SCH 40/80/160/XXS/P91 (AS PER PROCESS REQUIREMENT) NIPPLE OF MATERIAL SAME AS THAT OF MAIN PIPE.
2.	1/2"/3/4"/1" SW GLOBE VALVE/GATE VALVE
3.	3/4" / 1" x 1/2" SW REDUCING INSERT
4.	1/2" / 3/4" PIPE
5.	1/2" / 3/4" SW EQUAL TEE
6.	1/2" / 3/4" SW GLOBE VALVE.
7.	1/2" / 3/4" NPS SW x 1/2" / 3/4" NPT(M) CARBON/ALLOY STEEL NIPPLE.
8.	1/2" / 3/4" NPT(F) CAP.
9.	1/2" / 3/4" PIPE UNION.
10.	6" SS SYPHON
11.	1/2" BLIND 300lbs RF ANSI FLANGE DRILLED AND TAPED FOR 1" NPT PIPE.
12.	SUITABLE ADAPTER.
13.	1/4" CHROME MOLY STEEL TUBE.
14.	
15.	1"/3/4" SW EQUAL TEE.
16.	DIAPHRAGM(WAFER ELEMENT)
17.	ISOLATION VALVE 316 SS,1/4"SW

NOTES:-

1. THE MATERIAL SPECIFICATION AND SCHEDULE NO. OF IMPULSE PIPE & NIPPLE AS LISTED HEREIN SHALL BE AS PER TECHNICAL SPECIFICATIONS.
2. THE MATERIAL SPECIFICATION AND RATING OF FITTINGS AS LISTED SHALL BE AS PER SPECIFICATIONS. WELDED/THREADED FITTINGS SHALL CONFIRM TO ANSI-B.16-11.
3. INSTRUMENTS VALVES BODY STEM MATERIAL AND PRESSURE CLASS SHALL BE AS PER TECHNICAL SPECIFICATIONS.
4. FOR BOILER AIR/FLUE GAS SERVICES SOURCE CONNECTIONS IMPULSE PIPING AND ALL FITTINGS SHALL BE OF 3/4" NB SIZE.
5. GAUGES SHALL NOT BE MOUNTED ON THE PIPE. IT WILL BE MOUNTED ON A CHANNEL OR FRAME OR A RACK..
6. * SLOPE APPROX. 50 MM / METRE.

FOR TENDER PURPOSE ONLY

एन टी पी सी
NTPC

N T P C LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

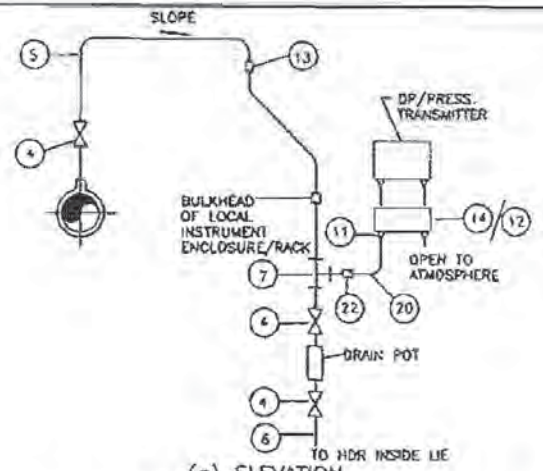
REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	G&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.G.			21.08.12
					CLEARED BY						

PROJECT: TYPICAL THERMAL POWER PROJECT

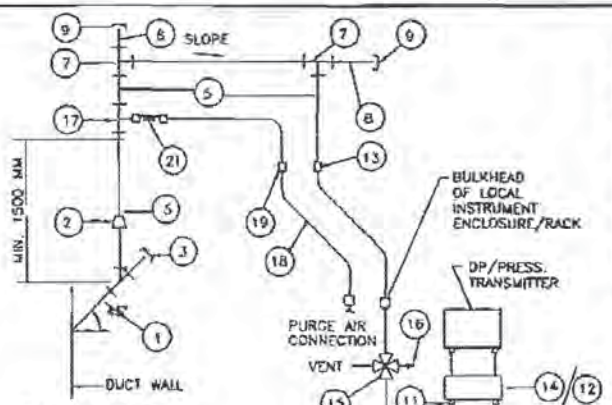
TITLE: INSTRUMENT INSTALLATION DIAGRAM (FOR PRESSURE GAUGE)

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-022	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

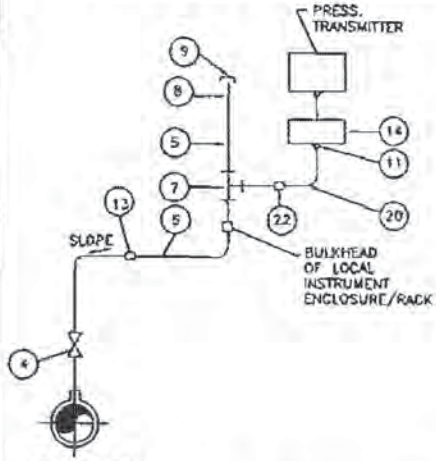


(a) ELEVATION
INST/SERVICE AIR PRESSURE MEASUREMENT

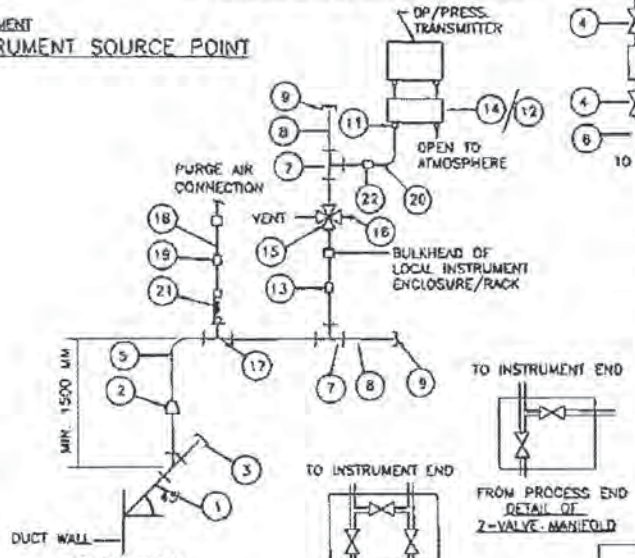


(b) ELEVATION
DIRTY AIR/FLUE GAS PRESSURE MEASUREMENT

TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT



ELEVATION
INST/SERVICE AIR PRESSURE MEASUREMENT



ELEVATION
DIRTY AIR/FLUE GAS PRESSURE MEASUREMENT

TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	42 K 405 MM M.S. BLACK PIPE
2.	M42x2 TO 3/4" REDUCING INSERT
3.	M42x2(F) M.S.CAP
4.	3/4" SW GLOBE VALVE/GATE VALVE
5.	3/4" NPS PIPE
6.	3/4" NPS SW 3/4" NPT(M) CS/AS NIPPLE
7.	3/4" SW EQUAL TEE
8.	3/4" NPS SCH 80 CARBON/ALLOY STEEL NIPPLE
9.	3/4" NPT(F) CS/AS CAP
10.	3/4" SW CS/AS EQUAL CROSS
11.	1/2" TUBE ADOPTER
12.	3 VALVE MANIFOLD
13.	3/4" PIPE UNION
14.	2 VALVE MANIFOLD
15.	3/4" SW 4 WAY VALVE
16.	QUICK DISCONNECT FITTING
17.	3/4"SWx1/2"SW BRANCH TEE
18.	1/2" NB SEAMLESS GI PIPE
19.	1/2" NPT (F) GI FITTING
20.	SS TUBE
21.	FLEXIBLE HOSE WITH ONE END SOCKET WELDED (PIPE SIDE) & OTHER END WITH SUITABLE FITTINGS.
22.	3/4" x 1/2" S.S. TUBE UNION

NOTES:-

1. SEE NOTES UNDER DRG. NO.0000-999-POI-A-022.
2. IMPULSE LINE DRAIN CONNECTIONS SHALL BE DONE AS PER TECHNICAL SPECIFICATIONS
3. THE SLOPE IN THE HORIZONTAL OF THE IMPULSE PIPE SHALL BE APPROX. 50 mm/mtr.
4. THE EXACT ORIENTATION OF THE TRANSMITTERS WITH RESPECT TO VALVE MANIFOLDS ETC. WILL BE FINALISED DURING DETAILED ENGINEERING KEEPING IN VIEW THE MANUFACTURER'S RECOMMENDATIONS.
5. COMMON INSTRUMENT AIR HEADER (1"NB) USING REDUNDANT AIR FILTER REGULATORS WILL BE MADE IN EACH TRANSMITTER ENCLOSURE REQUIRING PURGE AIR. PURGE AIR FOR EACH INSTRUMENT LINE SHALL BE TAPPED FROM THIS HEADER USING INDIVIDUAL PURGE ROTAMETERS AS SHOWN IN DRG. NO 0000-999-POI-A-034 TYPICALLY.

FOR TENDER PURPOSE ONLY

NTPC

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

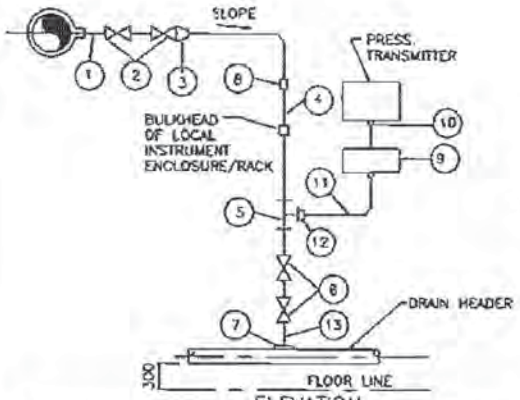
TITLE: INSTRUMENT INSTALLATION DIAGRAM
(PRESSURE MEASUREMENT USING PRESS / DP TRANSMITTERS
(INST./SERVICE, DIRTY AIR/FLUE GAS)

REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.G.			21.08.12

CLEARED BY

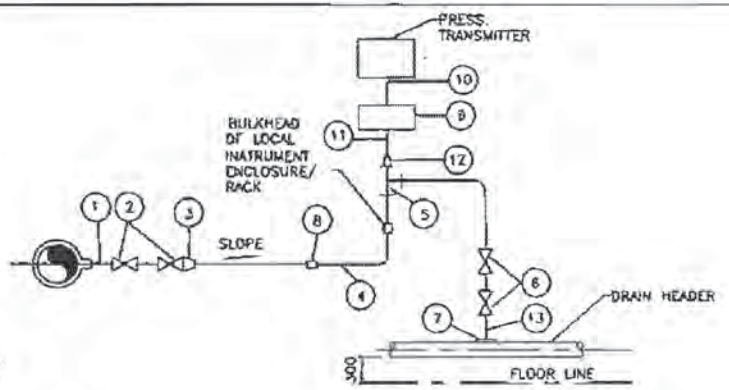
SIZE	SCALE	ORG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-023	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD
No part of this document will be reproduced by any means without the written permission.



ELEVATION

TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT



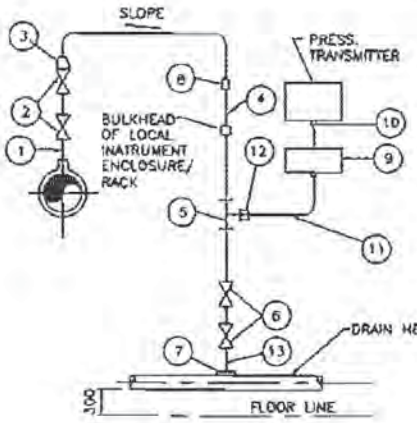
ELEVATION

TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

LIQUID PRESSURE MEASUREMENT

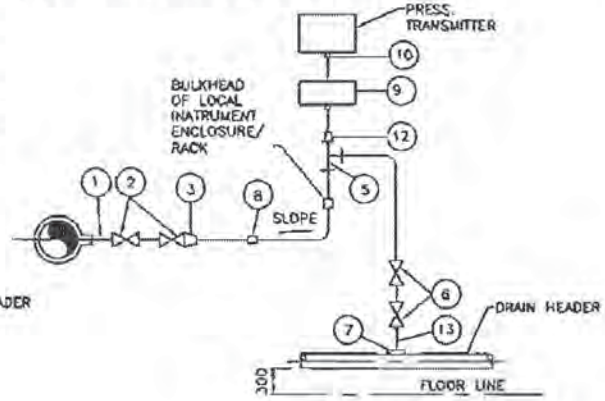
LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1/2" / 3/4" / 1" NPS SCH. 80/160/XXS/P91 NIPPLE OF MATERIAL SAME AS THAT OF MAIN PIPE
2.	3/4"/1" SW GLOBE VALVE.
3.	3/4"/1" TO 1/2" REDUCING INSERT
4.	1/2" NPS PIPE
5.	1/2" SW EQUAL TEE
6.	1/2"SW GLOBE VALVE
7.	1/2"NPS SCH. 80/160 SW x 1/2"CS/AS COUPLER
8.	1/2" PIPE UNION
9.	2/3 VALVE MANIFOLD (FOR DETAIL SEE DRAWING NO.0000-102-POI-A-023.
10.	SUITABLE ADAPTER
11.	SS TUBE
12.	1/2" PIPE x 1/2"TUBE UNION
13.	1/2"NPS SCH. 80/160 SW x 1/2" NPT(M) CS/AS NIPPLE



ELEVATION

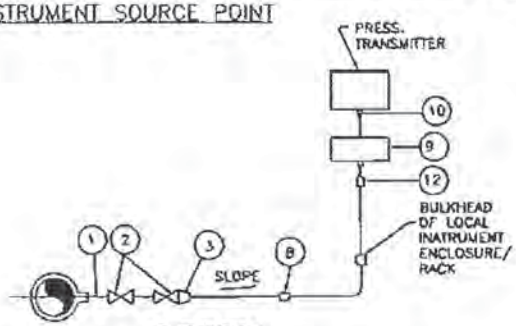
TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT



ELEVATION

TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

STEAM PRESSURE MEASUREMENT



ELEVATION

VACCUM PRESSURE MEASUREMENT

NOTES:-

1. SAME NOTES UNDER ORG. NO. 0000-999-POI-A-023.
2. FOR VACUUM APPLICATION OTHER PORT OF TRANSMITTER SHALL BE KEPT OPEN TO ATMOSPHERE.

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

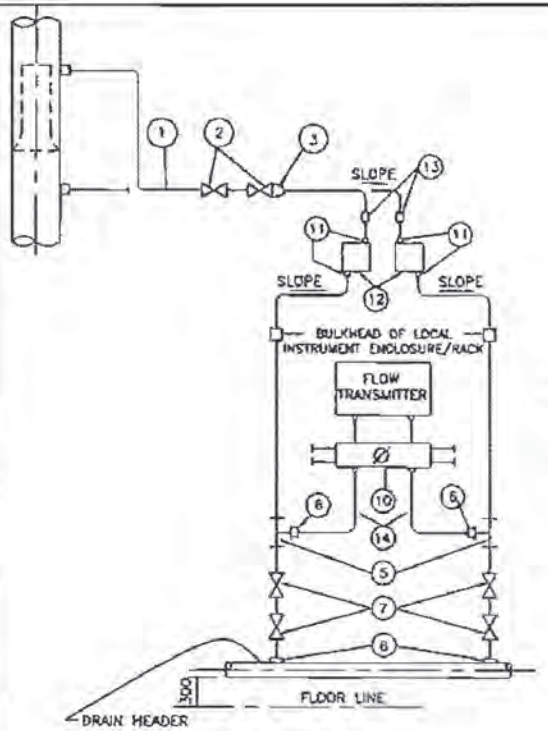
PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT INSTALLATION DIAGRAM (PRESSURE MEASUREMENT USING PRESS /DP TRANSMITTERS STEAM/LIQUID VACUUM)

REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
					CLEARED BY						
A	FIRST ISSUE							T.G.			21.06.12

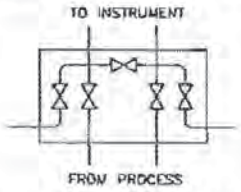
SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-025	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

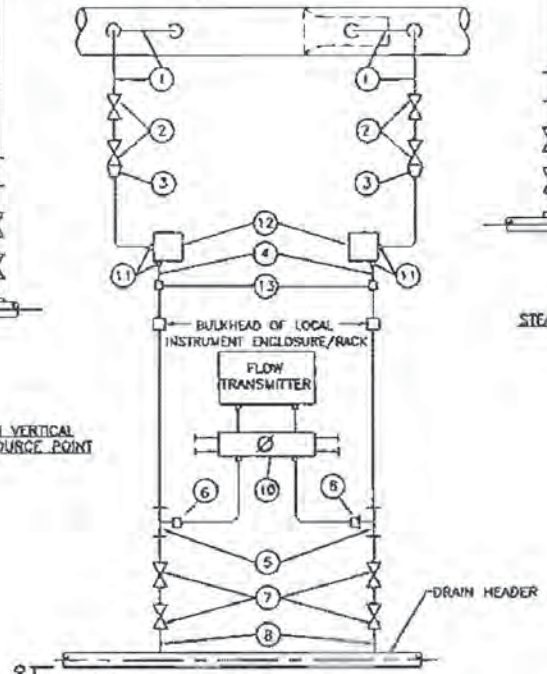


ELEVATION

FEED/ATTEMPERATION WATER FLOW MEASUREMENT IN VERTICAL PIPE-TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT

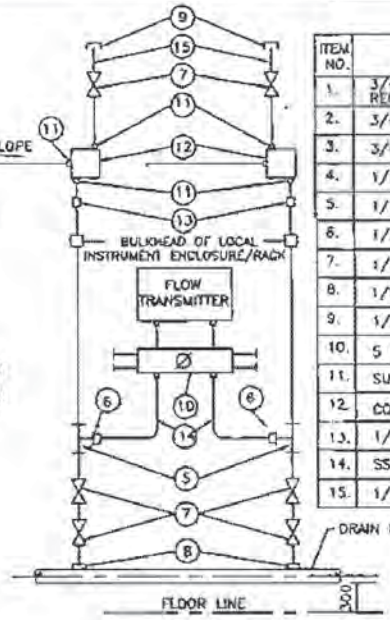


DETAIL OF 5 VALVE MANIFOLD
(ITEM NO. 10)



ELEVATION

FEED/ATTEMPERATION WATER FLOW MEASUREMENT IN HORIZONTAL PIPE-TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT



ELEVATION

STEAM FLOW MEASUREMENT IN VERTICAL PIPES

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	3/4" /1"NPS SCH. 80/160/XXS/P91 (AS PER PROCESS REQUIREMENT) NIPPLE OF MATERIAL SAME AS THAT OF MAIN PIPE.
2.	3/4"/1" SW GLOBE VALVE.
3.	3/4"/1" TO 1/2" REDUCING INSERT
4.	1/2" NPS PIPE
5.	1/2" SW EQUAL TEE
6.	1/2" PIPE x 1/2" TUBE UNION
7.	1/2" SW GLOBE VALVE.
8.	1/2"NPS SCH. 80/160 SWx1/2" SW CS/AS COUPLER
9.	1/2" NPT (F) CAP
10.	5 VALVE MANIFOLD
11.	SUITABLE ADAPTER
12.	CONDENSATE POT (RESERVOIR)
13.	1/2" PIPE UNION
14.	SS TUBE
15.	1/2"NPS SCH. 80/160 SWx1/2" NPT (M) CS/AS NIPPLE

NOTES:-

1. SAME NOTES UNDER DRG NO. 0000-999-POI-A-023.
2. CONDENSATE POTS SHALL BE PROVIDED FOR ALL STEAM SERVICES.
3. FOR WATER SERVICES CONDENSATE POTS SHALL BE PROVIDED ONLY IN THOSE CASES WHERE TEMP. > 120°C

FOR TENDER PURPOSE ONLY

NTPC

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

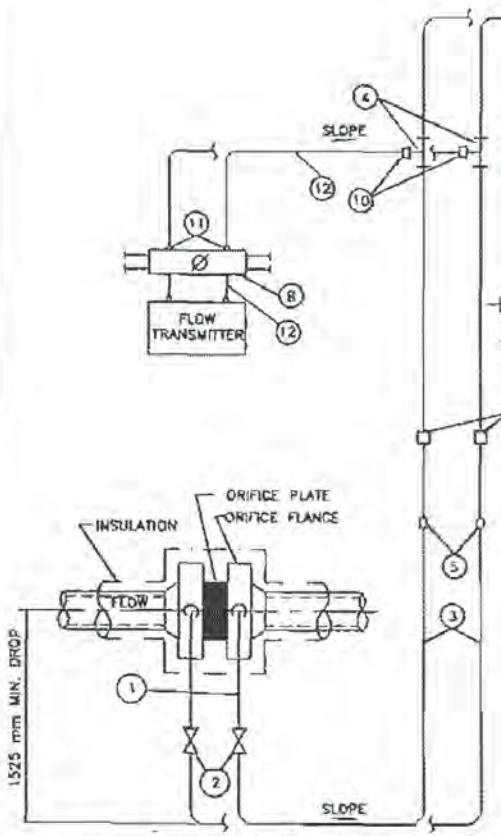
REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.C.			21.08.12
					CLEARED BY						

PROJECT: TYPICAL THERMAL POWER PROJECT

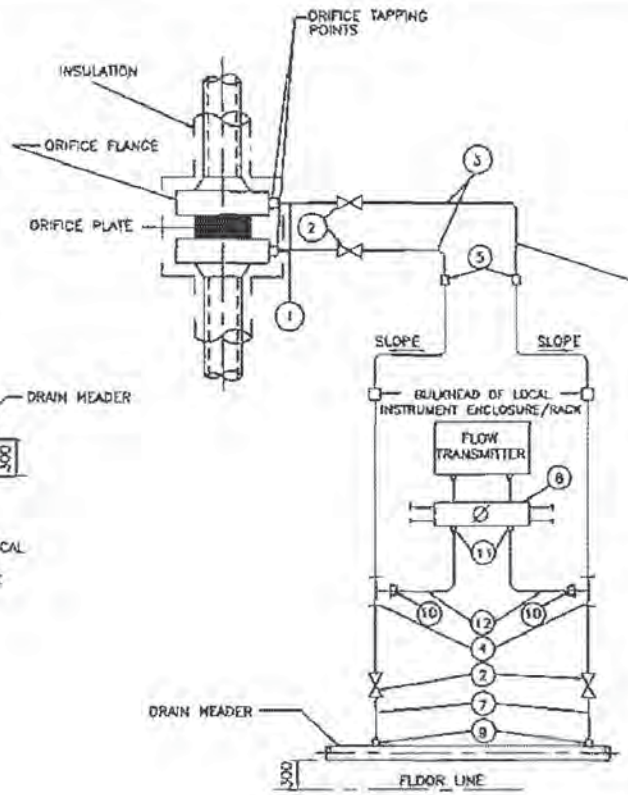
TITLE: INSTRUMENT INSTALLATION DIAGRAM
FLOW MEASUREMENT (USING FLOW NOZZLES)
STEAM & FEEDWATER

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-026	A

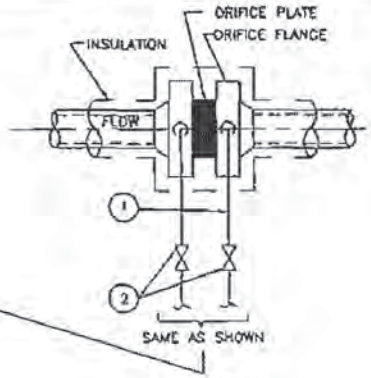
This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



ELEVATION
HORIZONTAL PIPE RUN
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT



ELEVATION
VERTICAL PIPE RUN
TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT



ELEVATION
HORIZONTAL PIPE RUN

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1/2"NPS SCH. 80 NIPPLE OF MATERIAL SAME AS THAT OF MAIN PIPE WITH NECESSARY ATTACHMENT TO FLANGE OF ORIFICE
2.	1/2"SW GLOBE VALVE.
3.	1/2" NPS PIPE
4.	1/2" SW EQUAL TEE
5.	1/2" PIPE UNION
6.	-
7.	1/2"NPS SCH. 80 SWx1/2"NPT (M) S.S. NIPPLE
8.	5 VALVE MANIFOLD FOR DETAIL REFER DRAWING NO.0000-102-POI-A-025.
9.	1/2" T SW HALF COUPLET
10.	1/2" PIPE x 1/2" TUBE UNION
11.	SUITABLE ADAPTER
12.	SS TUBE

NOTES:-

1. SAME NOTES AS UNDER DRG. NO. 0000-999-POI-A-023.

FOR TENDER PURPOSE ONLY

NTPC — NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.G.			21.08.12

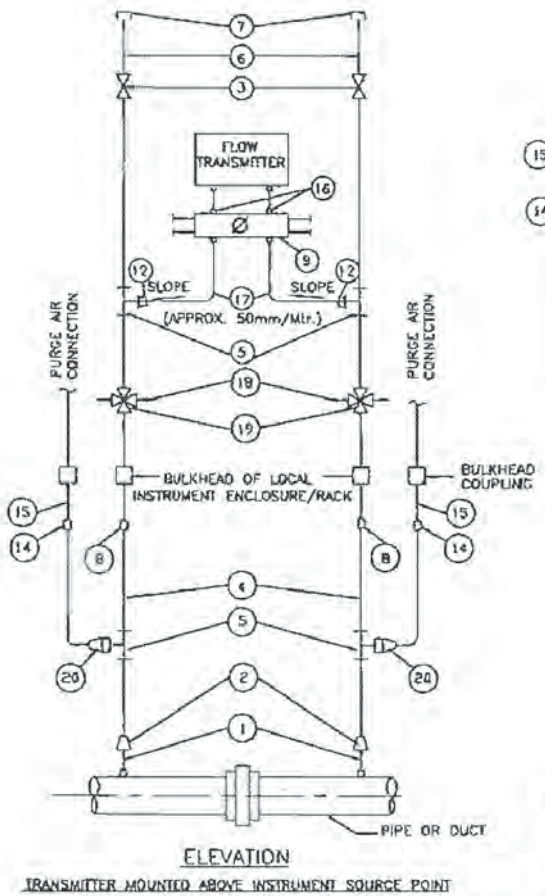
CLEARED BY

PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT INSTALLATION DIAGRAM
FLOW MEASUREMENT (USING ORIFICE PLATES)
CONDENSATE & SERVICE WATER

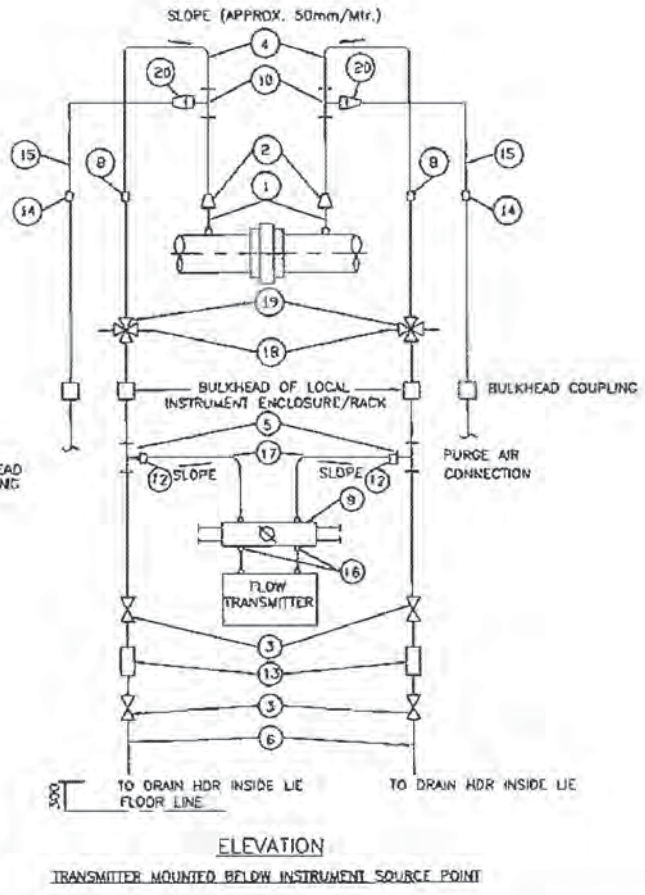
SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-027	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



ELEVATION

TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT



ELEVATION

TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	42x4.05mm W.S. BLACK PIPE.
2.	M 42x2 TO 3/4"SW REDUCING INSERT.
3.	3/4" SW GLOBE VALVE.
4.	3/4" PIPE.
5.	3/4" SW EQUAL TEE.
6.	3/4" SCH. 80 SWx3/4" NPT (M) CS/AS NIPPLE
7.	3/4" NPT (F) CAP.
8.	3/4" PIPE UNION.
9.	5 VALVE MANIFOLD FOR DETAIL REFER DRAWING NO.0000-102-P01-A-026.
10.	3/4" SW EQUAL TEE.
11.	3/4" SW GATE VALVE.
12.	3/4" PIPE x 1/2" TUBE UNION
13.	DRAIN POT.
14.	1/2" CI FITTING
15.	1/2" NB CI PIPE
16.	SUITABLE ADAPTER
17.	SS TUBE
18.	QUICK DISCONNECT FITTINGS.
19.	3/4" SW 4 WAY VALVE.
20.	3/4" x1/2" REDUCER.

NOTES:-

1. SAME NOTES AS UNDER DRG. NO. 0000-999-P01-A-023.

FOR TENDER PURPOSE ONLY

AIR/GAS FLOW MEASUREMENT USING HEAD TYPE PRIMARY ELEMENT

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

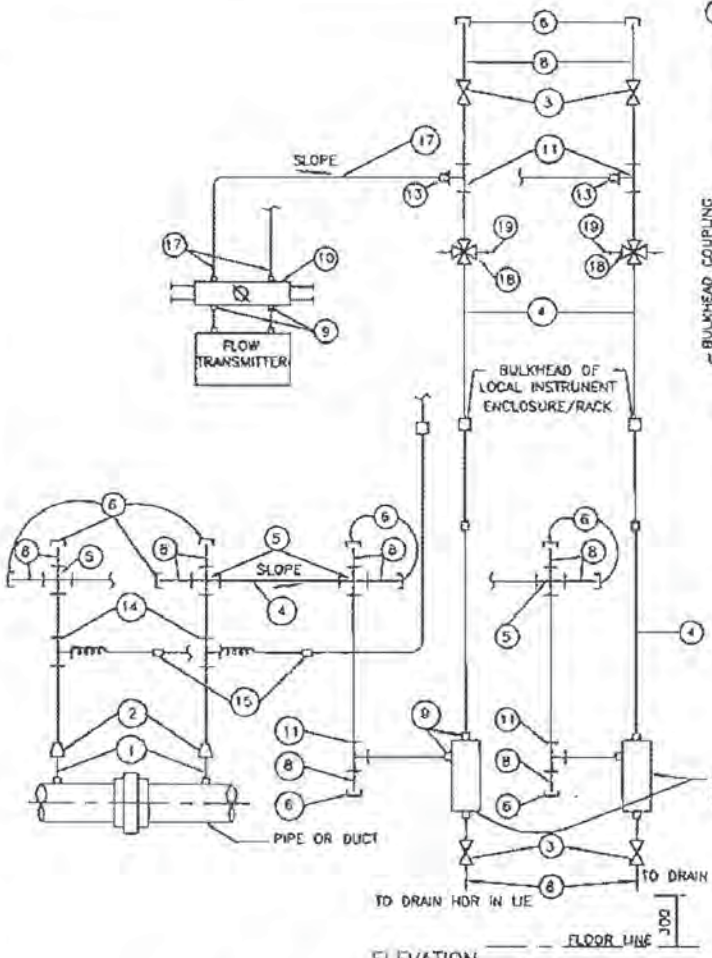
PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT INSTALLATION DIAGRAM (FLOW MEASUREMENT AIR/GAS)

REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	CLEARED BY: M	E	C	Cdd	ARCH.	APPD	DATE
A	FIRST ISSUE							T.C.			21.08.12

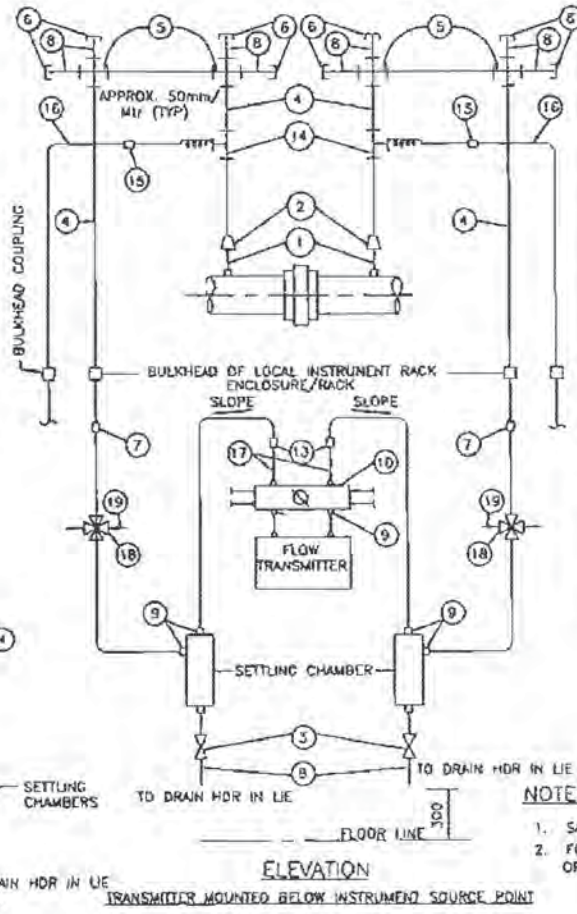
SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-P01-A-028	B

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



ELEVATION

TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT



ELEVATION

TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	42x4.05mm M.S. BLACK PIPE.
2.	M 42x2 TO 3/4"SW REDUCING INSERT.
3.	3/4" SW GLOBE VALVE.
4.	3/4" NPS PIPE.
5.	3/4" SW EQUAL CROSS.
6.	3/4" NPT (F) CS/AS CAP.
7.	3/4" PIPE UNION.
8.	3/4" NPS SW x 3/4" NPT (M) CS/AS NIPPLE
9.	SUITABLE ADAPTER
10.	5 VALVE MANIFOLD FOR DETAIL REFER DRAWING NO.0000-999-POI-A-026.
11.	3/4" SW EQUAL TEE.
12.	3/4" SW GATE VALVE.
13.	3/4" PIPE x 1/2" TUBE UNION
14.	3/4" SW x 1/2" SW BRANCH TEE.
15.	1/2" CI FITTING
16.	1/2" NB GI PIPE.
17.	SS TUBE
18.	3/4" SW 4 WAY VALVE.
19.	QUICK DISCONNECT FITTINGS.

NOTES:-

1. SAME NOTES UNDER DRG. NO. 0000-999-POI-A-023.
2. FOR VACUUM APPLICATION OTHER PORT OF TRANSMITTER SHALL BE KEPT OPEN TO ATMOSPHERE.

FOR TENDER PURPOSE ONLY

DIRTY AIR/FLUE GAS FLOW MEASUREMENT USING HEAD TYPE PRIMARY ELEMENT

REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							TG.			21.08.12

CLEARED BY

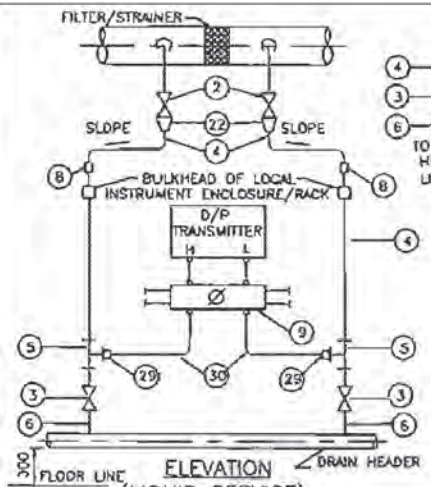
NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

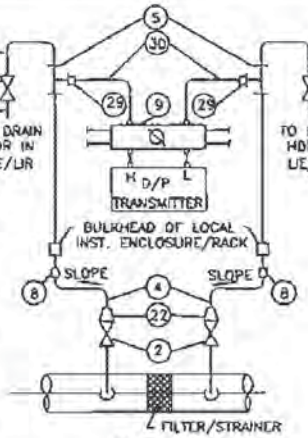
TITLE: INSTRUMENT INSTALLATION DIAGRAM (FLOW MEASUREMENT DIRTY AIR/ FLUE GAS)

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-029	A

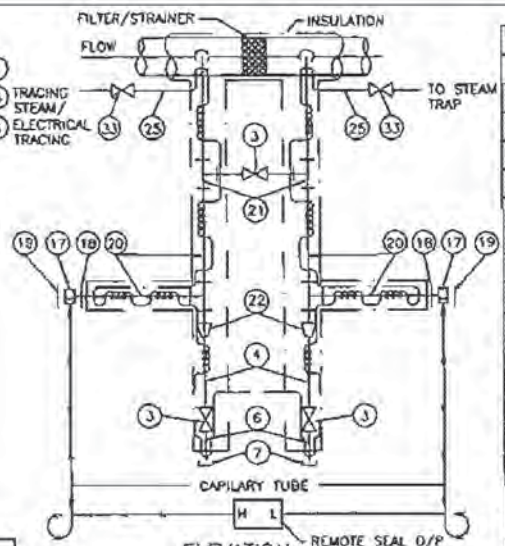
This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



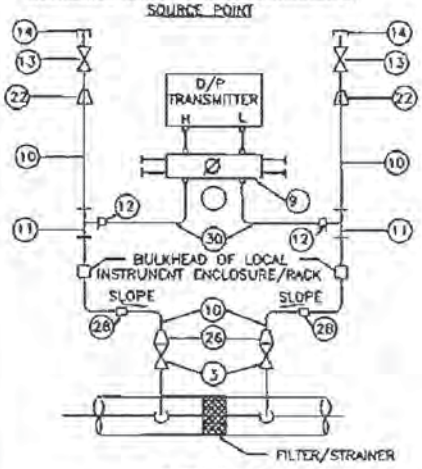
ELEVATION
(LIQUID SERVICE)
TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT



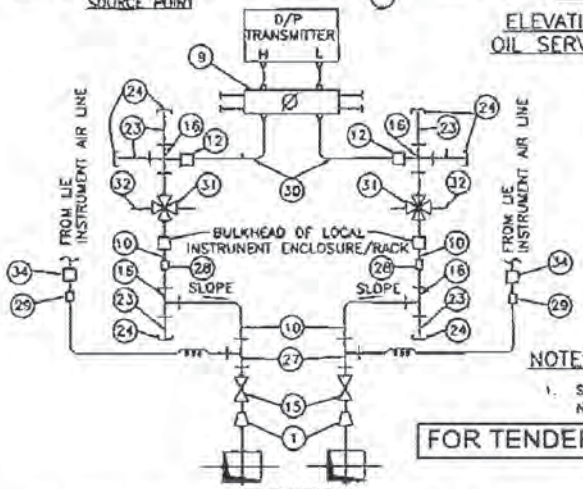
ELEVATION
(LIQUID SERVICE)
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT



ELEVATION
OIL SERVICE



ELEVATION
CLEAN GAS/AIR SERVICE
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT
DIFFERENTIAL PRESSURE MEASUREMENT



ELEVATION
FUEL GAS SERVICE/DIRTY AIR SERVICE

NOTES:-

1. SAME NOTES AS UNDER DRG. NO. 0000-999-POI-A-023.

FOR TENDER PURPOSE ONLY

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	42x2 TO 3/4" SW REDUCING INSERT
2.	3/4" SW GLOBE VALVE.
3.	1/2" SW GLOBE VALVE FOR LIQUID APPLICATION & 3/4"/1" IN GAS/AIR APPLICATION
4.	1/2" NPS 40/80/160 (AS PER PROCESS REQUIREMENT) CARBON/ALLOY STEEL PIPE.
5.	1/2" SW EQUAL TEE.
6.	1/2" NPS SW x 1/2" NPT (M) NIPPLE.
7.	1/2" NPT (F) CAP.
8.	1/2" PIPE x 1/2" PIPE UNION.
9.	5 VALVE MANIFOLD (FOR DETAIL REFER DRAWING NO.0000-999-POI-A-026.
10.	3/4" SCH 80 CARBON/ALLOY STEEL PIPE.
11.	3/4"/1/2" SW EQUAL TEE.
12.	3/4"x1/2" TUBE UNION.
13.	1/2" SCREWED GLOBE VALVE.
14.	1/2" NPT (M) PLUG.
15.	3/4" SW GATE VALVE.
16.	3/4" SW EQUAL CROSS.
17.	WAFER ELEMENT FOR USE WITH 3"ANSI R.F. VALVE.
18.	3"BLIND 300lbs R.F. WELD NECK FLANGE DRILLED FOR 1" SCH. 40/80 PIPE
19.	3" BLIND FLANGE.
20.	1"NPS SCH. 40/80 (AS PER PROCESS REQUIREMENT) CS PIPE.
21.	1" SW EQUAL TEE.
22.	3/4" x 1/2"SW REDUCING INSERT.
23.	3/4" SW x 3/4" NPT (M) CS/AS NIPPLE
24.	3/4" NPT (F) CS/AS CAP.
25.	1/4" NPS ALLOY STEEL PIPE.
26.	1" x 3/4" SW REDUCING INSERT.
27.	3/4" SW x 1/2" PSW BRANCH TEE.
28.	3/4" PIPE UNION
29.	1/2" CLAMP UNION (THREADED) SUITABLE FOR FLEXIBLE CONNECTION OF NYLON REINFORCED PVC TUBE.
30	SS TUBE
31.	3/4" SW 4 WAY VALVE.
32.	QUICK DISCONNECT FITTINGS.
33.	1/4" SW ISOLATION VALVE 316SS
34.	1/2" x 1/2" SS PIPE UNION.

NTPC

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

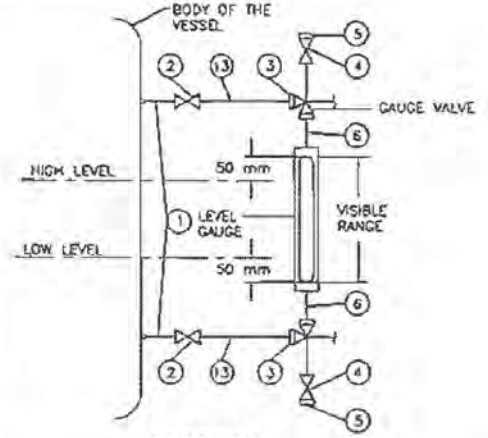
PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT INSTALLATION DIAGRAM
DIFF. PRESS.MEASUREMENT (LIQUID, OIL, AIR/GAS SERVICE)

REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.C.			21.08.12
					CLEARED BY						

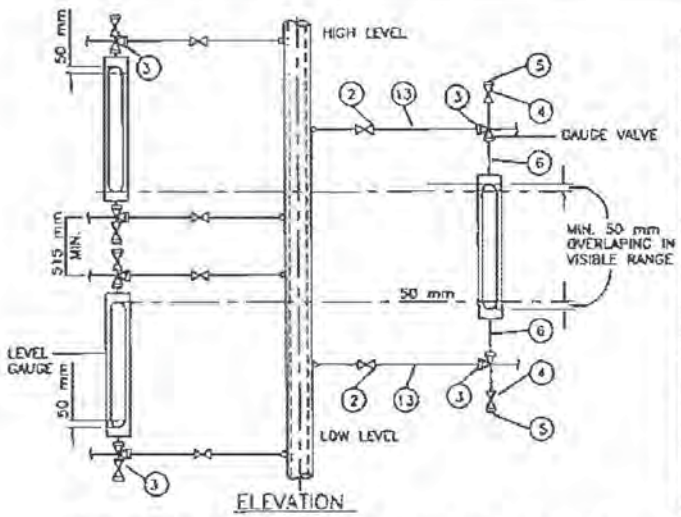
SIZE	SCALE	DRG NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-030	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



ELEVATION

LOCAL LEVEL INDICATION USING GAUGE GLASS

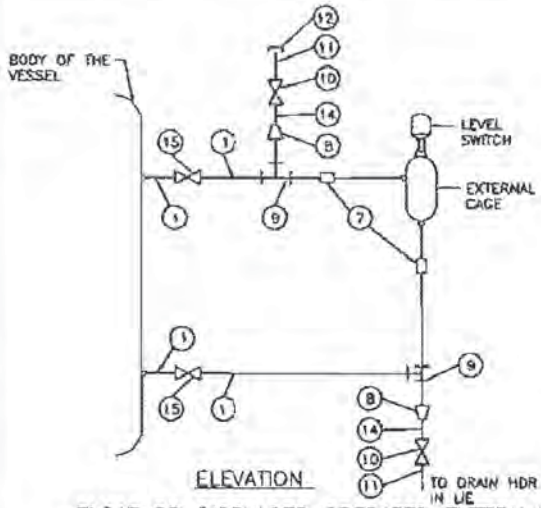


ELEVATION

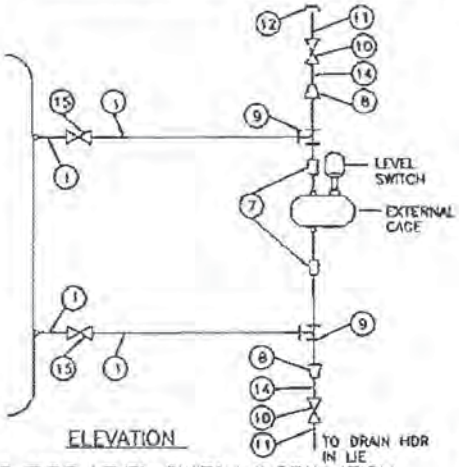
LOCAL LEVEL INDICATION USING MULTIPLE GAUGES FOR INCREASED RANGE NOT COVERED IN A SINGLE UNIT

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	3/4"/1" NPS SCH.40/80/160/PSI (AS PER PROCESS REQUIREMENT) CARBON /ALLOY STEEL PIPE.
2.	3/4" SW GLOBE VALVE.
3.	3/4" SW UNION.
4.	3/4" NPT GLOBE VALVE.
5.	3/4" NPT (M) CAP.
6.	3/4" NPT (F) UNION CONNECTION.
7.	1" SW EQUAL UNION.
8.	1" x 1/2" SW REDUCING INSERT.
9.	1" SW EQUAL TEE.
10.	1/2" SW GLOBE VALVE.
11.	1/2" NPS SWx1/2" NPT(M) CS/AS NIPPLE.
12.	1/2" NPT (F) CAP
13.	3/4"x1/2" NPS SCH.40/80 CS/AS PIPE.
14.	1/2" NPS SCH.80/160 CS/AS NIPPLE.
15.	1" SW GLOBE VALVE.



ELEVATION



ELEVATION

FLOAT OR DISPLACER OPERATED EXTERNAL CAGE TYPE LEVEL SWITCH INSTALLATION

NOTES:-

1. FOR LEVEL GAUGE 3/4" AND FOR LEVEL SWITCH 1" PROCESS CONNECTION SHALL BE PROVIDED.
2. NOTES UNDER DRG. NO. 0000-999-POI-A-023 (WHICHEVER ARE RELEVENT).

FOR TENDER PURPOSE ONLY

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							F.G.			21.08.17
					CLEARED BY						

एन टी पी सी NTPC

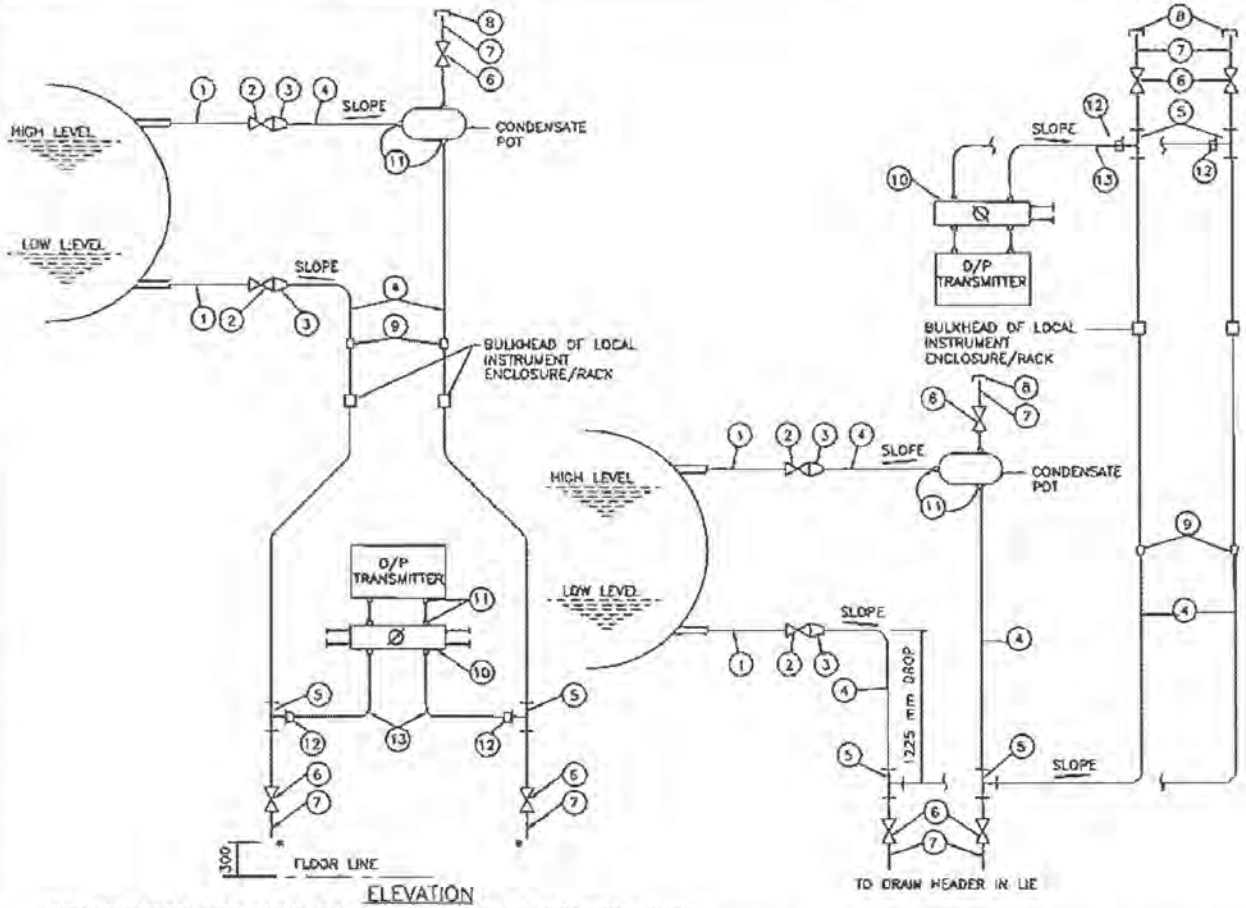
NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT INSTALLATION DIAGRAM (LEVEL GAUGE & SWITCHES)

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-031	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any media without the written permission.



ELEVATION
TRANSMITTER MOUNTED BELOW INSTRUMENT SOURCE POINT

ELEVATION
TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	1" NPS SCH.40/80/160/XXS/PBT (AS PER PROCESS REQUIREMENT) CARBON /ALLOY STEEL PIPE.
2.	1" SW GLOBE VALVE.
3.	3/4"/1" TO 1/2" REDUCING INSERT.
4.	1/2" NPS SCH.80/160/XXS(AS PER PROCESS REQ.)CS/AS PIPE.
5.	1/2" SW EQUAL TEE.
6.	1/2" SW GLOBE VALVE.
7.	1/2" NPS SWx1/2" NPT(M) CS/AS NIPPLE.
8.	1/2 NPT (F) CAP.
9.	1/2" PIPE UNION.
10.	5-VALVE MANIFOLD (FOR DETAILS REF. DRG. NO.0000-999-POI-A-026.
11.	SUITABLE ADAPTER.
12.	1/2" PIPE x 1/2" TUBE UNION.
13.	S.S. TUBE.

NOTES:-

1. SAME NOTES AS UNDER DRG. NO.0000-999-POI-A-023. (WHICHEVER ARE RELEVENT).
* TO DRAIN HEADER IN LIE/LIR.

FOR TENDER PURPOSE ONLY

LEVEL MEASUREMENT OF CLEAR NON-VISCOUS OR NON-CORROSIVE LIQUID IN CLOSED VESSEL WITH CONDENSABLE ATMOSPHERE USING D/P TRANSMITTER

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

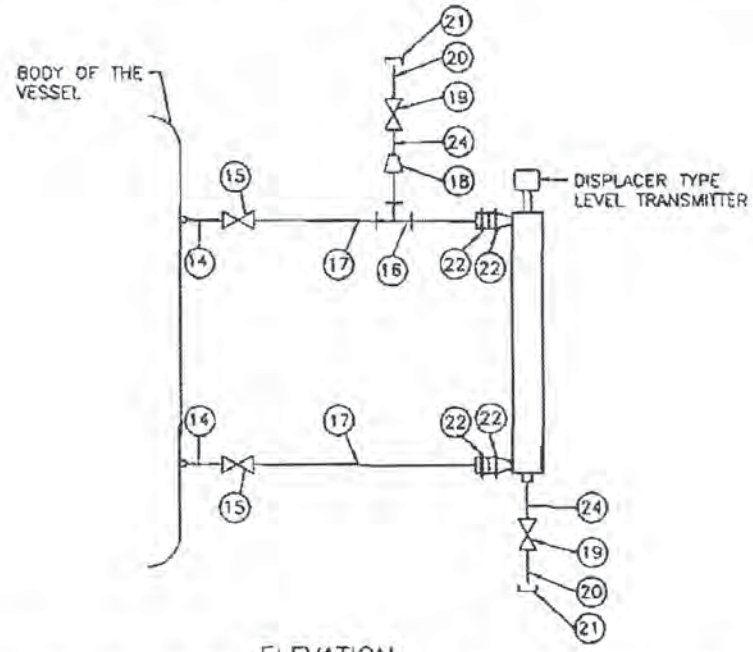
TITLE: INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT USING D/P TRANSMITTERS)

REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.C.			21.08.12

CLEARED BY

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-032 SH 1 OF 2	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



ELEVATION

DISPLACER TYPE LEVEL TRANSMITTER WITH SIDE CONNECTION

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	2" NPS SCH. 40/80 (AS PER PROCESS REQUIREMENT) VESSEL NOZZLE.
15.	2" SW GLOBE VALVE.
16.	2" SW EQUAL TEE.
17.	2" NPS SCH. 40/80 CS/AS PIPE
18	2" x 3/4" SW REDUCING INSERT.
19	3/4" SW GLOBE VALVE
20.	3/4" NPS SW x 3/4" NPT (M) CS/AS NIPPLE.
21.	3/4" NPT (F) CAP.
22.	2" ANSI 300 lbs RAISED PHASE WELD NECK FLANGE.
23.	2" ANSI FLANGE OF LEVEL TRANSMITTER.
24.	3/4" NPS SCH. 40/80 PIPE.

NOTES:-

1. SAME NOTES AS UNDER DRG. NO.0000-999-POI-A-023 (WHICHEVER ARE RELEVENT).

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

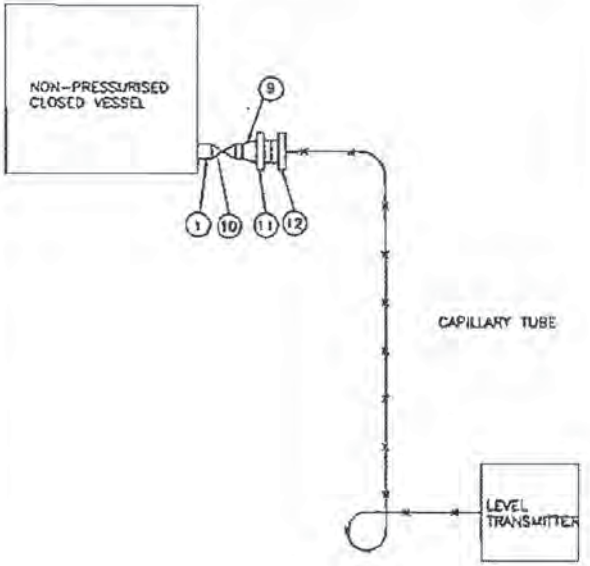
REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.G.			21.08.12
					CLEARED BY						

PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT USING DISPLACER TYPE TRANSMITTERS)

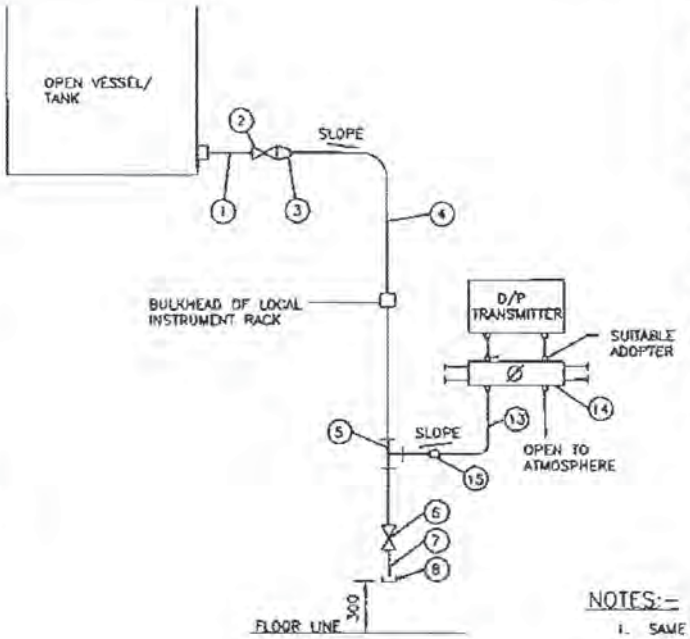
SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-032 SH 2 OF 2	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



ELEVATION

LEVEL MEASUREMENT OF VISCOUS OR CORROSIVE LIQUID IN CLOSED VESSEL USING FLUSH DIAPHRAGM/WAFER TYPE LEVEL TRANSMITTER WITH REMOTE SEAL



ELEVATION

LEVEL MEASUREMENT OF CLEAN LIQUID IN AN OPEN VESSEL USING D/P TRANSMITTER

LIST OF MATERIALS

ITEM NO.	DESCRIPTION
1.	3/4"/ 1" NPS 40/80 PIPE.
2.	3/4" SW GLOBE VALVE.
3.	3/4"/ 1/2" SW REDUCING INSERT.
4.	1/2" NPS SCH. 40/80 PIPE.
5.	1/2" SW EQUAL TEE.
6.	1/2" SW GLOBE VALVE.
7.	1/2" NPS SW x 1/2" NPT(M) NIPPLE.
8.	1/2" NPT (F) CAP.
9.	3/4" TO 4" EXPANDER.
10.	3/4" BUTT WELDED GATE VALVE.
11.	4" ANSI 300 lbs R.F. WELD NECK FLANGE.
12.	4" ANSI MATCHING FLANGE WITH FLUSH DIAPHRAGM OF LEVEL TRANSMITTER
13.	SS TUBE.
14.	3-VALVE MANIFOLD (FOR DETAIL REF. DRG. NO. 0000-999-POI-A-023.
15.	1/2" PIPE x 1/2" TUBE UNION.

NOTES:-

1. SAME NOTES UNDER DRG. NO. 0000-999-POI-A-023.
2. FOR VACUUM APPLICATION OTHER PORT OF TRANSMITTER SHALL BE KEPT OPEN TO ATMOSPHERE.

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

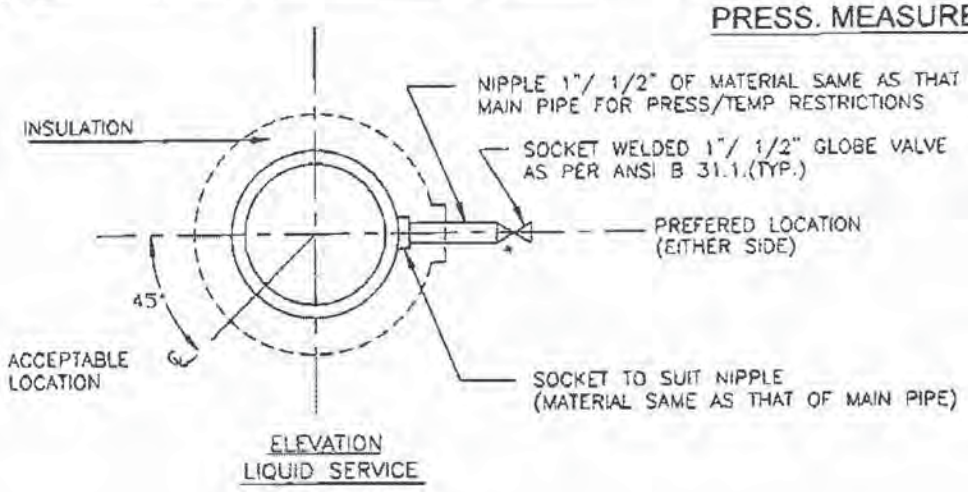
TITLE: INSTRUMENT INSTALLATION DIAGRAM (LEVEL MEASUREMENT-OPEN VESSEL)

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH	APPD	DATE
A	FIRST ISSUE							T.C.			21.08.12
					CLEARED BY						

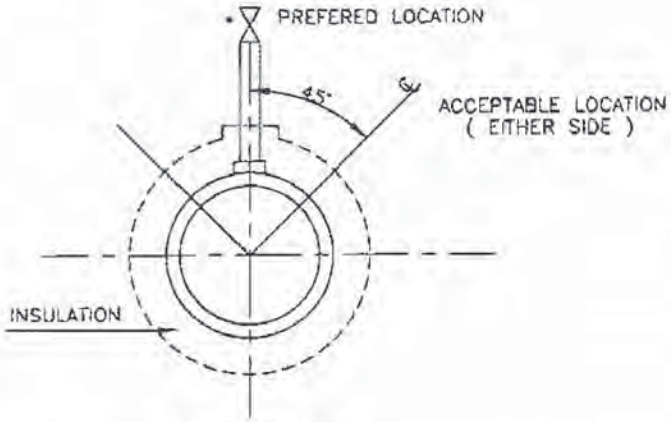
SIZE	SCALE	DRG. NO.	REV NO.
A3	N.T.S	0000-999-POI-A-033	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

PRESS. MEASUREMENT

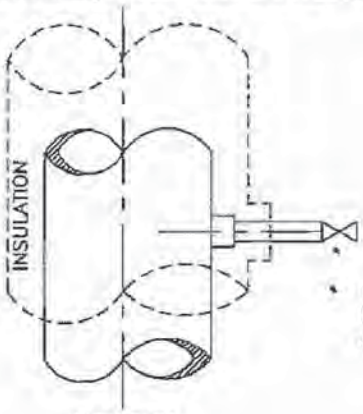


ELEVATION
LIQUID SERVICE



ELEVATION
STEAM SERVICE

PRESSURE CONNECTION ON HORIZONTAL PIPE



* USE DOUBLE ISOLATION VALVES FOR PRESSURE EQUAL TO OR EXCEEDING 40 Kg/Cm2.

ELEVATION
LIQUID OR STEAM SERVICE

PRESSURE CONNECTIONS ON VERTICAL PIPES

FOR TENDER PURPOSE ONLY

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CM	APPD.	APPD.	DATE
A	FIRST ISSUE							T.O.			

CLEARED BY

NTPC — N T P C LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICALTHERMAL POWER PROJECT

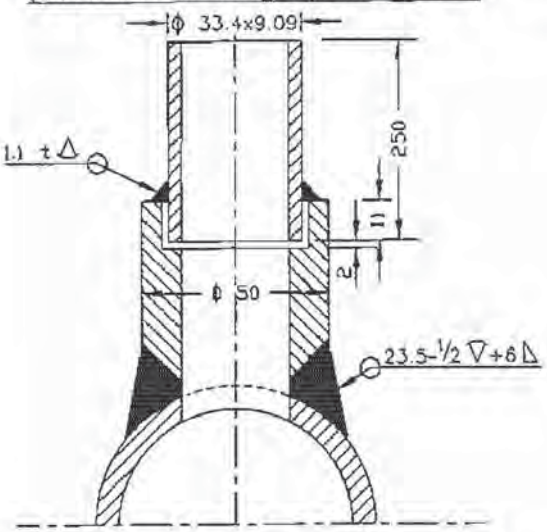
TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035	A

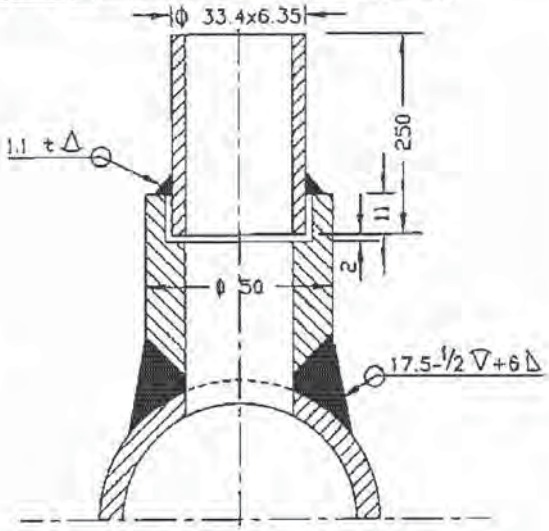
SHEET 9 OF 14

PRESSURE MEASUREMENT

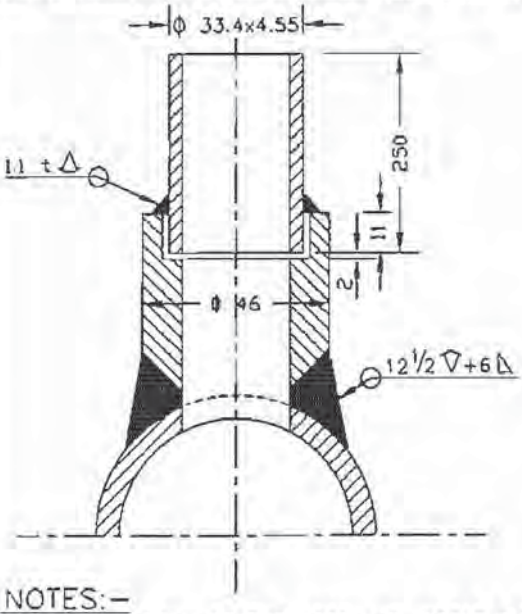
(SYSTEM PR.>40Kg/Sq Cm CL 9000)



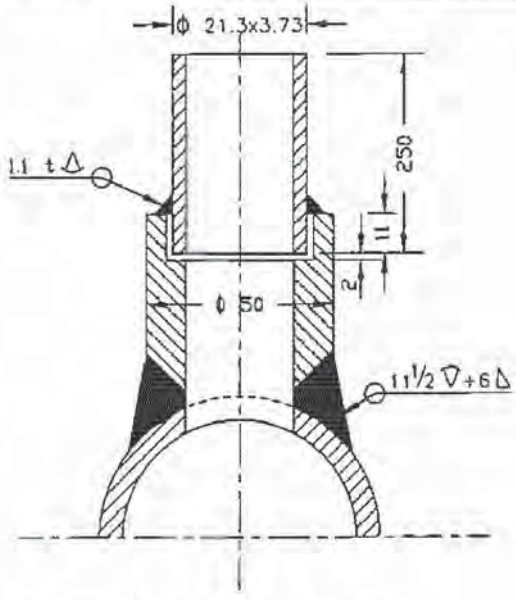
(SYSTEM PR.>40Kg/Sq Cm CL 6000)



(SYSTEM PR. <40Kg/Sq cm Nb 25 CL 3000)



(SYSTEM PR. <40Kg/Sq cm Nb 15 CL 3000)



NOTES:–

1. MATERIAL OF THE BOSS AND NIPPLE SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED AND CONFIRM TO ANSI B 16.11.
2. THE LENGTH OF THE NIPPLE SHOULD BE 250mm.
3. THE OTHER END OF THE NIPPLE SHALL BE SOCKET WELDED WITH 1" GLOBE VALVE OF MATERIAL AS PER ANSI B 16.1.
4. TWO ISOLATED VALVES ARE TO BE USED FOR PRESSURE = >40 Kg/Cm2.
5. EDGE HOLE MUST BE CLEAN AND SQUARE OR ROUNDED SLIGHTLY (1/64" RADIUS) FREE FROM BURRS, WIRE EDGES OR OTHER IRREGULARITIES.
6. ORIENTATION OF TAP WILL BE VARY WITH TYPE OF PROCESS FLUID AND NATURE OF RUN OF THE PIPE.
7. ACTIVITIES TO BE COMPLETED AT THE SHOP, WELD THE COUPLING (OR BOSS) ON THE PIPE AND DRILL PRESSURE CONNECTION HOLE (SAME AS I D OF NIPPLE) IN THE PIPE IN ALLIGNMENT WITH HOLE IN THE COUPLING.
8. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.

FOR TENDER PURPOSE ONLY

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	CLI	ARCH.	APPD.	DATE
A	FIRST ISSUE						T.G.				

CLEARED BY

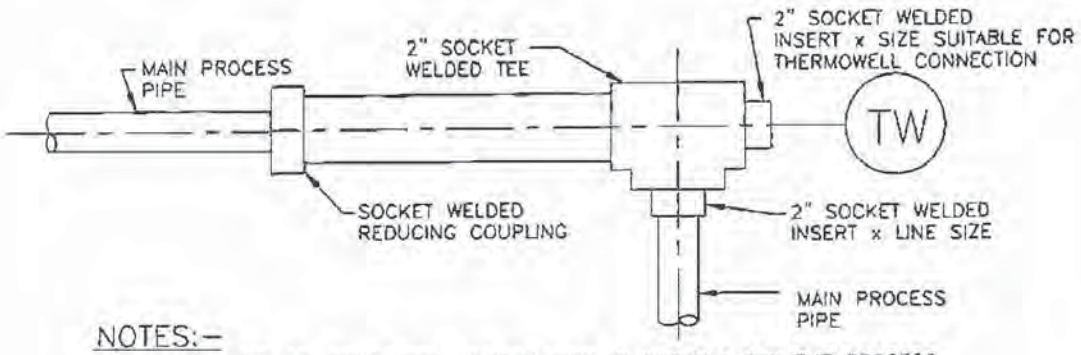
PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 Sh-2 Of 14	A

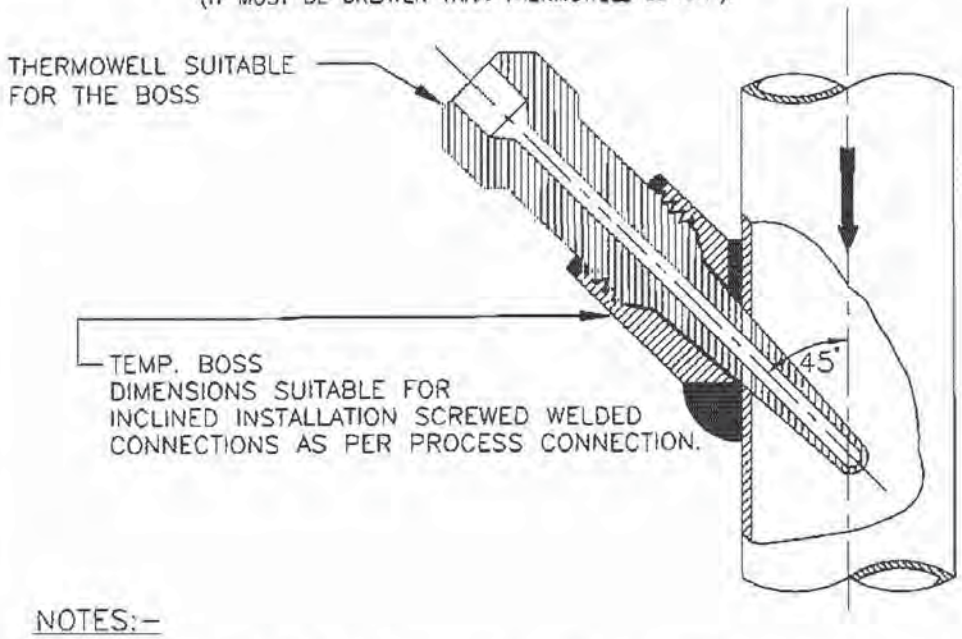
This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

TEMP. MEASUREMENT



NOTES:-

1. THIS TYPE OF THERMOWELL INSTALLATION IS SUITABLE FOR THE PROCESS PIPE OF 2" NPS AND SMALLER.
2. FOR STEAM SERVICE THIS TYPE OF THERMOWELL INSTALLATION 90° BEND MAY BE USED ONLY IN VERTICAL PLANE.
3. THE LENGTH OF THE LARGER PIPE SECTION SHALL BE MINIMUM 150mm (IT MUST BE GREATER THAN THERMOWELL LENGTH).



NOTES:-

1. INCLINED INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MIN. 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF MIN. 3" SIZE OF MAIN PIPING SPECIFICATION SHALL BE USED.
3. THIS TYPE OF INSTALLATION IS APPLICABLE FOR HORIZONTAL AND VERTICAL PIPE SECTION.
4. FOR STEAM SERVICES EXPANDER SECTION MAY BE USED ONLY IN VERTICAL RUN.
5. THE EXPANDER SECTION SHALL BE OF ADEQUATE LENGTH (ATLEAST 3-4 TIMES DIA OF THE MAIN PROCESS PIPE AT BOTH SIDE OF THE INSTALLED THERMOWELL).

FOR TENDER PURPOSE ONLY

NTPC — N T P C LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

REV NO	DESCRIPTION	DRAWN	DESIGN	CHKD	M	E	C	CLI	ARCH	APPD	DATE
A	FIRST ISSUE							T.G.			

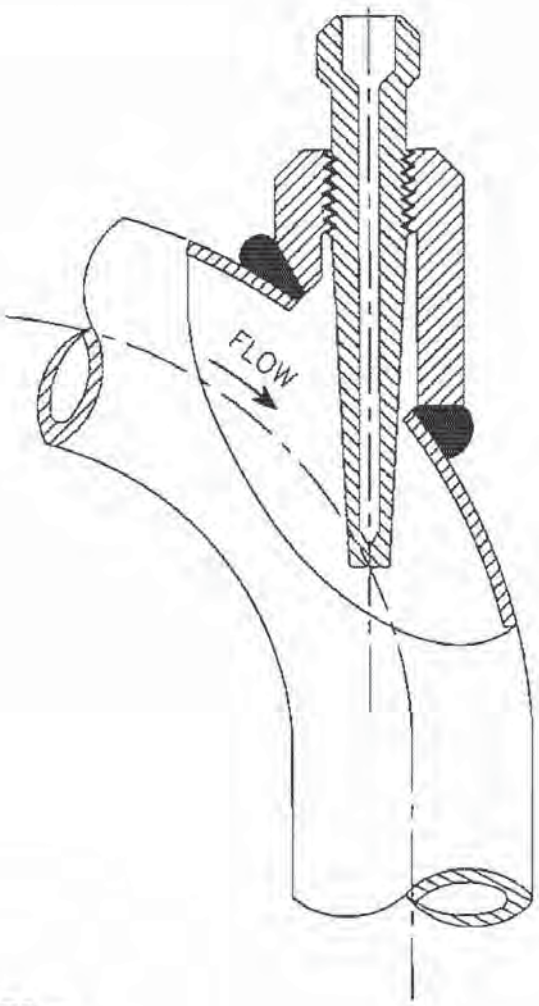
CLEARED BY

PROJECT: TYPICAL THERMAL POWER PROJECT (SG PACKAGE)

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO	REV. NO.
A4	N.T.S.	0000-999/102-POI-A-035	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



NOTES:-

1. FLOW INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MINIMUM 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF ELBOW FORM (AS SHOWN) OF MINIMUM 3" SIZE SHALL BE USED.
3. ELBOW EXPANDER SECTION IN HORIZONTAL PLANE MAY BE USED FOR LIQUID SERVICES. ONLY STEAM SERVICES EXPANDER SECTION MAY BE USED IN VERTICAL PLAN.

FOR TENDER PURPOSE ONLY

NTPC

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	T.C. DSJ	ARCH.	APPD.	DATE
A.	FIRST ISSUE										

CLEARED BY

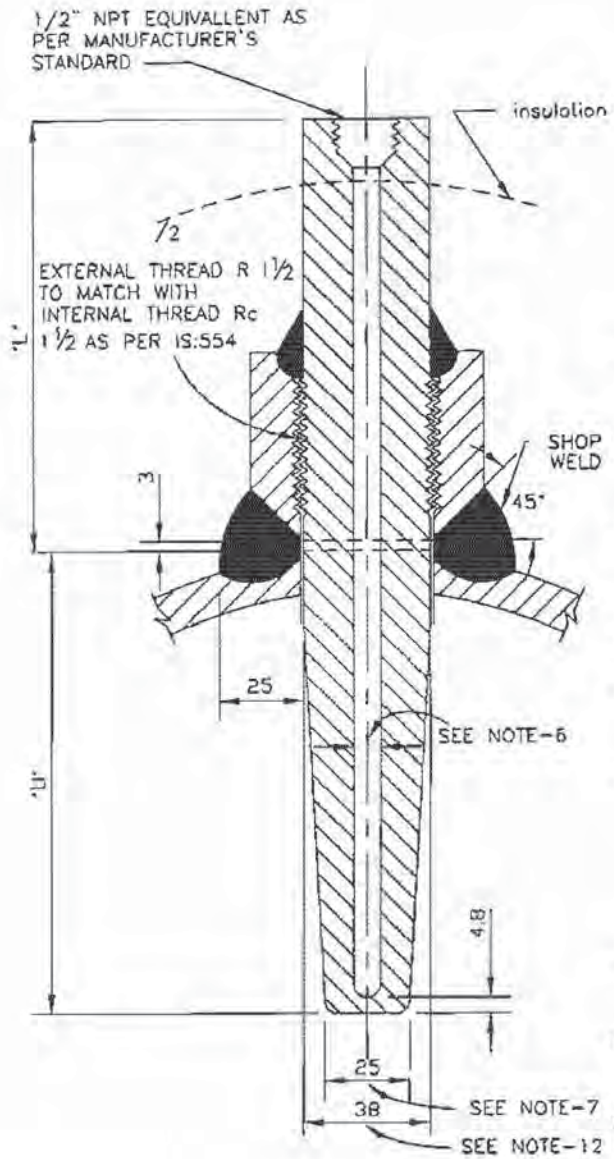
PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 SH-3 OF 14	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

TEMP. MEASUREMENT



NOTES:-

1. THIS TYPE OF TEMPERATURE BOSS SHALL BE USED FOR THE PROCESS PRESS EQUAL/ABOVE 40 Kg/Cm2(g).
2. THE MATERIAL OF THE BOSS SHOULD BE SIMILAR TO THAT OF PIPING MATERIAL OF SPECIFICATION.
3. ALL WELD TO BE TESTED IN ACCORDANCE WITH APPLICABLE CODES BY MANUFACTURER.
4. MATERIAL OF THE THERMOWELL SHALL BE OF 316SS.
5. THERMOWELL SHALL BE DRILLED BARSTOCK TYPE.
6. INTERNAL BORE OF THE THERMOWELL SHOULD BE SELECTED BASED ON THE NORMAL SIZE OF THE SENSING ELEMENT AS PER ASME,PTC-19.3.
7. THE BOTTOM DIAMETER OF THE THERMOWELL TYPICALLY SHOWN HERE SHALL BE SUBJECT TO VARIATION BASED ON THE INTERNAL BORE OF THERMOWELL AND THICKNESS OF THERMOWELL MATERIAL TO WITHSTAND THE PROCESS PRESS AND TEMP..AS PER ASME,PTC-19.3.
8. THE TYPE OF TAPERED THERMOWELL SHALL BE USED FOR LIQUID VELOCITIES UP TO 92M.P.S.(300F.T.P.S.).
9. THERMOWELL WITH THE INSULATION LAG EXTENSIONS SHALL BE USED WHEREVER APPLICABLE.
10. ACTIVITIES TO BE COMPLETED AT THE SHOP. WELD THE BOSS ON THE PIPE AND DRILL THE HOLE IN THE PIPE IN ALLIGNMENT WITH HOLE IN THE BOSS. PROVIDE INTERNAL THREAD AS PER IS:554 TO MATCH WITH THE THERMOWELL EXTERNAL THREAD.
11. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.
12. WIILL BE SUITABLE TO MATCH THE STUB DIMENSIONS AS PER RC 1½
13. THE "U" & "L" DIMENSIONS SHALL BE BE SELECTED BASED ON PARTICULAR APPLICATION AND THE SAME SHALL BE SUBJECT TO OWNER'S APPROVAL DURING DETAILED ENGINEERING.
14. ALL DIMENSIONS ARE INDICATIVE ONLY.

FOR TENDER PURPOSE ONLY

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	QA	ARCH.	APPD.	DATE
A	FIRST ISSUE										

CLEARED BY

NTPC — NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

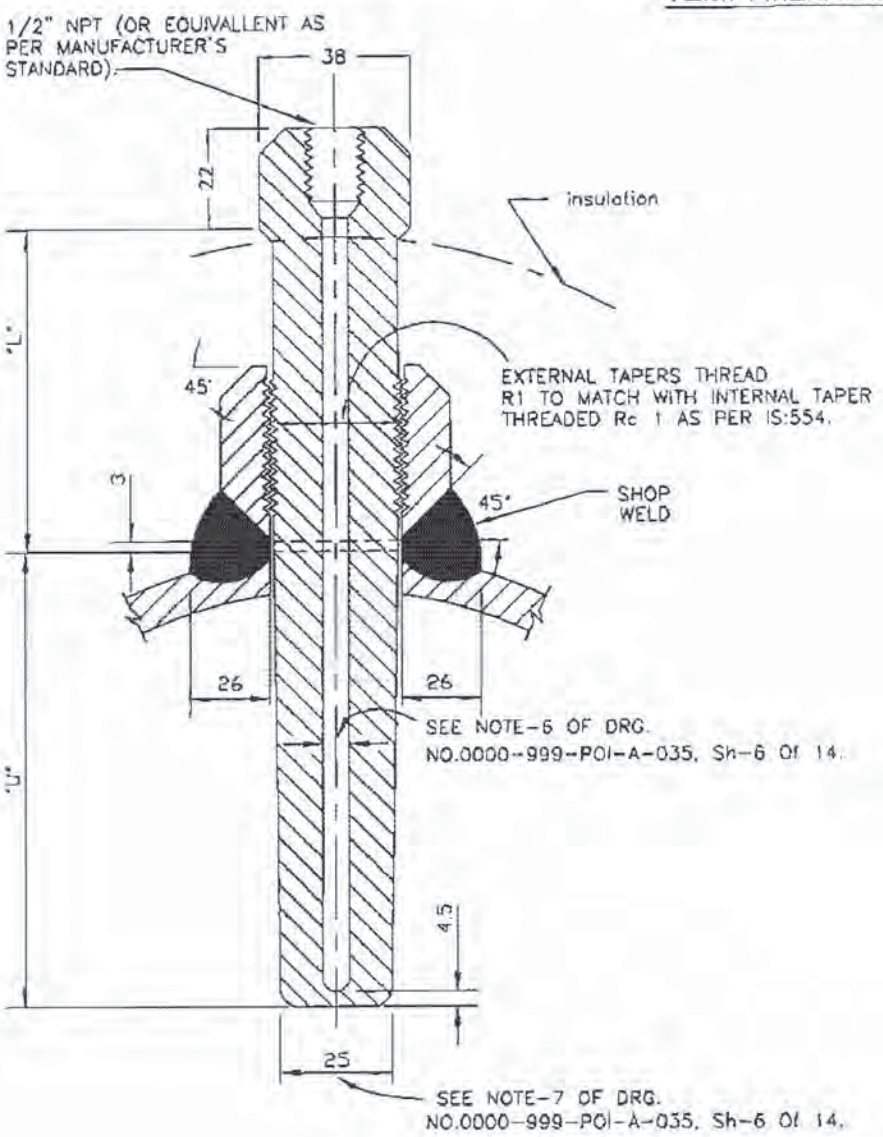
PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 SH-6 OF 14	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

TEMP. MEASUREMENT



NOTES:-

1. THIS TYPE OF TEMPERATURE BOSS IS APPLICABLE FOR THE PROCESS PRESSURE/TEMPERATURE BELOW 40 Kg/Cm2(g)/400°C
2. FOR PRESSURE TIGHT JOINTS THE BOSS SHOULD HAVE INTERNAL TAPERED PIPE THREAD Rc 1 AS PER IS:554. THE LENGTH OF THREAD ENGAGEMENT SHOULD BE AS PER ABOVE STANDARD.
3. PIPES HAVING PROBABILITY OF PROLONGED VIBRATION SEAL WELDING MAY BE DONE ALL AROUND AFTER TIGHTENING THERMOWELL WITHIN THE BOSS.
4. SEE NOTES-2 TO 14 OF DRG. NO. 0000-999-POI-A-035, Sh-6 Of 14.

FOR TENDER PURPOSE ONLY

REV NO.	DESCRIPTION	DRAWN	DESIGN	CHKD	M	E	C	CM	ARCH.	APPD	DATE
A	FIRST ISSUE							T.C.			

CLEARED BY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

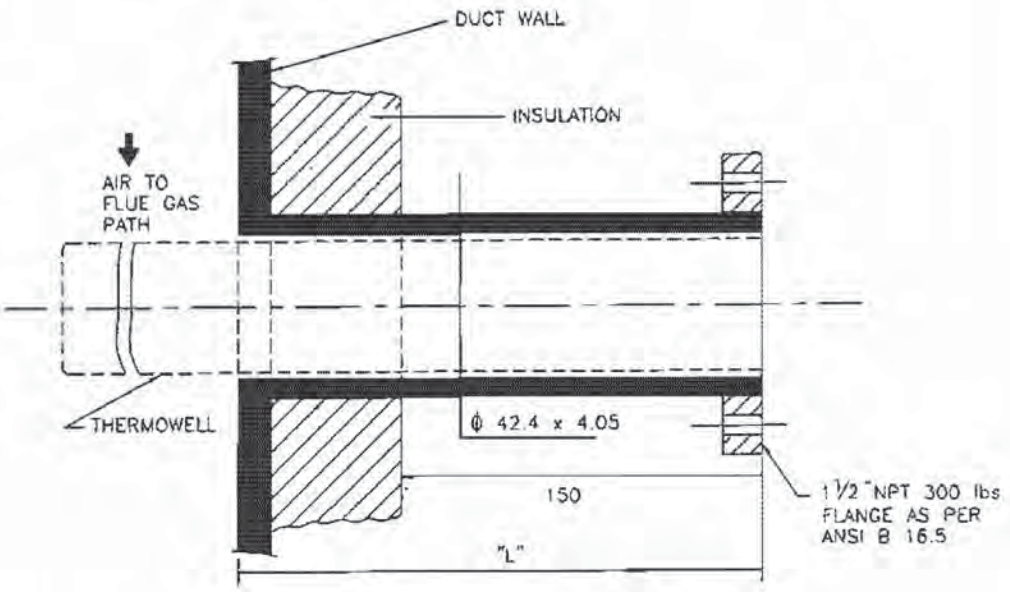
PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 Sh-7 Of 14	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means wihout the written permission.

TEMP. MEASUREMENT



NOTES:-

1. THIS TYPE OF TEMPERATURE CONNECTIONS SHALL BE PROVIDED FOR TEMPERATURE MEASUREMENT IN AIR AND FLUE GAS DUCT.
2. MATERIAL OF THERMOWELL SHALL BE OF 316SS.
3. EXTERNAL CONNECTION SHALL BE OF SLIP ON FLANGED TYPE AND THERMOWELL DESIGN SHALL BE AS PER ASME.PTC-19.3 (REFER NOTES 9&10 OF DRG.NO. 0000-999-POI-A-035, Sh-6 Of 14).
4. BIDDER TO SUPPLY AND INSTALL THE COUNTER FLANGED AND THERMOWELL (ALONG WITH TEMP. ELEMENT).
5. ALL DIMENSIONS ARE INDICATIVE ONLY.

FOR TENDER PURPOSE ONLY

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	O&I	MECH	APPD.	DATE
A	FIRST ISSUE							Y.G.			

CLEARED BY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

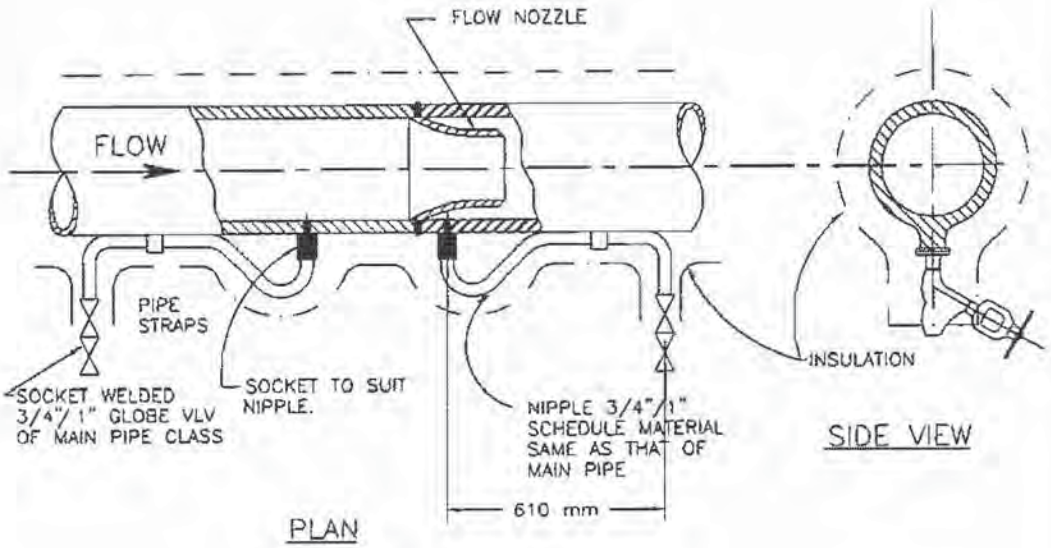
PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO.	REV. NO
A4	N.T.S.	0000-999-POI-A-035 Sh-8 Of 14	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

FLOW MEASUREMENT



NOTES:-

1. THIS METHOD OF CONNECTING NIPPLES AND VALVES ON THE HORIZONTAL PIPE IS APPLICABLE FOR MEASUREMENT OF STEAM AT TEMP. ABOVE 455°C .
2. FOR STEAM SERVICE IN HORIZONTAL PIPE THE PRESSURE HOLES AND CONNECTING NIPPLES SHOULD BE IN THE HORIZONTAL PLANE OF THE PIPE CENTRE LINE.
3. THE ENTIRE LENGTH OF THESE NIPPLES AS WELL AS SHUT OFF VALVES SHOULD BE LAGGED IN WITH STEAM LINE AS SHOWN IN THE DRAWING.
4. FLOW ELEMENTS SHALL BE PROVIDED WITH 3 PAIRS OF TAPPING POINTS.

FOR TENDER PURPOSE ONLY

NTPC — NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	E	T.G. CLI	ARCH.	APPD.	DATE
A	FIRST ISSUE										

CLEARED BY

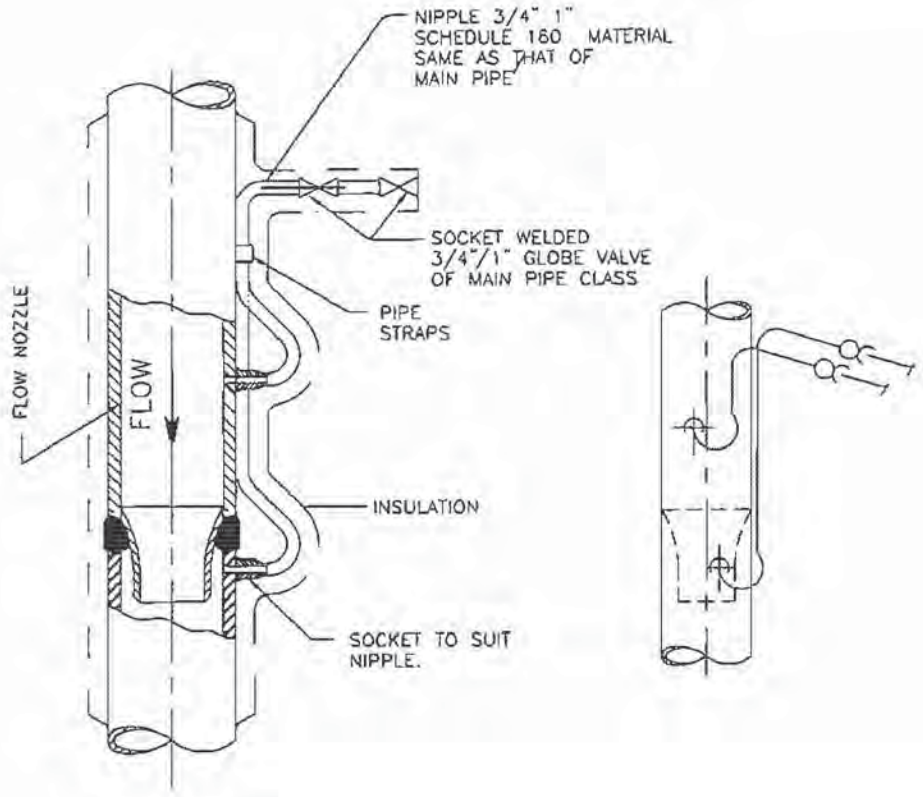
PROJECT: TYPICALTHERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 Sh-9 Of 14	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means wilhout the written permission.

FLOW MEASUREMENT



ELEVATION

NOTES:-

1. THIS METHOD OF CONNECTING NIPPLES AND VALVES ON THE VERTICAL STEAM PIPE IS APPLICABLE FOR MEASUREMENT OF STEAM AT TEMP. ABOVE 455°C
2. THE ENTIRE LENGTH OF THESE NIPPLES AS WELL AS SHUT OFF VALVES SHOULD BE LAGGED IN WITH STEAM LINE AS SHOWN IN THE DRAWING.
3. ON VERTICAL STEAM PIPE BOTH HIGH TEMPERATURE (SPECIAL VENTS) NIPPLES WILL BE LONG ENOUGH SO THAT HIGH AND LOW PRESSURE CONNECTION NIPPLES WILL BE AT SAME LEVEL.
4. UP STREAM AND DOWN STREAM PRESSURE CONNECTIONS MUST BE INSTALLED IN DIFFERENT PLANES PASSING THROUGH THE CENTRE OF THE PIPE.
5. FLOW ELEMENTS SHALL BE PROVIDED WITH 3 PAIRS OF TAPPING POINTS.

FOR TENDER PURPOSE ONLY

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	W	E	C	T.G. CM	ARCH.	APPD.	DATE
A	FIRST ISSUE										

CLEARED BY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

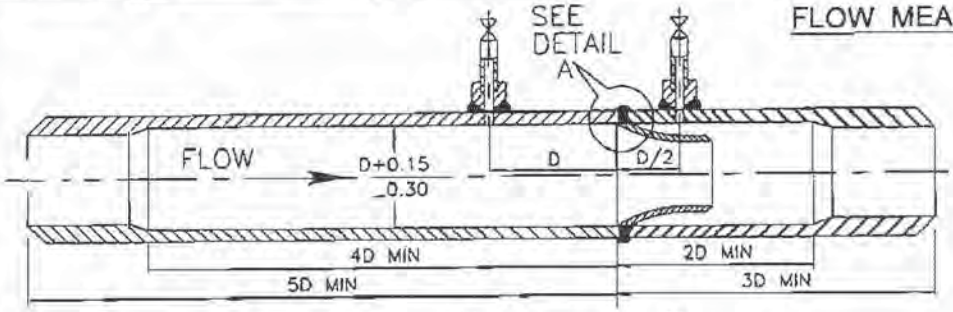
PROJECT: TYPICALTHERMAL POWER PROJECT

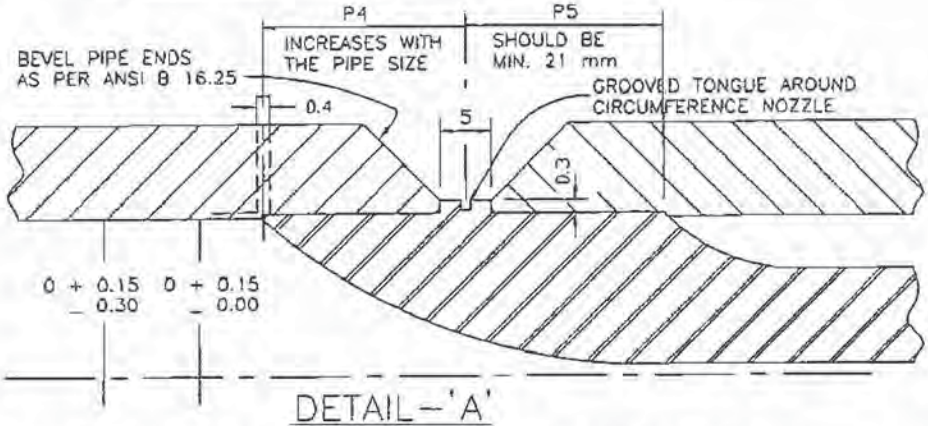
TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 Sh-10 OF 14	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

FLOW MEASUREMENT





DETAIL – 'A'

NOTES:–

1. COMPLETE FLOW NOZZLE BRANCH ASSEMBLY ALONG WITH NIPPLES AND SOURCE ISOLATION VALVES SHALL BE SUPPLIED BY THE BIDDER. THE BIDDER ALSO TO INSTALL FLOW NOZZLE WITHIN THE MACHINED BRANCH, PRESSURE STUBS ON THE BRANCH PIPE (FOR ORIENTATION OF PRESSURE TAP REF. NOTE–3) ALONG WITH NIPPLE AND SOURCE ISOLATION VALVES.
2. THE MACHINING OF BRANCH PIPE SHOULD BE DONE AFTER PRESSURE CONNECTIONS HAVE BEEN WELDED TO PIPE AND ALSO EXTEND FOR ATLEAST 4D IN THE INLET SECTION, 2D IN THE OUTLET SECTION, MEASURED FROM THE INLET FACE OF FLOW NOZZLE. TOTAL BRANCH PIPE ASSEMBLY SHOULD BE ATLEAST A LENGTH OF 8D/5D IN THE INLET SECTION AND 3D IN THE OUTLET SECTION, MEASURED FROM THE INLET FACE OF THE FLOW NOZZLE AS SHOWN ABOVE.
3. ON HORIZONTAL PIPE RUN PRESSURE CONNECTIONS ARE TO BE LOCATED ON SIDES OF THE PIPE FOR LIQUID AND STEAM SERVICE AND ON THE TOP FOR DRY GAS SERVICE FOR PROCESS LIQUIDS, INSTALLATION OF PRESS. TAPS MAY BE ALLOWED WITHIN AN ANGLE OF 45° ELBOW HORIZONTAL FOR SPECIAL CASES BUT NO BOTTOM CONNECTIONS ARE ALLOWED.
4. THE LOCATION OF PRESSURE TAPS MUST BE WITHIN 1.5 mm(1/16") OF DISTANCE SPECIFIED AND NUMBER OF PAIRS OF PRESSURE TAPS TO BE PROVIDED WILL BE AS PER FLOW MEASUREMENT DATA SHEET.
5. PRESSURE TAPS SHOULD BE DRILLED RADIALLY WITH RESPECT TO PIPE AND THIS DRILLING SHOULD BE DONE AFTER ANY COUPLING FOR ATTACHING THE PRESSURE TUBING HAS BEEN WELDED TO THE PIPE. THE HOLE WHERE IT BREAKS THROUGH THE INNER SURFACE OF THE PIPE MUST BE FREE OF BURRS OR WIRE EDGE AND CORNER OF EDGE HOLE LEFT ROUNDED VERY SLIGHTLY (1/64" RADIOUS).
6. RECOMMENDED MAXIMUM DIAMETERS OF PRESSURE TAP HOLES IN THE BRANCH PIPES WILL BE AS PER EN ISO 5167:2003. THE DIAMETER FOR HOLE SHOULD REMAIN SAME FOR DISTANCE NOT LESS THAN 2.5 TIME OF DIA FROM THE INNER SURFACE OF THE PIPE.
7. FLOW NOZZLE SHALL BE CENTRED IN THE PIPE WITHIN 0.8 mm (1/32") OF THE PIPE AXIS. INSIDE DIAMETER MEASURED AT FOUR POINTS AT ANY CROSS SECTION SHALL NOT DIFFER BY MORE THAN 1%.
8. BRANCH PIPE SHALL BE AS PER MAIN PIPING MATERIAL SPECIFICATION. INTERNAL SURFACE OF BORED SECTIONS MUST BE SMOOTH AND STRAIGHT, FREE FROM SCALES, PITS, BURRS OR ANY IRREGULARTIES.
9. FLOW NOZZLE MATERIAL SHALL BE 316 SS AND THE DESIGN AS PER ASME.
10. MAXIMUM UPSTREAM AND DOWN STREAM STRAIGHT LENGTH REQUIRED FROM INLET FACE OF FLOW NOZZLE SHALL BE AS PER EN ISO 5167:2003.

FOR TENDER PURPOSE ONLY

NTPC — N T P C LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

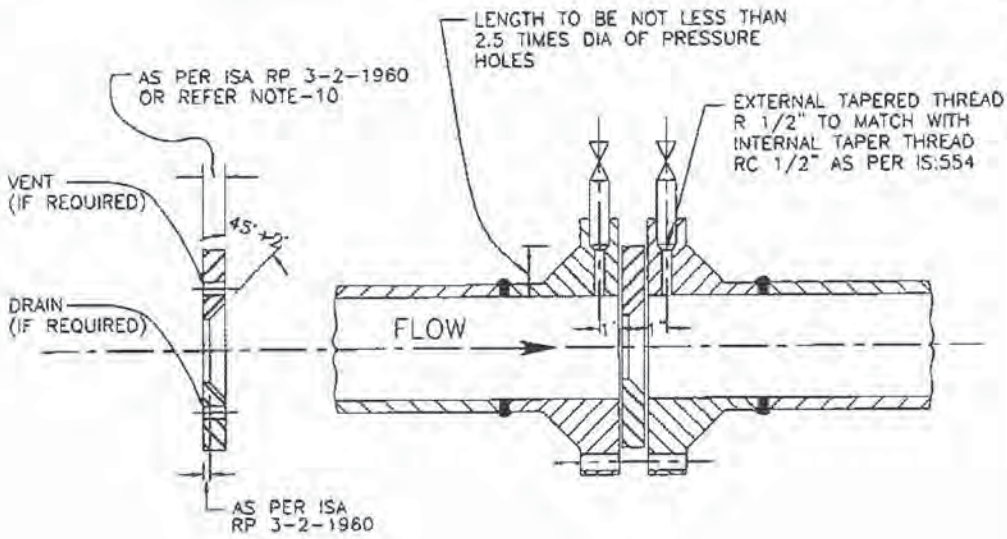
TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	T.C. / C&I	ARCH.	APPD.	DATE
A	FIRST ISSUE							T.G.			

CLEARED BY

SIZE	SCALE	DRG. NO.	REV. NO
A4	N.T.S.	0000-999-POI-A-035	A

FLOW MEASUREMENT



NOTES:-

1. ORIFICE PLATE MOUNTED BETWEEN FLANGES WITH FLANGE TAPPING (AS SHOWN ABOVE) SHOULD BE LIMITED TO PIPE SIZES OF 2" OR LARGER.
2. ORIFICE PLATE SHALL BE MOUNTED BETWEEN PIPING FLANGES WITH THE SHARP EDGE FACING UPSTREAM SUCH THAT CENTRE OF THE CONCENTRIC ORIFICE SHOULD BE WITHIN 0.79 mm (1/32") OF THE AXIS OF THE PIPE.
3. TWO GASKETS SHALL BE INSERTED BETWEEN THE PLATE AND THE FLANGES AND INSIDE DIAMETER OF THE GASKETS SHOULD BE ATLEAST 1.5 mm (1/16") GREATER THAN THE INSIDE DIAMETER OF THE PIPE SO THAT THEY DO NOT PROTRUDE INTO THE PIPE.
4. PIPING FLANGES SHALL BE ANSI WELD NECK, RAISED FACE TYPE. THE FLANGE IS TO BE ALIGNED WITH THE FACE PERPENDICULAR TO THE FLOW AXIS.
5. BIDDER TO SUPPLY ORIFICE PLATE SPECIAL TYPE (HAVING PRESS. CONNECTIONS) OF FLANGES ALONG WITH GASKETS, NIPPLES AND SOURCE VALVES.
6. ON HORIZONTAL PIPE RUN PRESSURE CONNECTIONS ARE TO BE TAKEN FROM SIDES FOR LIQUID AND STEAM SERVICE AND FROM TOP FOR DRY GAS SERVICE. FOR PROCESS LIQUIDS INSTALLATION OF PRESSURE TAPS MAY BE ALLOWED WITHIN AN ANGLE OF 45° ELBOW THE HORIZONTAL IN SPECIAL CASES BUT NO BOTTOM CONNECTIONS ARE ALLOWED.
7. THE LOCATION OF PRESSURE TAPS MUST BE WITHIN 1.5 mm (1/16") OF THE DISTANCE SPECIFIED.
8. MAXIMUM DIAMETER OF PRESS. CONNECTION HOLES SHALL BE AS PER RECOMMENDATIONS OF ASME PTC 19.5. THE DIAMETER OF THE HOLE SHOULD REMAIN THE SAME FOR A DISTANCE NOT LESS THAN 2.5 TIMES OF THE DIAMETER BEFORE EXPANDING INTO THE PRESSURE PIPE.
9. THERE MUST BE NO BURRS WIRE EDGES OR OTHER IRREGULARTIES ALONG THE EDGE OF THE HOLE AND IT MUST BE SQUARE AND ROUNDED SLIGHTLY (1/64" RADIUS).
10. ORIFICE PLATE SHOULD BE FLAT WITHIN 0.02 mm (0.001") AND THE SURFACE ROUGHNESS SHOULD NOT EXCEED 20 MICRO INCH. THE THICKNESS OF THE ORIFICE PLATE SHOULD BE AS PER EN ISO 5167:2003.
11. FOR HORIZONTAL PIPE RUN DRAIN HOLES IN ORIFICE PLATES ARE AT THE BOTTOM (APPROX. TANGENT TO INSIDE DIA OF PIPE) FOR STEAM OR GAS SERVICE. VENT HOLES SHOULD BE LOCATED ON UPPER SIDE FOR INCOMPRESSIBLE FLUID.
12. ORIFICE PLATE SHOULD BE OF 316 SS (ASTM A167-54 GRADE-II).
13. RECOMMENDED MINIMUM LENGTHS OF STRAIGHT PIPE PRECEDING AND FOLLOWING ORIFICES SHALL BE AS PER EN ISO 5167:2003.
14. THREE PAIRS OF PRESSURE TAPS SHALL BE PROVIDED WITH NIPPLES OF REQUIRED LENGTH AND SOURCE VALVES AND THE UN-USED TAPS ARE PLUGGED.
15. THE INTERNAL TAPERED CONNECTION WITHIN THE FLANGE FOR PRESSURE TAPS SHOULD BE RC 1/2" AND THE NIPPLE SHOULD ALSO OF EXTERNAL THREADED R 1/2" AS PER IS:554. THE LENGTH OF THREADED ENGAGEMENT SHALL BE AS PER ABOVE STANDARD.

FOR TENDER PURPOSE ONLY

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

NTPC

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD.	DATE
A	FIRST ISSUE							T.Q.			

CLEARED BY

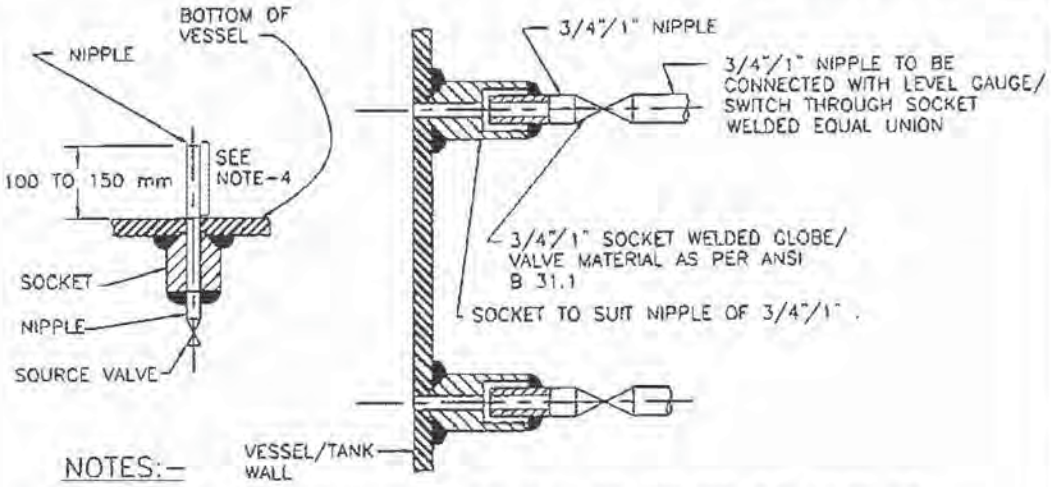
PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 SH-12 OF 14	A

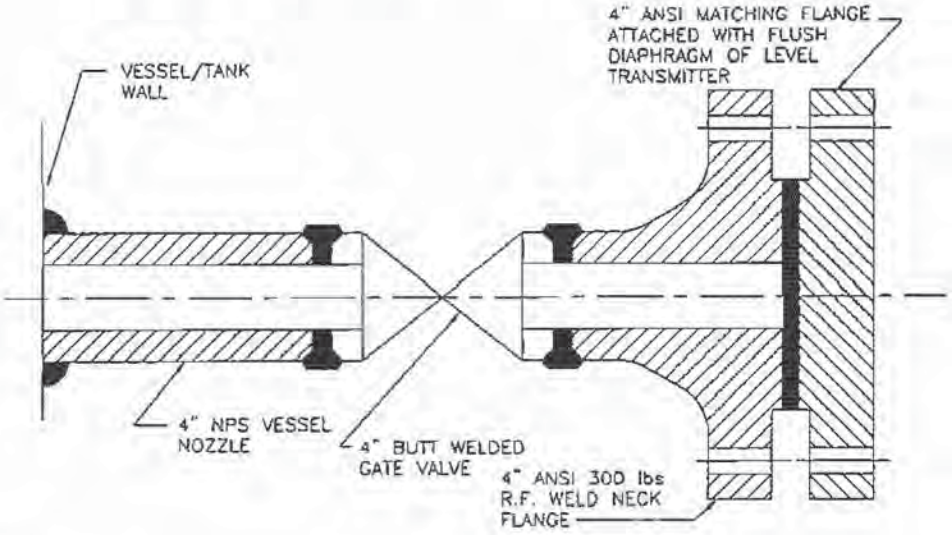
This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

LEVEL MEASUREMENT



NOTES:-

1. THIS TYPE OF PROCESS CONNECTION SHALL BE USED FOR LEVEL GAUGE AND EXTERNAL CAGE TYPE FLOAT OR DISPLACER OPERATED LEVEL SWITCH.
2. FOR GAUGES 3/4" NIPPLE ALONG WITH 3/4" SW SOURCE VALVE AND FOR SWITCHES 1" NIPPLE ALONG WITH 1" SW SOURCE VALVE SHALL BE PROVIDED AS PROCESS CONNECTION.
3. SOURCE CONNECTION ON VESSEL SHOULD NOT BE LOCATED AT PLACES SUBJECTED TO INTERFACE AND TURBULENCE FROM INLETS AND OUTLETS.
4. IF LOWER CONNECTION IS TAKEN FROM BOTTOM OF THE VESSEL THEN THE NIPPLE MUST BE 100 mm TO 150 mm ABOVE THE BOTTOM OF THE VESSEL.



NOTES:-

1. THIS TYPE OF PROCESS CONNECTION SHALL BE PROVIDED FOR TANK LEVEL MEASUREMENT OF VISCOUS OR CORROSIVE LIQUID USING FLUSH DIAPHRAGM/WAFER TYPE LEVEL TRANSMITTER.
2. WELDING OF MATCHING FLANGE TO GATE VALVE SHALL BE DONE BY BIDDER.

FOR TENDER PURPOSE ONLY

NTPC — NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	U	E	C	CKT	MECH.	APPD.	DATE
A	FIRST ISSUE							T.C.			

CLEARED BY

PROJECT: TYPICALTHERMAL POWER PROJECT

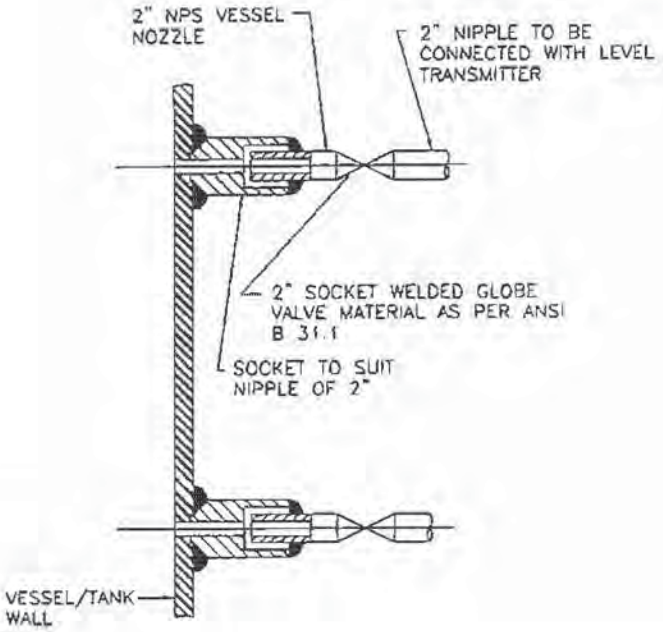
TITLE: INSTRUMENT SOURCE CONNECTION DETAILS

SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035	A

SH-13 OF 14

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.

LEVEL MEASUREMENT



NOTES:-

1. THIS TYPE OF PROCESS CONNECTION SHALL BE USED FOR DISPLACER TYPE LEVEL TRANSMITTER.
2. SOURCE CONNECTION ON VESSEL SHOULD NOT BE LOCATED AT PLACES SUBJECTED TO INTERFACE AND TURBULENCE FROM INLETS AND OUTLETS.
3. IF LOWER CONNECTION IS TAKEN FROM BOTTOM OF THE VESSEL THEN THE NIPPLE MUST BE 100 mm TO 150 mm ABOVE THE BOTTOM OF THE VESSEL.

FOR TENDER PURPOSE ONLY

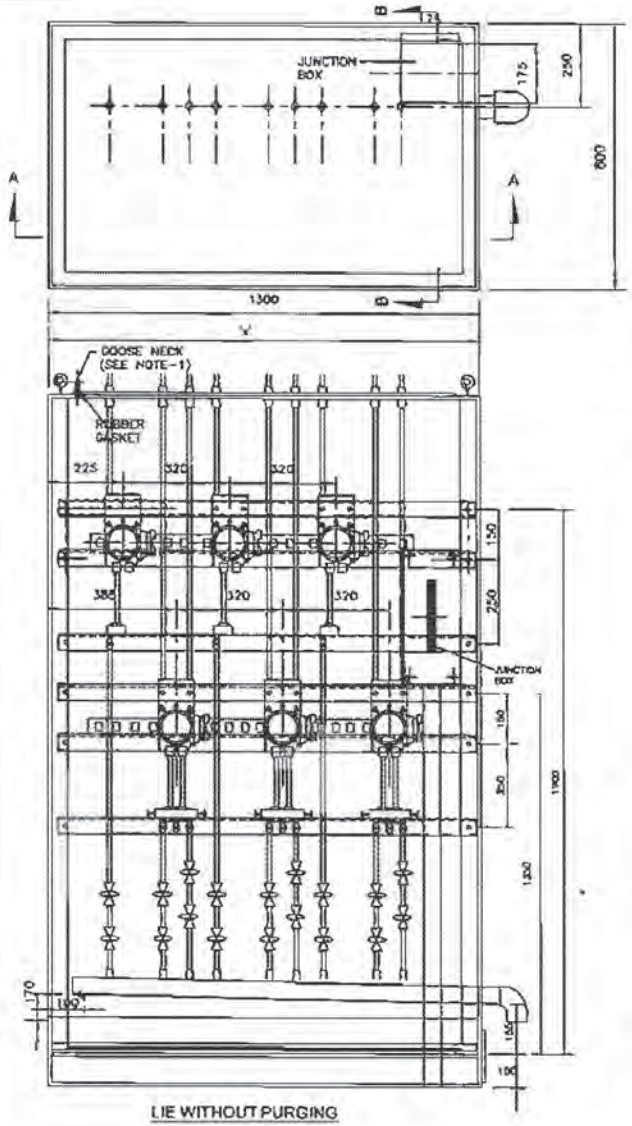
REV NO.	DESCRIPTION	DRAWN	DESIGN	CHKD	M	E	C	DH	ARCH.	APPD.	DATE
A	FIRST ISSUE							T.G.			

CLEARED BY

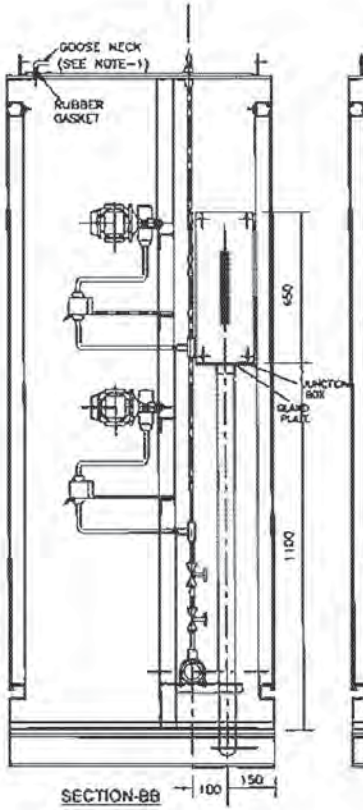
NTPC — NTPC LIMITED (A GOVERNMENT OF INDIA ENTERPRISE) ENGINEERING DIVISION

PROJECT	TYPICAL THERMAL POWER PROJECT
TITLE	INSTRUMENT SOURCE CONNECTION DETAILS

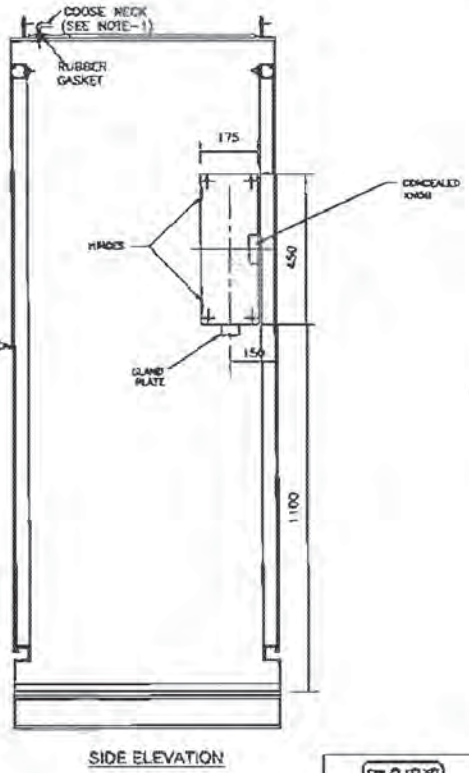
SIZE	SCALE	DRG. NO.	REV. NO.
A4	N.T.S.	0000-999-POI-A-035 SH:- 14 OF 14	A



LIE WITHOUT PURGING



SECTION-BB



SIDE ELEVATION

LIE TYPE	MAX. NO. OF TRANSMITTERS	DIMENSION 'X' (mm)
A	6	1250
B	4	830
C	2	830

NOTES:-

1. TO BE PROVIDED FOR LIEs USED IN STEAM & WATER APPLICATION.
2. MATERIAL OF JBs FOR LIEs SHALL BE SAME AS THAT OF LIE.

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK

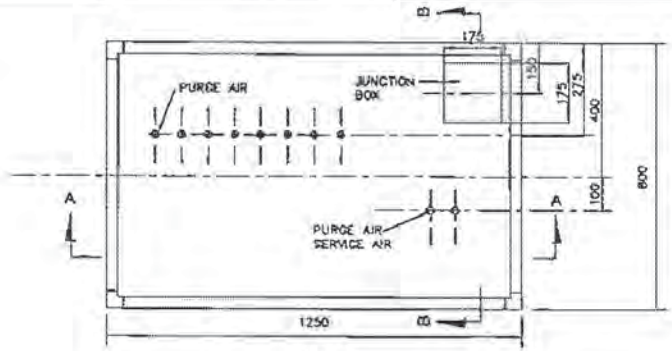
REV. NO	DESCRIPTION	DRAWN	DESIGN	CHKD	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE							T.G.			31.05.18

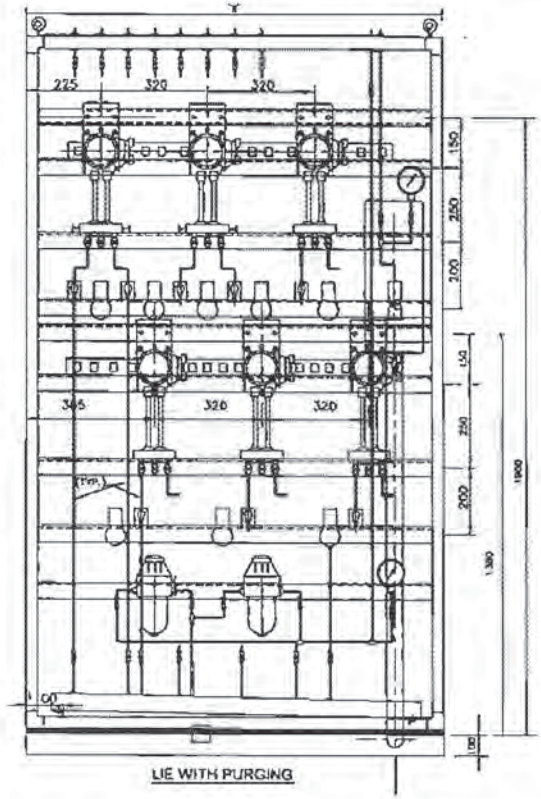
CLEARED BY

SIZE: A2 | SCALE: N.T.S. | DRG. NO.: 0000-999-POI-A-064 SHEET 01 OF 03 | REV. NO.: B

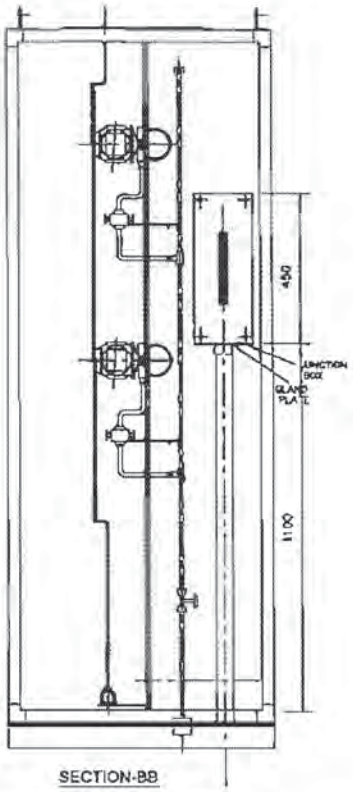
The document is the property of NATIONAL THERMAL POWER CORPORATION LTD. No part of this document shall be reproduced by any means without the written permission.

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD
No part of this document will be reproduced by any means without the written permission.





LIE WITH PURGING



SECTION-BB

LIE TYPE	MAX. NO. OF TRANSMITTERS	DIMENSION 'X' (mm)
A	6	1300
B	4	980
C	2	680

NOTES:-

1. MATERIAL OF JBs FOR LIEs SHALL BE SAME AS THAT OF LIE.

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

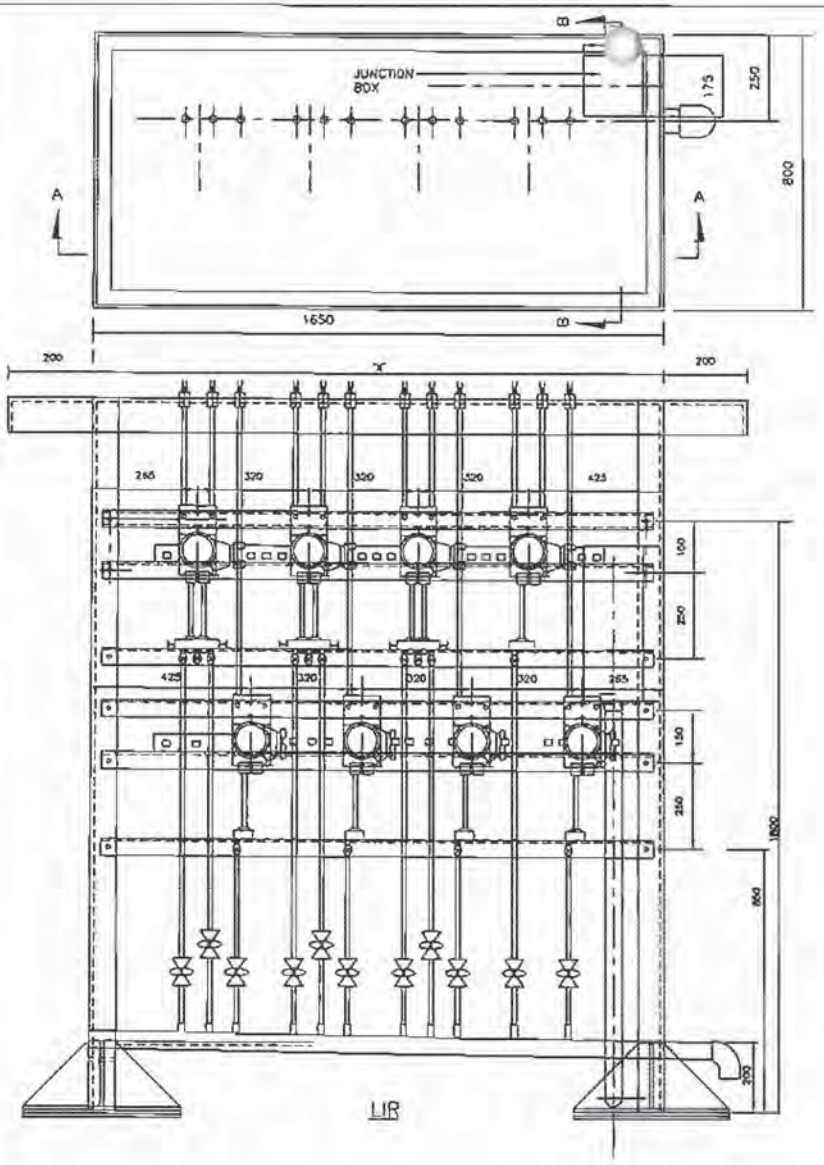
TITLE: TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	T.O. Gen	ARCH.	APPD	DATE
A	FIRST ISSUE										

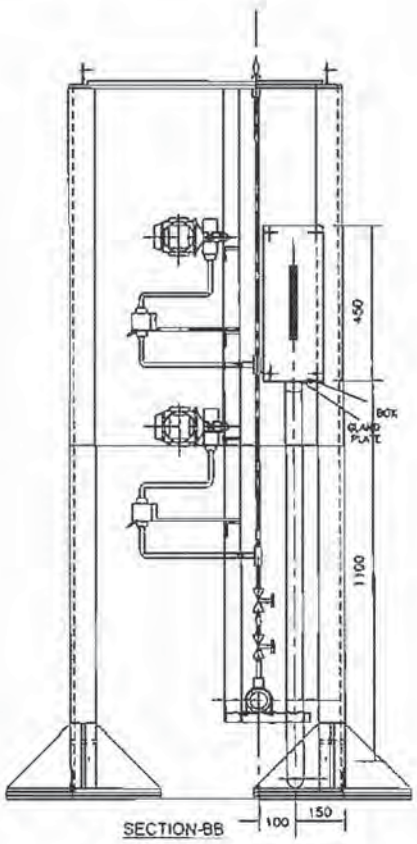
CLEARED BY

SIZE	SCALE	DRG. NO.	REV. NO.
A2	N.T.S.	0000-999-POI-A-084 SH- 02 OF 03	B

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



LIR TYPE	MAX. NO. OF TRANSMITTERS	DIMENSION 'X' (mm)
A	8	1650
B	5	1330
C	4	1010



NOTE:-

1. MATERIAL OF JBs FOR LIRs SHALL BE SAME AS THAT OF LIR.

SECTION-AA
LIR WITHOUT PURGING

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

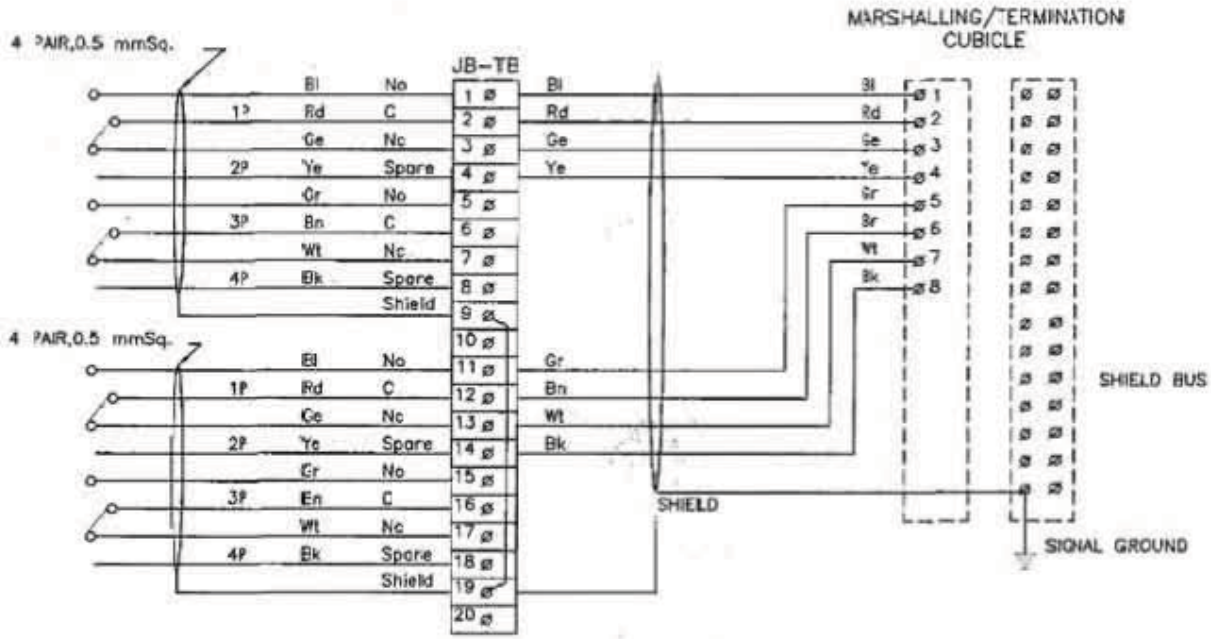
TITLE: TYPICAL GA OF LOCAL INSTRUMENT ENCLOSURE / RACK

REV.NO	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE						T.C.				21.08.12

CLEARED BY

SIZE	SCALE	DRG. NO.	REV. NO.
A3	N.T.S.	0000-999-POI-A-064 SH- 03 OF 03	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



FOR TENDER PURPOSE ONLY

एन टी पी सी लिमिटेड
NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

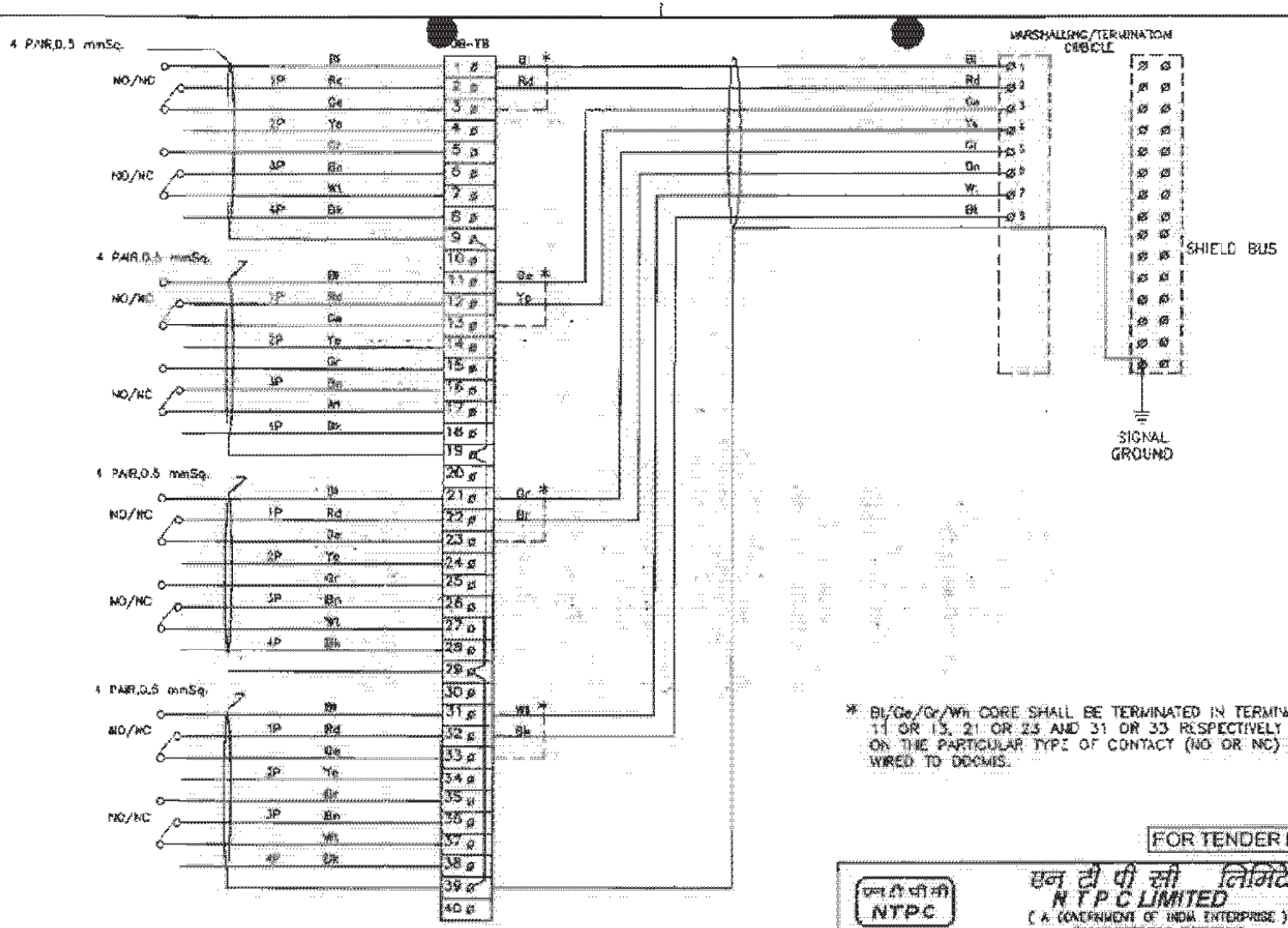
TITLE: INTERFACING OF FIELD INSTRUMENTS/ SWGR SWITCH (COC) TERMINATION DETAILS

REV.NO.	DESCRIPTION	DRWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APP'D	DATE
A	FIRST ISSUE										29.04.06

CLEARED BY

SIZE	SCALE	DRG. NO.	REV. NO.
A3	NTS	0000-999-POI-A-065 SH 01 OF 14	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



FOR TENDER PURPOSE ONLY

एन टी पी सी लिमिटेड
NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TYPICAL THERMAL POWER PROJECT

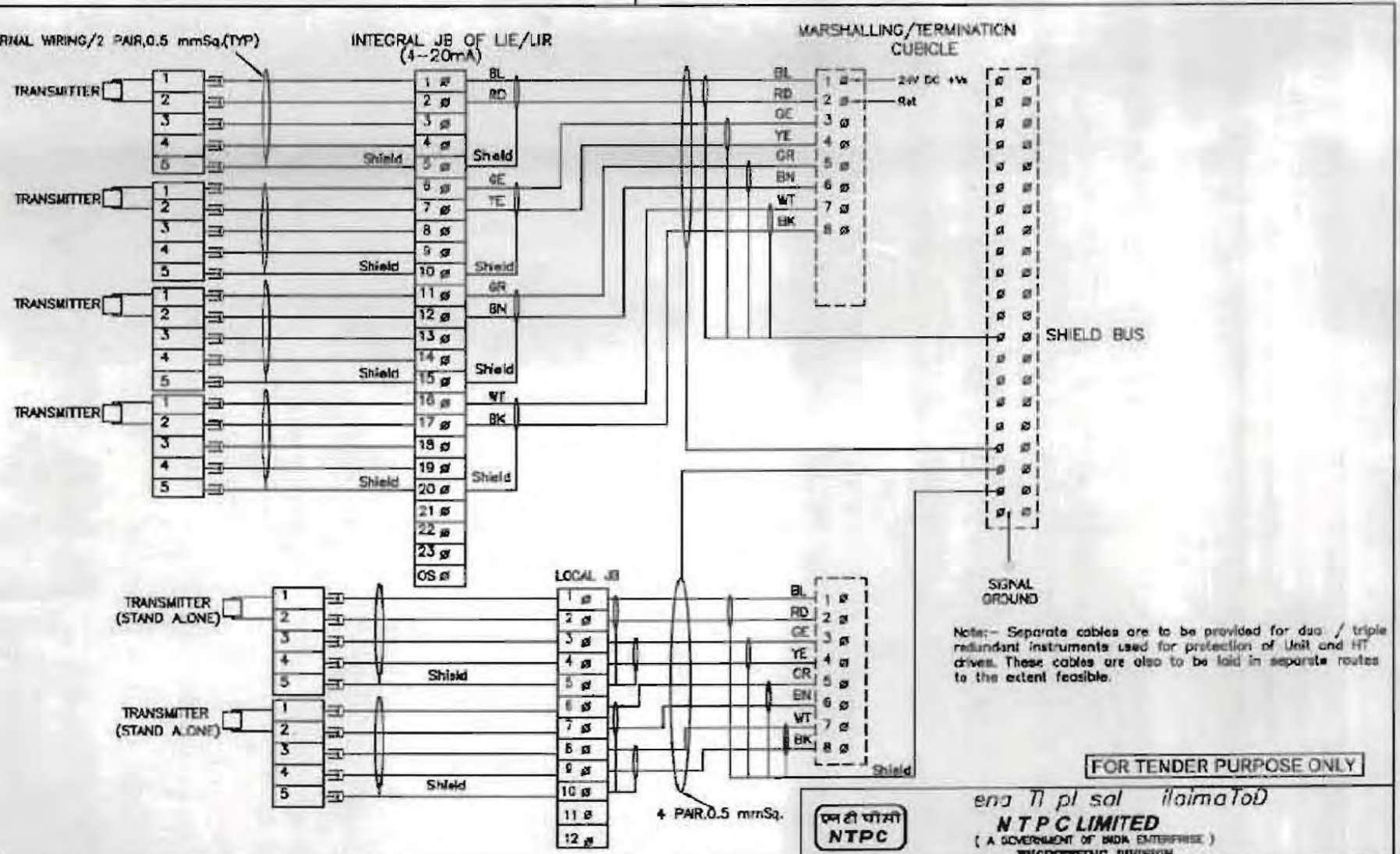
TITLE: INTERFACING OF FIELD INSTRUMENTS
SWITCH TERMINATION DETAILS
NO/NC

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE
A	FIRST ISSUE										29.04.08

CLEARED BY

SIZE	SCALE	DRG. NO.	REV. NO.
A3	NTS	0000-999-POI-A-065 SH 02 OF 14	A

This document is the property of NATIONAL THERMAL POWER CORPORATION LTD.
No part of this document will be reproduced by any means without the written permission.



Note:- Separate cables are to be provided for duo / triple redundant instruments used for protection of Unit and HT drives. These cables are also to be laid in separate routes to the extent feasible.

FOR TENDER PURPOSE ONLY

एन टी पी सी NTPC

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	Cdc	ARCH.	APPD	DATE
C	NOTE REGARDING CABLE IS ADDED.										18.12.13
B	INTERNAL WIRING FOR LIE/LIR MOUNTED SHOWN WIRING OF STAND ALONE TXTR SHOWN										10.12.08
A	FIRST ISSUE										11.1.05

CLEARED BY

PROJECT: TYPICAL THERMAL POWER PROJECT

TITLE: INTERFACING OF FIELD INSTRUMENTS 4-20mA

SIZE	SCALE	DRG. NO.	REV. NO.
A3	NTS	0000-999-POI-A-065 SH 04 OF 14	C

GENERAL TECHNICAL REQUIREMENT

(COMMON FOR TG & SG)

GENERAL TECHNICAL REQUIREMENT (MECHANICAL)

(COMMON FOR TG & SG)

LOW PRESSURE PIPING
(COMMON FOR TG & SG)

1.00.00 **LOW PRESSURE PIPING**

1.01.00 The Scope of Low Pressure (LP) piping systems for the following services shall be as defined in various tender drawings & the sub section pertaining to "Terminal points and exclusions" and shall include the following systems:

a) Circulating water piping

b) DM water normal make-up piping (condenser makeup, ECW makeup for both Steam Generator and Turbo Generator Auxiliaries & CPU regeneration plant, etc.). DM for Aux Boiler filling, FGD area, etc.

c) Condenser emergency make up and ECW tank emergency make-up for SG & TG / condensate storage and transfer system.

d) Boiler (Steam Generator) and Deaerator fill piping.

e) Equipment Cooling Water (ECW) piping including its chemical dosing for primary circuit for Steam generator and Turbo generator and their auxiliaries.

f) Auxiliary cooling water piping.

g) Complete service water piping, APH /ESP wash water piping, Drinking (potable) water piping (plant distribution, CHP area, for Colony, etc.), CW Blowdown piping (including FGD & CHP area), clarified water & HVAC piping, Raw water piping (PT plant, ash handling, Make up to Fire water Tank), R.O. reject to CHP piping, Sludge & Effluent transfer piping system.

h) Compressed air (Instrument & service air) piping system.

i) Sludge (PT Plant to Ash slurry sump) & Effluent (DM Plant to Ash slurry sump) transfer systems.

j) CPU Regeneration waste to CW Channel, Condenser Pit Clear water to CW Channel, ADV discharge to CW Channel, etc.

k) Drain & vent piping system for the piping\equipment etc. under the bidder's scope.

l) Tanks as described elsewhere in the specification for the above systems. (Including condensate storage tanks, etc.).

m) Re-circulation pipes along with valves, breakdown orifices etc., wherever required/specified elsewhere in Technical Specification.

n) Any other piping system required making the Low Pressure (LP) piping systems in the bidder's scope complete.

o) Other applicable piping systems as mentioned in Plant Water Scheme and elsewhere in Technical Specification.

1.02.00 The scope covers the following for the complete LP piping mentioned above:

a) Design, engineering, manufacturing, supply, fabrication, testing packaging,

transportation to site, storage, taking delivery of Employer supplied equipment from site stores, in plant transportation, erection, cleaning, testing and commissioning of all items i.e., pipes, fittings, supports/ hangers, valves, actuators, motors, specialties, expansion joints, strainers, moisture traps, tanks, chemical dosing system for Equipment Cooling Water System (Primary circuit), instruments, drains, vent including drain/ vent valves ,air release valves etc.

The items though not specifically mentioned or indicated here in but are needed to make the system / equipment complete shall also be furnished and treated as if included in the specification unless otherwise specifically excluded.

1.03.00 Bidder's scope of supply & works shall include but not be limited to the following:

a) Pipes, headers and manifolds, bends, elbows, returns, tees, laterals, crosses, reducers/ expanders, caps and closures, couplings, plugs, sleeves, and saddles, stubs and bosses, unions and other similar fittings, flanges, gaskets, fasteners and sealants, ring joints, backing rings, all types of valves including drain/ vent/ air release valves, 3-way valves(where applicable) with test connection for instruments/ manifolds etc. actuators, specialties, orifices, flow nozzles, etc. as per finalized single line flow diagrams and layout drawings/ isometric drawings.

b) Complete assemblies of hangers, supports anchor, guides, restraints, etc. including welded attachments, clamps, devices tie-rods, turn-buckles, springs and spring cages, shoes, rollers, trapezes etc.

c) Weather hoods for pipes crossing ceilings and walls.

d) Instrument tapping and stub connections, root valves, 3-way valves (where applicable) with test connections, drains and vent valves & expanders / reducers as required and instruments as indicated else where for instruments supplied by the Contractor.

e) Drain funnels, drip pans, moisture traps etc. wherever required shall be provided.

f) Instrument tapping, stub connections, root valves and instrument tubing up to root valves for instruments supplied by the Employer for onward connections by the Employer.

g) All supporting attachments like plates, saddles, stools, shoes, base plate, saddle plates, angles, channels, I-beams, trapeze, cantilevers, brackets, sways, braces, nuts, bolts, cleats, clamps, needed to complete the erection of piping system covered under this specification.

Anchor bolts, bed & foundation plates, pipe sleeves and Nuts to be embedded in concrete for piping where ever indicated in the drawing. All grouting and chipping work (including supply of cement, sand and stone chips) for equipment foundations, pipe supporting etc.

Reinforced concrete valve chambers wherever required for underground piping.

h) Surface preparation, priming and painting of all non-insulated above ground piping and equipment except galvanized steel piping & surfaces, stainless steel piping & surfaces, and gun metal surfaces.

Paints and varnishes, primers, thinners etc. as required for anti-corrosive protection of piping & equipment above ground.

i) Bidder shall provide anti-corrosive protection anticorrosive tape or coating wrapping on the external surfaces of pipes to all directly buried piping including galvanized carbon steel piping.

j) On the internal surface of all pipes 1000 mm and above, a coat of primer followed by a hot coat of coal tar enamel paint or coal tar epoxy paint shall be applied.

k) Excavation, preparation of bed, backfilling with compaction of soil and removal of extra-earth to designated places in case of pipes to be buried.

l) Bidder shall also design, supply, fabricate, erect, set and commission all hangers, tie-rods, turn-buckles, supports, guides, restraints, anchors, etc. as required for the, piping system. This includes the provision of all associated steel work including brackets, cradle supports, duck foots, channels, angles, etc. It is Bidder's responsibility to estimate these requirements and include them in their offer price. Whenever, straight run of the yard pipes are more than 300 meters, flexibility analysis shall be conducted by the contractor to identify the requirement of loops, type of supports etc.

m) In covered concrete trenches bidder shall supply necessary supporting materials such as stools, saddles, base plates, clamps, U-bolts, angles, clips etc.

n) Bidder shall supply all necessary drains and vents with drain & vent valves including anti-flash funnels and moisture traps for compressed air system as required for the safe and effective draining-venting of the piping systems based on the approved flow scheme / single line diagram. It is bidder's responsibility to identify the requirements of drains, vents, and supply the necessary pipe work, fittings, hangers and supports etc. for the same.

o) Bidder shall supply and install necessary matching pieces as may be needed for connection of piping systems with equipment terminals, valves and specialties.

p) Bidder shall erect all instrument impulse piping and fittings from the tap-off point of the last root valve including the root valve and instruments.

q) Bidder shall perform necessary internal machining of pipe for installing orifices, flow nozzles, straightening vanes etc.

r) The Bidder shall prepare the flow diagrams, detailed dimensional piping layout/ Isometric/ fabrication/ as built drawings of all the systems along with Cross sectional drawings, showing all supports and equipment as required.

s) In addition to submission of drawings as stipulated above bidder shall also furnish the data/ documents with respect to following:

1) Thickness calculation of large diameter buried pipes as per AWWA-M-11.
2) System design calculation of Primary closed circuit ECW and secondary circuit ACW system for flow & pressure balancing.
3) Design calculations for condensate storage tank and Drinking water tank.

4) Static Analysis for Long (more than 300 meter straight run) above ground piping wherever required.

t) Bidder's scope of supply for fabrication, erection, cleaning, testing and commissioning of the piping systems installed by him shall include the following: -

All welding consumables like welding electrodes, filler rods and wires; gases like oxygen, acetylenes, argon, carbon-dioxide, propane, backing rings etc.

Films for radiographic examination of welds.

X-ray and Gamma -ray equipment including isotopes, dye penetrants, and other required non-destructive testing materials and equipment (all to be taken back by the Bidder after completion of work).

All heating and stress relieving equipment, thermocouples asbestos blankets, cables, temperature recorders, charts heat sensitive chalks and crayons etc. (All to be taken back by bidder after completion of work).

All machinery, equipment tools and tackles as required for transportation handling, fabrication and erection (All to be taken back by Bidder after completion of work).

All equipment/ materials as required for cleaning, flushing, blowing out and hydro testing of the piping systems; these shall include but not be limited to pumps and compressors with prime movers, instruments, pipe work with supports, valves, strainers and other specialties, blanks, plugs, spool pieces, dummy plates, electrical accessories, etc. (All to be taken back by Bidder after completion of work).

All scaffolding materials and false work (To be taken back by Bidder after completion of work).

1.04.00 The Bidder shall provide Services of erection superintendent and foremen, fitters and riggers, welders, transport and crane operators and other skilled and unskilled labour.

The design engineering and providing all temporary pipe work as required for erection, cleaning, flushing, blowing out, testing and commissioning of the piping system is the responsibility of the Bidder.

The Bidder's scope shall include design, supply of required structural steel (except those which are specifically excluded), their fabrication and erection where ever required.

LOW PRESSURE PIPING

(CONT.)

LOW PRESSURE PIPING

1.00.00 **EQUIPMENT SIZING CRITERIA**

1.01.00 All the piping systems and equipment supplied under this package shall be designed to operate without replacement and with normal maintenance for a plant service life of 30 years, and shall withstand the operating parameter fluctuations and cycling which can be normally expected during this period.

1.02.00 For all Low-Pressure piping systems covered under this specification, sizing and system design shall be to the requirements of relevant codes and standard indicated. In addition to this, requirements of any statutory code as applicable shall also be taken into consideration.

1.03.00 Inside diameters of piping shall be calculated for the flow requirements of various systems. The velocities for calculating the inside diameters shall be limited to the following:

a) **Water Application**

	Pipe Size	Water Velocity in m/sec Below 50 mm	50-150 mm	200 mm & above
(a)	Pump suction	------	1.2-1.5	1.2-1.8
(b)	Pump discharge and recirculation	1.2-1.8	1.8-2.4	2.1-2.5
(c)	Header	------	1.5-2.4	2.1-2.4

Pipeline under gravity flow shall be restricted to a flow velocity of 1 m/sec generally.

WILLIAM & HAZEN formula shall be used for calculating the friction loss in piping systems with the following "C" value:

(i)	Carbon steel pipe	100
(ii)	Ductile Iron.	140
(iii)	Rubber lined steel pipe	120
(iv)	Stainless steel pipe	100

For calculating the required pump head for pump selection, at least 10% margin shall be taken over the pipe friction losses and static head shall be calculated from the minimum water level of the tank/ sump/ reservoir from which the pumps draw water.

(b) **Compressed Air Application**

Compressed air 15.0 m/sec.

1.04.00 The pipes shall be sized for the worst (i.e. maximum flow, temp. and pressure values) operating conditions.

1.05.00 Based on the inside diameter so established, minimum thickness calculation shall be made as per ANSI B 31.1 OD. Manufacturing allowance shall be added to minimum calculated thickness and next higher standard thickness of pipes shall than be selected as per ANSI B 36.10/IS-1239 Heavy grade/IS-3589/ASTM-A-53/API-5L/ANSI B36.19 as the case may be. Alternatively, manufacturers standard thickness can also be accepted subject to that such thickness shall be equal to or more than the minimum calculated thickness after considering manufacturing allowance. Selected thickness then shall be checked for vacuum loading criterion as per the guidelines given in AWWA-M-11. However, in no case, the selected Thickness for various pipe sizes shall be less than the following for indicated Pipe Sizes as below:

200 NB - 6mm 250 NB – 6 mm 300 NB - 6 mm 350 NB- 6mm 400 NB- 6 mm 450 NB- 6 mm 500 NB- 6 mm	600 NB- 6mm 700 NB- 7mm 800 NB- 8 mm 900 Nb – 10 mm 1000 Nb – 10 mm 1100 Nb – 10mm 1200 Nb – 12 mm

1.06.00 Corrosion allowance of 1.6 mm will be added to the calculated thickness being considered (except stainless steel piping).

1.07.00 Bend thinning allowance/manufacturing allowance etc. shall be as per the requirement of the design code provision.

1.08.00 Material of construction for pipes carrying various fluids shall be as specified elsewhere.

1.09.00 Compressed air pipe work shall be adequately drained to prevent internal moisture accumulation and moisture traps shall be provided at strategic locations in the piping systems.

1.10.00 Depending upon the size and system pressure, joints in compressed air pipe work shall be screwed or flanged. The flange shall be welded with the parent pipe at shop and shall be hot dip galvanized before dispatch to site. Alternatively, the flanges on GI pipes may be screwed-on flanges also.

1.11.00 Threaded joints shall be provided with Teflon sealant tapes.

1.12.00 Following types of valves shall be used for the system/service indicated.

SYSTEM	**TYPES OF VALVES**					
	Butterfly	Gate	Globe	Check	Ball	Plug
Water	x	x	x	x	x	
Air		x	x	x	x	
Drains & vents		x	x	x		
Fuel oil (if any)		x	x	x	x	x

1.13.00 Recirculation pipes along with valves, breakdown orifices etc. shall be provided for important pumping systems as indicated in respective process and instrumentation diagrams

	(P&IDs). The recirculation pipe shall be sized for minimum 30%design flow of single pump operation or the recommended flow of the pump manufacturer whichever is higher.
2.00.00	**TECHNICAL SPECIFICATION**
2.01.00	**GENERAL**
	Specific technical requirements of low-pressure piping, fittings, supports, valves, specialties and tanks etc. have been covered under this Sub-section. It includes details pertaining to design and material of construction for piping, fittings, valves, equipment, etc. cleaning/surface preparation application of primer and painting on over ground piping. It also includes detailed technical requirement of laying underground/buried piping including water proofing/anti corrosive protection. It also covers design, engineering, manufacturing, fabrication, technical details of piping, valves, specialties, piping hangers / supports, tanks etc.
2.02.00	**Pipes and fittings**
2.02.01	All low-pressure piping systems shall be capable of withstanding the maximum pressure in the corresponding lines at the relevant temperatures. However, the minimum thickness as specified in the following clauses and or respective codes for pipes and fittings shall be adhered to. The bidder shall furnish the pipe sizing/ thickness calculation as per the criteria mentioned above under LP piping equipment sizing criteria of this Technical Specification.
2.02.02	Piping and fittings coming under the purview of IBR shall be designed satisfying the requirements of IBR as a minimum.
2.02.03	Supporting arrangement of piping systems shall be properly designed for systems where hydraulic shocks and pressure surges may arise in the system during operation. Bidder should provide necessary protective arrangement like anchor blocks/anchor bolt etc. for the safeguard of the piping systems under above mentioned conditions. The requirement will be, however, worked out by the contractor and he will submit the detailed drawings for thrust/anchor block to the Employer. External, and internal, attachments to piping shall be designed so as not to cause flattening of pipes and excessive localized bending stresses.
2.02.04	Bends, loops, off sets, expansion or flexible joints shall be used as required in order to prevent overstressing the piping system and to provide adequate flexibility. Flexibility analysis (using software packages such as Caesar-II etc.) shall be carried out for sufficiently long piping (straight run more than 300M).
2.02.05	Wherever Bidder's piping coming under this specification, terminates at an equipments or terminal point not included in this specification, the reaction and the thermal movement imposed by bidder's piping on equipment terminal point shall be within limits to be approved by the Employer.
2.02.06	The hot lines shall be supported with flexible connections to permit axial and lateral movements. Flexibility analysis shall be carried out for pipelines which have considerable straight run as indicated above and necessary loops/ expansion joint etc. shall be provided as may be necessary depending on layout.
2.02.07	Piping and fittings shall be manufactured by an approved manufacturer of repute. They should be truly cylindrical of clear internal diameter, of uniform thickness, smooth and strong, free from dents, cracks and holes and other defects.
2.02.08	For rubber lined ERW pipes, beads shall be removed for pipe size 80 NB and above.

2.02.09 Inspection holes shall be provided at suitable locations for pipes 800 Nb and above as required for periodic observations and inspection purposes.

2.02.10 At all intersection joints, it is Contractor's responsibility to design and provide suitable reinforcements as per the applicable codes and standards.

2.02.11 For large size pipes/ducts, at high point and bends/change of direction of flow, air release valves shall be provided as dictated by the system requirement and operation philosophy & tripping conditions of pumping system. Sizing criteria for air release valves shall be generally on the basis of valve size to pipe diameter ratio of 1:8. Requirement shall be decided as per relevant code.
Transient analysis /surge analysis wherever specified and required shall be conducted in order to determine the location, number and size of the Air-Release valve on certain long distance/high volume piping systems, if applicable within the scope of work of the package.

2.03.00 **Material**

2.03.01 Alternate materials offered by Bidder against those specified. shall either be equal to or superior to those specified. The responsibility for establishing equality or superiority of the alternate materials offered rests entirely with the Bidder and any standard code required for establishing the same shall be in English language.

2.03.02 No extra credit would be given to offers containing materials superior to those specified. Likewise, no extra credit would be given to offers containing pipe thickness more than specified.

2.03.03 All materials shall be new and procured directly from the manufacturers. Materials procured from traders or stockists are not acceptable.

2.03.04 All materials shall be certified by proper material test certificates. All material test certificates shall carry proper heat number or other acceptable references to enable identification of the certificate that certifies the material.

2.03.05 Material of construction for pipes carrying various fluids shall be as follows:

Sl No	Type of Fluid	Material
1.	i) Ordinary Water (Raw Water, Clarified Water, etc.) ii) Equipment cooling water including Both primary & secondary circuit (DMCW pH corrected & ACW drain water)	IS-2062 Gr.-E-250B/ASTM A-36/ASTM A-53 type 'E' Gr. B/IS-3589 Gr. 410 /IS-1239 Heavy.
2.	i) Demineralised water, ii)Alkaline solution (ECW system chemical dosing)	Stainless Steel to ASTM A312, Gr. 304 welded for sizes 65 mm NB and above. Stainless steel to ASTM A312, Gr. 304 sch.40s seamless for sizes 50mm and below
3.	i) Drinking (potable) water ii)Compressed air (Instrument & service air)	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent.
4.	(Condensate) spill water	ASTM A 106 Gr. B
5.	Effluents from Neutralization pit	MSRL

2.03.06	In water lines, pipes up to 150mm Nb shall conform to ANSI B36.10/ASTM-A-53, Type-E Gr. B /IS:1239 Gr. Heavy and minimum selected thickness shall not be less than IS:1239 Grade Heavy except for demineralised water, drinking water and condensate spill lines.
2.03.07	Pipes of above 150mm Nb shall be to AWWA-C200/ANSI B 36.10/ASTM A-53/IS 3589 Gr.410. Pipe to be fabricated by the bidder shall be rolled and butt welded from plates conforming to ASTM A-53 type 'E' Gr. B/IS 2062 Gr. E-250B/ASTM-A-36. However, larger pipes, i.e. 1000mm Nb and above shall be made from plates conforming to ASTM A 36/IS 2062 Gr. E-250B and shall meet the requirements of AWWA-M-11 (for deflection & buckling criteria considering water filled pipe as well as vacuum condition that may prevail during transient/surge conditions, truck-load, rail-load and weight density for compacted soil or any other load as the case may be).
2.03.08	In demineralised water service, the pipes up to 50 Nb shall be of stainless-steel ASTM A 312, Gr. 304 sch. 40 Seamless. The size for these pipes shall be to ANSI B 36.19. These shall be socket welded. The material for pipe from 65mm NB up to and including 400 NB shall be to ASTM A 312, Gr. 304 (welded). In no case the thickness of fittings shall be less than parent pipe thickness. Bidder/Contractor shall note that pipes offered as per a particular code shall conform to that code in all respects i.e. Dimension, tolerances, manufacturing methods, material, heat treatment, testing requirements, etc. unless otherwise mentioned elsewhere in the specification.
2.03.09	Instrument air, Plant (service) air lines and Drinking water lines shall be to ASTM A 53 type E grade B/ANSI B 36. 10/IS 3589, Gr. 410 / IS: 1239 Heavy (in case thickness calculated is more than gr. Heavy, ANSI B 36.10 Schedule numbers shall be followed) and galvanized to IS 4736 or any equivalent internationally reputed standard. The material of the pipes shall be to ASTM A 53 type 'E' Gr. B / IS: 3589, Gr. 410 / IS: 1239 Gr. Heavy. The fittings shall be of either same as parent material or malleable iron to IS-1879 (galvanized).
2.03.10	Spiral welded pipes as per API-5L/IS-3589 are also acceptable for pipe of size above 150 NB. However minimum thickness of the pipes shall be as elaborated in above clauses.
2.03.11	Condensate lines shall be to ASTM A 106 Gr. B and dimension to ANSI B 36.10 schedule "standard" as minimum to be maintained.
2.03.12	If carbon steel plates of thickness more than 12 mm are used for manufacture of pipes, fittings and other appurtenances, then the same shall be control-cooled or normalized as the case may be following the guidelines of the governing code.
2.04.00	**Field routed pipes:**
2.04.01	Pipelines of NB 50 size and below are regarded as field run piping. It is Bidder's responsibility to plan suitable layouts for these system insitu. Bidder shall prepare drawings indicating the layout of field run pipe work. These drawings shall be approved by Project Manager to the installation of the field run pipe work. Based on these approved layouts the Bidder shall prepare the BOQ of field run pipes and submit to Employer for approval.
2.05.00	**Slope/Drains and Vents**
2.05.01	Suitable slope shall be provided for all pipelines towards drain points. It is Bidder responsibility to identify the requirements of drains and vents, and supply the necessary pipe work, valves, fittings, hangers and supports etc. As per the system requirement low points in the pipelines shall be provided with suitable draining arrangement and high points shall be provided with vent connections where air or gas pockets may occur. Vent for use during hydrostatic test shall be plugged after the completion of the test. Vent shall not be less than 15mm size. Drains shall be provided at low points and at pockets in piping such that

complete drainage of all systems is possible. Drain shall not be less than 15mm for line size up to 150mm, not less than 20mm up to 300mm and not less than 25mm for 350mm to 600mm pipes and not less than 50mm for 600mm and above pipes. Material for drain and vent lines shall be compatible with that of the parent pipe material.

2.05.02 Air piping shall be sloped so that any part of the system can be drained through the shut-off drain valve or drain plugs.

2.06.00 **Pipe Joints**

In general, all water lines 65mm NB and above, are to be joined generally by butt welding except the locations where valves/fittings are to be installed with flanged connections and 50mm and below by socket welding unless mentioned otherwise specifically. All air lines shall be of screwed connection and rubber lined pipes of flanged connections.

2.06.01 **Screwed Joints**

(a) Threading of pipes shall be carried out after bending, heat treatment etc. If not possible, threading may be done prior to these operations but proper care should be taken to protect them from damage. Threads shall be to ANSI B 2.1 (taper) NPT / ANSI B1.20.1 (taper) NPT / IS: 554 unless specified otherwise.

(b) Galvanized pipe shall generally be joined by screwing into sockets. The exposed threaded portion on the outside of the pipes shall be given a zinc silicate coating. Galvanized pipes shall not be field joined by welding for protection of Galvanising Zinc layer. Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before jointing. For galvanized pipe sizes above 150 mm NB, screw & socket jointing as per ASTM-A-865 shall be employed for both pipe-to-pipe and pipe-to-fitting jointing. For pipe to fitting connection since no direct threading can be done on the fittings (supplied as per ASTM-A-234 Gr. WPB and ANSI B-16.9) necessary straight pipe lengths acting as match pieces shall be welded to the fitting at both ends and subsequently the free ends of the straight lengths shall be threaded as per ASTM A-865 for jointing with main pipe. Once welding of fittings with match pieces and threading of free ends of match pieces are over, the entire fabricated piece shall be galvanized, or in case match pipes and fittings are already galvanized before the above mentioned fabrication then suitable application of Zinc-Silicate paste adequately at the welded surface (both in side & outside) after welding, along with the nascent threaded metal portions at both free ends given the same application of Zinc Silicate paste. Alternatively, flanged jointing may be employed for pipe sizes 100 NB and above. However, the bidder shall ensure the galvanized pipe joints do not fail during hydro test.

(c) Teflon tapes shall be used to seal out screwed joints and shall be applied to the male threads only. Threaded parts shall be wiped clean of oil or grease with appropriate solvent if necessary and allowing proper time for drying before applying the sealant. Pipe ends shall be reamed, and all chips shall be removed. Screwed flanges shall be attached by screwing the pipe through the flange and the pipe and flange shall be refaced accurately.

(d) For pipe sizes from 350 mm NB to 550 mm NB (including 350 NB & 550 NB) the GI pipes shall be of flanged connection. However, the pipes after welding of flanges shall be completely galvanized. All the welded surfaces whether inside or outside shall be coated with zinc-silicate paste. Seal welding of flanges will be permitted only when any flange is leak-prone during hydro testing.

(e) For pipe sizes 600 mm NB and above, the GI pipes shall be of welded connection followed by application of zinc silicate coating at welded surfaces both inside and outside the pipe, except for the last blank/blind flange, or, equipment connection where application of zinc-silicate paste after welding cannot be done due to inaccessibility of the inside welded surface and where galvanic protection has been

impaired due to welding of pipe-to-pipe joint. Thus, the last erection joint shall be flanged joint.

2.06.02 **Welded Joints**

(a) For making up welded joints (butt weld or socket weld) the welding shall be performed by manual shielded metal arc process in accordance with the requirements specified elsewhere in the spec. Any welder employed for carrying butt welding shall be qualified as per ASME section IX for the type of joints he is going to weld. Jointing by butt weld, or socket weld shall depend upon the respective piping material specifications.

2.06.03 **Flanged Joints**

(a) Flanged connections for pipes are to be kept to the minimum and used only for connections to vessel, equipments, flanged valves and other fittings like strainer/traps/orifices etc. for ease of connection and maintenance etc. Rubber lined pipes shall be flange joined only.

(b) All flanged valves intended for installation on steel piping system, shall have their flanges drilled to ANSI B 16.5 (or equivalent) and according to the pressure class stated in their respective piping material specification.

(c) Drilling on flanges of flanged valves must correspond to the drilling of flanges on the piping system on which the valves are installed.

2.07.00 **Bends / elbows / mitre bends / Tees / Reducers & other fittings**

2.07.01 For pipe fittings such as elbows (long radius), reducers, tees, etc. the material shall be to ASTM-A-234 Gr. WPB/ASTM-105 up to 300 NB. For pipe fittings above 300 NB, the fittings may be fabricated conforming to parent pipe material. Provision of compensation pads shall be kept as per ANSI B 31.1. The fitting shall conform to the dimensional standard of ANSI B-16.9/ 16.11. Further branching in pipes for sizes 65nb and above is also acceptable (ANSI B 31.1).

However, for pipes up to 150 NB, pipe fittings may be supplied with material and dimension conforming to IS 1239 in case parent pipes also conform to IS 1239.

2.07.02 For pipe size 350Nb and above mitre bends may be used for all pipes except rubber lined pipes. However, mitre bends are also acceptable for rubber lined pipes above 1200 NB. The bend radius shall be 1½ times the nominal pipe diameter. 90 deg. bends (mitre) shall be in 4 pieces (3 cuts) and 45 deg. mitre bends shall be in 3 pieces 22½ deg. Fabrication of mitre bends shall be as detailed in BS 2633/BS534.

2.07.03 For pipes, above 1200 NB, reducer and tees shall be to dimensional standard of AWWA-C-208.

2.07.04 Stainless steel fittings shall conform to either ASTM-A-182 Gr. 304 or ASTM-A-403 Grade WP. 304 Class-S, for sizes up to and including 50 mm NB, i.e. the fittings shall be of seamless construction. However, for stainless fittings above 50 mm NB, the same shall conform to ASTM-A-403 Gr. WP 304 Class W i.e. the fittings shall be of welded construction strictly in accordance with ASTM-A-403.

2.07.07 In no case, the thickness of fittings shall be less than the thickness of parent pipe, irrespective of material of construction.

2.08.00 **Flanges**

2.08.01 Flanges shall be slip on type or weld neck type. Welding of flanges in tension is not permitted.

2.08.02 All flanges and-flanged drilling shall be to ANSI B 16.5/BS EN-1092 / AWWA C-207 of relevant pressure/temperature class. Flanges shall be fabricated from steel plates conforming to ASTM A 105/IS 2062 Gr. E-250B. However stainless-steel flanges shall be fabricated from SS plates to ASTM-A-240, Gr. 304 or equivalent.

2.09.00 **Specific technical requirement of laying buried pipe with anti-corrosive treatment**

The pipe in general shall be laid with the top of the pipe minimum 1.0 (one) meter below finished general ground level.

2.09.01 **Trenching**

(a) The trench shall be cut true to the line and level and shall follow the gradient of the pipeline. The width of the trench shall be sufficient to give free working space on each side of the pipe. Trenches shall conform to IS 5822 or any international standard.

2.09.02 **Preparation and cleaning of piping**

(a) The pipeline shall be thoroughly cleaned of all rust, grease, dirt, weld scales and weld burrs etc. moisture or other foreign matter by power cleaning method such as sand or grit blasting, power tool cleaning, etc. Grease or heavy oil shall be removed by washing with a volatile solvent such as gasoline. Certain inaccessible portions of the pipeline (which otherwise not possible to be cleaned by power cleaning methods) may be scrubbed manually with a stiff wire brush and scrapped where necessary with specific permission of the Project Manager.

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

2.09.03 **Coating and wrapping/ Anti corrosive Protection Coal tar tape**

a. Buried piping shall be coated and wrapped, as per specification, after completion of welded and/or flanged connections, and after completion and approval of Hydro testing. Materials to be used for coating and wrapping of underground pipelines are:

(1) Coating primer (coal tar primer)

(2) Coating enamel (coal tar enamel)

(3) Wrapping materials.

All primer/coating/wrapping materials and methods of application shall conform to IS: 10221 except asphalt/bitumen material. Materials (primer/coating/wrapping) as per AWWA-C-203 are also acceptable.

Protective coating shall consist of coal tar primer, coal tar enamel coating, glass fiber, tissue inner wrap followed by glass fiber or coal tar impregnated Kraft outer wrap or finish coat.
Number of coats and wraps, minimum thickness for each layer of application shall be as per IS-10221. Number of. Coats and wraps shall be decided based on soil corrosivity / resistivity as indicated in IS-10221. Soil data-for this purpose shall be made available.

	Total thickness of completed coating and wrapping shall not be less than 4.0 mm.
	b. Alternatively, the anti-corrosive protection for buried pipes can consist of anti-corrosive protection Coal-tar tapes. Material and application of tapes shall conform to IS 15337 or equivalent. These-tapes shall be applied hot over the cold coal tar primer in steps of 2mm thickness so as to cover the spiral edges of the first tape by the application of second tape. The total nominal thickness of the finished protective coating shall be 4.0 mm.
2.09.04	**Trench bed preparation and back filling**
	Prior to lowering and laying pipe in any excavated trench, the bottom of the trench may require to be back filled and compacted (or as the case may be) to provide an acceptable bed for placing the pipe. Bed preparation in general shall be as per IS: 5822.
2.09.05	**Laying of galvanized steel (GI) pipes**
	All the joints shall be screwed with socket or flanged. Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before jointing Threaded portion on either side of the socket joint shall be applied with Zinc silicate paste.
	All the provisions for trenching' bed preparation' laying the pipe application of primer' coating' wrapping with tapes and back filling etc. as indicated for "laying of buried piping" and " anti-corrosive protection for buried piping" are applicable for buried galvanized steel (GI) pipes also.
2.10.00	**Cleaning and flushing**
2.10.01	All piping shall be cleaned by the Bidder before and after erection to remove grease, dirt, dust, scale and welding slag.
2.10.02	Before erection all pipe work, assemblies, sub-assemblies, fittings, and components, etc. shall be thoroughly cleaned internally and externally by blast cleaning or by power driven wire brushes and followed by air-blowing. However, for pipe sizes below 100nb the pipes may be cleaned internally by compressed air blowing as an alternative to internal blast cleaning. The brushes shall be of the same or similar material as the metal being cleaned. Cleaning of Galvanized pipes shall be done by air blowing only.
2.10.03	After erection, all water lines shall be mass flushed with water. The cleaning velocities in water lines shall be 1.2-1.5 times the operating velocities in the pipelines.
2.10.04	All compressed air pipe work shall be cleaned by blowing compressed air.
2.11.00	**Specification for hangers and supports**
2.11.01	All supports and parts shall conform to the requirement of power piping code ANSI B 31.1 or approved equivalent.
2.11.02	The maximum spans of the supports of straight length shall not exceed the recommended values indicated in ANSI B 31.1.
2.11.03	At all sliding surfaces of supports suitable arrangement is to be provided to minimize sliding friction.
2.12.00	**Design/Construction/Material Particulars of Gate/ Globe /Check /Butterfly / Ball / Air release /Float valves / Moisture Traps.**

2.12.01 **GENERAL**

(a) All valves shall have indicators or direction clearly marked on the hand-wheel so that the valves opening/closing can be readily determined.

(b) Special attention shall be given to operating mechanism for large size valves with a view to obtaining quick and easy operation ensuring that a minimum of maintenance is required.

(c) The valves coming in vacuum lines shall be of extended gland type and/or water sealed.

(d) The actuator-operated valves shall be designed on the basis of the following:

(1) The internal parts shall be suitable to support the pressure caused by the actuators.

(2) The valve-actuator unit shall be suitably stiff so as not to cause vibrations, misalignments, etc.

(3) All actuator-operated valves shall be provided with hand operated gearing mechanism also.

(4) All actuators operated valves shall open/ close fully within time required by the process.

(e) Valves coming under the purview of IBR shall meet IBR requirements.

(f) All valves shall be provided with embossed name plate giving details such as tag number, type, size etc.

(g) Wherever required valves shall be provided with chain operator, extension spindles and floor stands or any other arrangement approved by employer so that they can be operated with ease from the nearest operating floor. Wherever necessary for safety purpose locking device shall be provided. Further, necessary small platforms for facilitating easy valve operation shall be provided by the contractor wherever necessary in consultation with project manager within the bid price at no extra cost to employer

2.12.02 **VALVE BODY MATERIAL**

Valve body material for various services shall be as follows:

Valve body material for water application like Secondary circuit auxiliary cooling water of ECW system, Raw water, Ash water make-up, service water, clarified water, DM cooling water (pH corrected) , drinking water etc. shall be cast iron for sizes 65NB and above; gun-metal for sizes 50 Nb and below.

For compressed air application, valve body material shall be cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.

DM water: SS body and disc along with SS internals. However, for butterfly valves, Cast Iron /Ductile Iron/SG iron/carbon steel body and disc with elastomer lining are also acceptable.

Condensate: Cast Carbon Steel / Forged Carbon Steel.

2.12.03 The design, material, construction, manufacture, inspection, testing and performance of valves shall comply with all currently applicable statutes, regulations and safety codes in the locality where the valves will be installed. The valves shall conform to the latest editions of applicable codes and standards as mentioned elsewhere. Nothing in this specification shall be construed to relieve the Bidder of his responsibility. Valves in general shall conform to the requirements of the following standards.

Standards and Codes

AWWA-C-504	Rubber seated butterfly valves.
BS-5155/EN-593	Cast iron and steel body butterfly valves for general purpose.
IS-778	Gun-metal gate, globe and check valves for general purpose.
BS-5154	Copper alloy globe/globe stop and check and gate valves for general purpose.
IS-780	Sluice valves for water works purpose (50-300 mm size)
IS-2906	Sluice valves for water works purpose (350-1200 mm size)
IS-5150	Cast iron wedge and double disc gate for general purpose.
BS-5152	Specification for cast iron globe valves.
BS-5153	Cast iron check valves for general purpose.
IS-5312	Swing check type reflux (non-return) valves.
ANSI B 16.34	Standard for valves.
API-594	Standard for Dual-check valves.
API-600	Steel gate valves.
ANSI-B-16.10	Valves face to face and other relevant dimension.
API-598	Valves inspection test.

2.12.04 **End Connections**

The end connections, shall comply with the following:

Socket welding (SW) - ANSI B 16.11

Butt Welding (BW) - ANSI B 16.25.

Threaded (SC) - ANSI B 2.1

Flanged (FL) - ANSI B 16.5& AWWA-C-207 (steel flanges), ANSI B 16.1 (Cast Iron flanges).

2.13.00 **Gate/Globe/Check Valves**

(a) All cast iron body valves (gate, globe and non-return) shall have flanged end connections; (screwed ends for Ductile D.2NI body valves are not acceptable).

(b) All steel and stainless-steel body valves of sizes 65 mm and above shall have flanged or butt-welding ends. Valves of sizes below 65mm shall have flanged or socket welded ends. Compatibility of welding between valve body material and connecting pipe material is a pre-requisite in case of butt-welded joints.

(c) All gun metal body valves shall have screwed ends.

(d) All flanged end valves / specialties shall be furnished along with matching counter flanges, fasteners, gaskets etc. as required to complete the joints.

(e) Gate/sluice valves shall be used for isolation of flow. All gate valves shall be of the full-way type, and when in the fully open position, the bore of the valve shall not be constricted by any part of the gate.

Gate valves shall be of the solid/elastic or articulated wedge disc. Gate valves shall be provided with the following accessories in addition to other standard items:

(1) Hand wheel

(2) Position indicator (for above 50 mm NB valve size)

(3) Draining arrangement wherever required.

(f) Globe valves shall be used for regulation purposes. They shall be provided with hand wheel, position indicator, draining arrangement (wherever required) and arrow indicating flow direction. Preferably, the valves shall be of the vertical stem type. Globe valves shall preferably have reduced or spherical seating and discs shall be free to revolve on the spindle.

The pressure shall preferably be under the disc of the valve. However, globe valves, with pressure over the disc shall also be accepted provided (i) no possibility exists that flow from above the disc can remove either the disc from stem or component from disc (ii) manual globe valves can easily be operated by hand. If the fluid load on the top of the disc is higher than 40-60 KN, bypass valve shall be provided which permits the downstream system to be pressurized before the globe valve is opened.

(g) Check valves shall be used for non-return service. They shall be swing check type or double door (Dual plate) check type with a permanent arrow inscription on the valve body indicating the fluid flow direction. In long distance pipes lines with possibility of surge-occurrence, dual plate check valves are preferable for its spring-controlled opening /closing of flaps/doors against flow reversals. However, dual plate check valves shall not be used for sizes more than 600mm NB.

(h) For bore greater than 2" the valves must be swing check type or dual plate check type suitable for installation in all positions (vertical and horizontal);

(i) For bore smaller than or equal to 2" the valves must be of the piston type to be installed, in horizontal position.

(j) All gate and globe valves shall be provided with back seating arrangement to enable online changing of gland packing. The valves shall be preferably outside screw & yoke type.

(k) All gate and globe valves shall be rising stem type and shall have limit switches for full OPEN and full CLOSED indication wherever required. This will include motor-operated valves also wherever required. In such cases the limit switches shall form

an integral part of the valve. Stop-gap arrangement in this respect is not acceptable.

(l) All valves except those with rising stems shall be provided with continuous mechanical position indicators; rising stem valves shall have only visual indication through plastic/metallic stem cover for sizes above 50 mm nominal bore.

(m) For Cl gate, globe and check valves wherever thickness of body/bonnet is not mentioned in the valves standards, thickness mentioned in IS- 1538 for fitting shall be applicable.

2.13.01 **MATERIAL OF CONSTRUCTION (GATE/GLOBE/CHECK VALVE)**

(a) The materials shall generally comply with the following:

(1) **Cast Steel Valves**

Body & bonnet	ASTM A 216 Gr. WCB/ ASTM A 105
Disc for non-return Valves	ASTM A 216 Gr. WCB/ ASTM A 105
Trim.	ASTM A 182 Gr. F6 or Equivalent

(2) **Stainless steel valves**

Body & Bonnet	SS 304
Disc	-do-
Trim.	SS 316

(3) **Cast iron valves**

Body & bonnet	BS 1452 Gr. 14/ IS-210 Gr. FG 260
Seating surfaces and rings	13% chromium steel/ 13% Chrome overlay
Disc for non-return valves	BS 1452 Gr. 14/IS-210 Gr FG 260
Hinge pin for non-return valves	AISI 316
Stem for gate globe valves	13% chromium steel or Equivalent
Back seat	13 % chromium steel / 13% Chrome overlay

(4) **Gun Metal valves**

Body and bonnet	IS 318 Gr. 2/ Equivalent Standard
Trim.	-do-

(b) Cast iron body valves shall have high alloy steel stem and seat.

(c) Material for counter flanges shall be the same as for the piping.

(d) Forged carbon steel & Forged stainless-steel valves are also acceptable in place of Gun metal valves.

2.14.00 **Air Release Valve**

(a) The air release valves shall be of automatic double air valve with two orifices and two floats. The float shall not close the valve at higher air velocities. The orifice contact joint with the float shall be leak tight joint.

(b) The valve shall efficiently discharge the displaced air automatically from ducts/pipes while filling them and admit air automatically into the ducts/pipes while they are being emptied. The valve shall also automatically release trapped air from ducts/pipes during operation at the normal working pressure.

(c) Body material of automatic air release valves shall comply generally with BS 1452 Gr. 14/IS: 210 Gr. FG 260. and spindle shall conform to high tensile brass.

(d) Air release valves shall not have any integral isolation device within them. Each Air release valve shall be mounted, preceded by a separate isolation gate/ butterfly valve.

2.15.00 **Butterfly valves**

2.15.01 **Design/Construction**

(a) The valves shall be designed for the design pressure/temperature of the system on which it is installed and in accordance with AWWA-C-504, EN-593 or any other approved equivalent standard latest edition. Fabricated steel (IS: 2062 GR. E-250B) butterfly valves instead of cast iron body valves are also acceptable for size above 300 mm Nb diameter.

(b) The valves shall be suitable for installation in any position (horizontal/vertical etc.) and shall be generally of double-flanged construction. However, for sizes 600 NB and below the valves of Wafer construction are also acceptable

(c) Valves-350Nb and above shall have pressure equalizing bypass valves, wherever system parameters warrant the same.

(d) Valves-200Nb and above shall also be provided with gear operator arrangement as a standard practice suitable for manual operation. Manual operation of valve shall be through gear arrangement having totally enclosed gearing with hand wheel diameter and gear ratio designed to meet the required operating torque It shall be designed to hold the valve disc in intermediate position between full open and full closed position without creeping or fluttering. Adjustable stops shall be provided to prevent over travel in either direction.

Limit and torque switches (if applicable) shall be enclosed in watertight enclosures along with suitable space heaters for motor actuated valves, which may be either for On-Off operation or inching operation with position transmitter.

2.15.02 **Material of Construction (Butterfly Valves)**

Materials and other design details shall be as indicated below:

(a) **Cast Iron Butterfly Valves**

	Body & Disc	ASTM A48, Gr. 40 with 2% Ni / IS: 210. Gr. FG-260, with 2% Ni / SG iron BSEN 1563, Gr EN GJS-400-15 with 2%Ni and epoxy coated
	Shaft	BS 970 431 S: 291 / EN 57, or AISI-410 or AWWA-permitted shaft material equivalent to EN-57/AISI-410 or better.
	Seat ring	18-8 Stainless steel
	SEAL	NITRILE RUBBER

(b) **Stainless Steel Butterfly Valves**

Body & Disc	SS 304
Shaft	SS 316
Seat Rings	EPT/BUNA-N/Neoprene

(c) **Carbon steel Butterfly Valves**

Body & Disc	ASTM A 216, Gr. WCB
Shaft	SS 304
Disc & Seat Rings	EPT/BUNA-N/Neoprene

(d) **Elstomer lined Butterfly Valves**

Body & Disc	ASTM A48, Gr. 40 / IS: 210. Gr. FG-260 / SG Iron (ductile iron) IS 1865 Gr 400-15 or BSEN 1563, Gr EN GJS-400-15 / ASTM A 216, Gr. WCB with elastomer lining.
Shaft	SS 316

2.15.03 **Proof of Design Test (Type Test) for Butterfly Valves**

Proof of Design (P.O.D.) test certificates shall be furnished by the bidder for all applicable size-ranges and classes of Butterfly valves supplied by him, in the absence of which actual P.O.D. test shall be conducted by the bidder.

All valves that are designed and manufactured as per AWWA-C-504 / AWWA-C-516 shall be governed by the relevant clauses of P.O.D test in AWWA-C-504/AWWA-C-516. For Butterfly valves, designed and manufactured to EN-593 or equivalent, the P.O.D. test methods and procedures shall generally follow the guidelines of AWWA-C-504 in all respect except that Body & seat hydro test and disc-strength test shall be conducted at the pressures specified in EN-593 or the applicable code. Actuators shall also meet requirements of P.O.D. test of AWWA-C-504/AWWA-C-516.

2.16.00 **Float operated valves**

(a) Valve shall automatically control the rate of filling and will shut off when a predetermined level is reached and close to prevent over flow on pre-set maximum water level. Valve shall also open and close in direct proportion to rise or fall of water level.

(b) DESIGN AND CONSTRUCTION FEATURES
The following design and construction feature of the valve shall be the minimum acceptable.
(c) Valves shall be right-angled or globe pattern.
(d) Valves shall be balance piston type with float ball.
(e) Leather liner shall not be provided.
(f) The body and cover material shall be cast iron conforming to ASTM-A 126 Grade 'B' or IS: 210 Grade 200 or equivalent, and Float shall be of copper with epoxy painting of two (2) coats.
(g) Valves shall be suitable for flow velocities of 2 to 2.5m/sec.
(h) The valves shall have flanged connections.

2.17.00 **Tanks and Accessories**

2.17.01 The designer and manufacturer of storage tanks shall comply with and obtain approval of all currently applicable statutory regulations and safety codes in the locality where the equipment will be installed. The tanks shall conform to IS 803/IS804/IS 805/ IS 2825/ API 650/ IS 4049/ IS 4682 (part-I) and IS 4864 to 4870/ ASME B & PV code Sec.-VIII as the case may be.

2.17.02 **DESIGN AND CONSTRUCTION**

(a) Design of all vertical atmospheric storage tanks containing water, acid, alkali and other chemical shall conform to IS:803 & API 650.

(b) Design of all horizontal atmospheric storage tanks containing water, acid, alkali and other chemicals shall generally conform to IS:2825 as regards to fabrication and general construction taking care of combined bending, shear & hoop stresses developed due to supporting arrangement.

(c) Tank shall be made from mild steel plates to BS 4360/IS-2062 Gr.E-250B (or equivalent) for ordinary wafer application when it is not corrosive in nature.

(f) Tank shall be provided with suitable supporting joints. All vessels shall be provided with lifting lugs, eye bolts etc. for effective handling during erection.

(j) Tanks shall be provided with float operated level indicators / level gauges / level transmitters and level switches, as required, with complete assembly. Suitable flanged pads for level switches mounting shall also be provided. The level indicator can be top or side mounted as the case may be.

(k) In addition to inlet and outlet nozzles, the tanks shall be provided with vents, overflow, drain nozzles complete for various connections on tanks. Overflow lines from storage tanks is to be routed to the nearest surface drains. For tanks containing DM water, alkaline water or power cycle water the vent to atmosphere shall be through carbon-di-oxide absorber vessel suitably mounted on the tank. CO2 absorber vessel shall be provided with the initial fill of chemicals.

(l) Tanks shall have suitable stairs/ladders on inside and outside of the tanks, manholes / inspection cover as required and also platform suitably located.

(m) Tank supporting arrangement as approved by Employer shall be provided with all plates/angles/joints/flats and supporting attachment including lugs, saddles, legs etc.

(o) Tank fabrication drawing and design calculations shall be approved by the Project Manager.

2.17.03 **Corrosion protection**

(a) A corrosion allowance, applicable to surface in contact with corrosive media, when required after thorough cleaning by blast cleaning preceded by wire brushing shall be taken into consideration.

(b) Manholes shall be provided for easy access into the vessels. The size shall be minimum 500 mm and will be with cover plate, nuts bolts, etc. to ensure leak tightness at the test pressure.

(c) Each tank shall be provided with drilled cleats welded to the tank for electrical grounding. Material of cleats shall be same as that of the shell.

Sl. No.	Description	Tech. Particulars
1.00	**CONDENSATE STORAGE TANKS**	
1.01	Number required	one for each unit
1.02	Capacity of each tank (Effective)	450 Cu. m (for 800 MW units)
1.03	Size (Dia. & Height)/Plate Thickness	8.6mX7.2m minimum, Shell & Roof plate Thickness 8mm and Base plate thickness 10mm
1.04	Type and pressure class	Vertical, cylindrical, atmospheric
1.05	Material of construction	MS- (IS-2062 Gr. B or equivalent) as per specified code, 8mm thickness (minimum)
1.06	Location	Outdoor
1.07	Overflow, drain, vent and Sample connection (piping &valve)	required
1.08	Level Indicator	
	a) Number	One for each tank
	b) Type	Mechanical float type with dial type indicator (Guide wire, Float and Housing of Stainless steel - 316 Gr. construction)
1.09	Manhole (minimum 500mm size)	Two (2)-one on shell and the other on roof
1.10	Special Fittings	
	a) Hydraulic Seal of Overflow/Drain	Required

b)	Additional nozzle Connection	number and size to be indicated to successful Bidder
c)	Nozzle connection for Instrument/spare	Three (3) nos. for each tank
d)	CO2 Absorber for vent (not to be kept on roof of tank, but to be kept on ground level)	required
e)	Outside stair case (spiral)	required
f)	Inside Ladder	Required
g)	Draw off sump	required
h)	Root valve for level Transmitter	Root valves for two (2) nos. level transmitter for each tank Required

---

2.18.00 **RUBBER EXPANSION JOINTS**

2.18.01 All parts of expansion joints shall be suitably designed for all stresses that may occur during continuous operation and for any additional stresses that may occur during installation and also during transient condition.

2.18.02 The expansion joints shall be single bellow rubber expansion joints. The arches of the expansion joints shall be filled with soft rubber.

2.18.03 The tube (i.e. inner cover) and the cover (outer) shall be made of natural or synthetic rubber of adequate hardness. The shore hardness shall not be less than 60 deg. A for outer and 50 deg. A for inner cover.

2.18.04 The carcass between the tube and the cover shall be made of high quality cotton duck, preferably, square woven to provide equal strength in both directions of the weave. The fabric plies shall be impregnated with age resistant rubber or synthetic compound and laminated into a unit.

2.18.05 Reinforcement, consisting of solid metal rings embedded in carcass shall be provided.

2.18.06 Expansion joints shall be complete with stretcher bolt assembly. The expansion joints shall be suitable to absorb piping movements and accommodate mismatch between pipe lines.

2.18.07 The expansion joints shall be of heavy duty construction made of high grade abrasion-resistant natural or synthetic rubber compound. The basic fabric for the' duck' shall be either a superior quality braided cotton or synthetic fiber having maximum flexibility and non-set characteristic.

2.18.08 The expansion joints shall be adequately reinforced, with solid steel rings, to meet the service conditions under which they are to operate.

2.18.09 All expansion joints shall be provided with stainless steel retaining rings for DM water application and IS 2062 Gr E-250B galvanized steel retaining rings for ordinary water for use on the inner face of the rubber flanges, to prevent any possibility of damage to the rubber when the bolts are tightened. These rings shall be split and beveled type for easy installation and replacement and shall be drilled to match the drilling on the end rubber flanges and shall be in two or more pieces.

2.18.10 The expansion joints shall have integral fabric reinforced full-face rubber flanges. The bolt on one flange shall have no eccentricity in relation to the corresponding bolt hole on the flange on the other face. The end rubber flanges shall be drilled to suit the companion pipe flanges. The flanges shall be as per ANSI B 16.5. For higher sizes, not covered under ANSI B 16.5, the same shall be as per AWWA.

2.18.11 All exposed surfaces of the expansion joint shall be given a 3 mm thick coating of neoprene. This surface shall be reasonably uniform and free from any blisters, porosity and other surface defects.

2.18.12 Each control unit shall consist of two (2) numbers of triangular stretcher bolt plates, a stretcher bolt with washers, nuts, and lock nuts. Each plate shall be drilled with three holes, two for fixing the plate on to the companion steel flange and the third for fixing the stretcher bolt.

2.18.13 Each joint shall have a permanently attached brass or stainless-steel metal tag indicating the tag numbers and other salient design features.

2.18.14 Bidder to note that any metallic part which comes in contact with DM /corrosive water shall be of Stainless-Steel material.

2.18.15 **Life cycle test for RE Joints of Condenser CW Inlet Outlet lines:**

Life cycle test certificates shall be furnished by the bidder for each type and size of RE joints supplied by the Bidder, in the absence of which actual Life cycle test shall be conducted on one rubber expansion joint of each type and size.

2.19.00 **STRAINERS**

2.19.01 **Simplex type**

The strainers shall be basket type and of simplex construction. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least four (4) times the internal area of the connecting pipelines. The strainer element shall be 20 mesh. Pressure drop across the strainers in new condition shall not exceed 1.5 MCW at full flow. Wire mesh of the strainers shall be suitably reinforced, to avoid buckling under operation. Strainer shall have screwed blow off connection fitted with a removable plug. The material of construction of various parts shall be as follows:

(a)	Body	IS: 318, Gr. 2 up to 50 mm Nb, and IS: 210 Gr. FG 260 above 50 mm Nb. (For DM water/ -Body: AISI 316 or equivalent)
(b)	Strainer Element	Stainless steel (AISI 316)
(c)	End connection	Screwed up to 50 mm Nb, and Flanged above 50 mm Nb

2.19.02 **Duplex type**

(a) The strainers shall be basket type and of duplex construction. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least four (4) times the internal area of the connecting pipe. The mesh of strainer element shall be commensurate with the actual service required. Pressure drop across the strainer in new condition shall not exceed 4.0 MWC at full flow.

(b) Wire mesh (if applicable) of the strainers shall be suitably reinforced. The material of construction of various parts shall be as follows.

Body	IS: 318, Gr. 2 up to 50 mm Nb, and IS:210, Gr. FG 260 or ASTM-A-515 Gr. 75/IS-2062 Gr. E-250B and internally epoxy-painted above 50 mm NB.
Strainer element	Stainless steel (AISI 316)
End connection	Screwed up to 50mm Nb, and Flanged above 50 mm Nb. Gasket shall be of full-face type

(c) The strainer will have a permanent stainless-steel tag fixed on the strainer body indicating the strainer tag number and service and other salient data.

(d) The size of the strainer and the flow direction will be indicated on the strainer body casting.

(e) Thickness of the strainer element should be designed to withstand the pressure developed within the strainer due to 100% clogged condition exerting shut-off pressure on the element.

GENERAL TECHNICAL REQUIREMENTS FOR PUMPS

(COMMON FOR TG & SG)

Annexure-1

HORIZONTAL CENTRIFUGAL PUMPS

1.00.00 SCOPE

General requirements in respect of design, material, constructional features, manufacture, inspection, testing the performance at the Vendor's/ Sub-Vendor's works and delivery to site erection, field testing and commissioning of Horizontal Centrifugal Pumps. The minimum technical requirements and equipment shall include, but not be limited to the following:

2.00.00 CODES AND STANDARDS

2.01.00 Design, material, construction manufacture inspection and performance testing of Horizontal Centrifugal Pumps shall comply with all currently applicable statutes, regulations, and safety codes in the locality where the equipment will be installed. The equipment supplied shall comply with the latest applicable Indian standards listed below. Other National Standards are acceptable, if they are established to be equal or superior to the Indian Standards.

2.02.00 **List of Applicable Standards**

i) IS : 1520 - Horizontal Centrifugal Pumps for clear cold fresh water.

ii) IS : 5120 - Technical requirements of roto-dynamic special purpose pumps

iii) API - 610 - Centrifugal pumps for general refinery service.

iv) IS : 5639 - Pumps Handling Chemicals & corrosion liquids.

v) IS : 5659 - Pumps for process water

vi) HIS - Hydraulic Institute Standards; USA

vii) ASTM-I-165-65 - Standards Methods for Liquid Penetration Inspection.

3.00.00 DESIGN REQUIREMENTS

3.01.00 The maximum efficiency of pumps shall be preferably within + 10% of the rated design flow indicated in data sheets.

3.02.00 Total head capacity curve shall be continuously rising from the operating point towards shut - off without any zone of instability and with a minimum shut off head of 15% more than design head.

3.03.00 Pumps of a particular category shall be identical and shall be suitable for parallel operation with equal load division. The head Vs capacity and BHP Vs capacity characteristics should match to ensure even load sharing and trouble-free operation throughout the range. Components of identical pumps shall be interchangeable.

3.04.00 Pumps shall run smoothly without undue noise and vibration. Peak to peak vibration limits shall be restricted to the following values during operation.

Speed	Antifriction bearing	Sleeve bearing
1500 rpm and below	75.0-micron	75.0 micron
3000 rpm	50.0-micron	65.0 micron

The noise level shall not exceed 85 dBA. Overall sound pressure level reference 0.0002 microbar (the standard pressure reference for air sound measurement) at a distance of 1M from the equipment surface.

4.00.00 DESIGN CONSTRUCTION

4.01.00 Pump casing shall have radially/axially split type construction. The casing shall be designed to withstand the maximum shut - off pressure developed by the pump at the pumping temperature. The pumps shall be capable of starting with discharge valve fully open and close condition.

4.02.00	Pump casing shall be provided with a vent connection and piping with fittings & valves Casing drain as required shall be provided complete with drain valves, piping and plugs. It shall be provided with a connection for suction and discharge pr. Gauge as standard feature.
4.03.00	**Impeller** Impeller shall be closed or semi-closed as specified elsewhere and designed in conformance with the detailed analysis of the liquid being handled
4.04.00	**Impeller/ Casing Wearing Rings** Replaceable type wearing rings shall be provided at suitable locations pumps.
4.05.00	**Shaft** The critical speed shall be well away from the operating speed and in no case less than 130% of the rated speed.
4.06.00	**Shaft Sleeves** Shaft sleeves shall be fastened to the shaft to prevent any leakage or loosening
4.07.00	**Bearings** The bearings offered shall be capable of taking both the radial and axial thrust. Anti-friction bearings of standard type, if provided, shall be selected for a minimum life 16,000 hours of continuous operation at maximum axial and a radial loads and rated speed. Bearings shall be easily accessible without disturbing the pump assembly.
4.08.00	**Stuffing Boxes / Mechanical Seals** Stuffing boxes of packed ring construction type or mechanical seals shall be provided wherever specified. Packed ring stuffing boxes shall be properly lubricated and sealed as per service requirements. If external gland sealing is required, it shall be done from the pump discharge. The Mech sealing face should be low frictional co-efficient & resistance to corrosion against the liquid being pumped.
4.09.00	**Pump Shaft Motor Shaft Coupling** The Pump and motor shaft shall be connected with a adequately sized flexible coupling of proven design with a spacer
4.10.00	**Base Plate** A common base plate mounting both for the pump and motor shall be furnished. The base plate shall be of fabricated steel and of rigid construction, suitable ribbed and reinforced.
4.11.00	**Assembly and Dismantling** Assembly and dismantling of each pump with drive motor shall be possible without disturbing the grouting base plate or alignment.
4.12.00	**Drive Motor (Prime Mover)** The KW rating of the drive shall be based on continuously driving the connected equipment for the conditions specified. In case, where parallel operation of the pumps is specified, the actual motor rating is to be selected considering overloading of the pump in the event of tripping of operating pumps. Continuous motor rating (at 50 deg. Cent, ambient) for pump shall be at least 10% above the maximum load demand of the driven equipment in the complete range.

5.00.00 **Technical Data sheet of Pumps**

No	Designation\Application	Clarified/Raw/ Treated water	DM water
1)	Operating Speed	1500 rpm (nominal)	
2)	Pumps and drives to be designed for	Outdoor duty & Continuous Operation	
3)	Type of lubrication	Grease	
4)	Suction condition	Flooded Suction	
5)	Type of Shaft Sealing	Gland packing	Mechanical Seal
6)	Type of coupling (motor & pump)	Flexible	
11)	**Material of Construction**		
i)	Casing, Stuffing Box, Gland	2.5% Ni CI IS210 Gr FG 260	ASTM A CF8M
ii)	Impeller	ASTM A351 CF8M	
	Wearing rings (if applicable)	SS – 316	
iii)	Shaft, Shaft Sleeves	SS-410	
iv)	Bolts & nuts	SS 316 for those encountering water and for others, material shall be high tension carbon steel.	
v)	Base plate (min 12 mm thick)	Carbon Steel (Epoxy Painted)	
7)	Accessories	a. Required Instrumentation b. Companion flanges with nuts, bolts and gaskets, Anchor bolts, nuts, sleeves and inserts. c. Internal piping with valves, filters & Instruments for sealing/ cooling/ lubrication system up to and including isolating valve etc. d. Positioning dowels, Eye bolts, lifting etc. e. Ladders, Platforms & Other accessories	

Annexure-2

VERTICAL PUMPS

1.00.00 SCOPE

1.01.00 This specification covers general requirements in respect of design, construction features, manufacture, inspection, and performance at Vendor's / sub-vendor's works delivery to site, erection field testing and commissioning of Makeup Water & Raw Water Pumps. The minimum technical requirements and equipment shall include, but not be limited to the following:

2.00.00 CODES AND STANDARDS

2.01.00 The design, material, construction, manufacture, inspection, testing and performance of Vertical Pumps shall comply with all currently applicable statutes, regulations, and safety codes in the locality where the equipment will be installed. The equipment supplied shall comply with the latest applicable Standards listed below. Other national standards are acceptable, if they are established to be equal or superior to the listed standards.

2.02.00 **List of Applicable Standards**

IS: 1710	:	Vertical Turbine Pumps for clear cold fresh water.
IS: 5120	:	Technical requirement of rotor dynamic special purpose pumps.
HIS	:	Hydraulic Institute Standards U.S.A.
PTC 82 :		Centrifugal pumps-power test code
API 610:		Centrifugal pumps for general refinery purposes.

3.00.00 DESIGN AND PERFORMANCE REQUIREMENTS

3.01.00 The maximum efficiency point of the pumps shall preferably lie within 10% of the rated design flow.

3.02.00 Pumps of a particular category shall be identical, suitable for parallel operation and provided with interchangeable components. Head vs. capacity and BHP vs. Capacity characteristic should match to ensure even load sharing and trouble-free operation throughout the range.

3.03.00 The pumps shall have stable Head vs. Capacity characteristic continuously rising towards shut-off with the highest at shut-off and with an approximate shut-off head of 15% or more than the design head for radial flow pumps and 50% more than the design head for mixed flow/ turbine type pumps.

3.04.00 The operating range of operation of pumps shall generally be 40% to 120% of rated flow for sustained period of operation.

3.05.00 The power requirement of the pump shall be non-over loading type for mixed flow/ turbine type pumps.

3.06.00 The critical speed of the pump shall be less than 80% of the rated speed or more than 130% of the rated speed. Also, the critical speed of the pump-motor assembly shall be more than the maximum reverse run-away speed.

3.07.00 Pump shall run smoothly without undue noise and vibration. The vibration limit measured at motor end shall not exceed the limit specified in Hydraulic Institute Standards. The noise level shall not exceed 85 dBA overall sound pressure level reference 0.0002 microbar (the standard pressure reference for air sound measurement) at a distance of 1M from the equipment surface.

3.08.00 The base plate, foundation bolts, motor stool and other components shall be designed to take the full force coming on the discharge elbow under shut-off condition.

3.09.00 Water for motor cooling and thrust bearing cooling, if required, shall be tapped from the discharge of the pumps and/or fed from an over-head tank. All piping, valves, strainer,

instruments etc. required for this purpose and line shaft bearing lubrication (if required) shall be provided by the Contractor.

3.10.00 **Reverse Rotation**

a) The pump shall be provided with an approved mechanical device to protect reverse rotation on loss of drive motor power and failure of discharge valve to close.

b) a reverse rotation detection switch shall be provided to prevent starting of motor while rotating in reverse direction.

3.11.00 **Motor Rating**

The pumps shall be capable of starting with discharge valve fully closed as well as fully open conditions. Motors shall be selected to suit to the above requirements. Continuous motor rating (at 50°C ambient) for all pumps shall be at least ten per cent (10%) above the maximum load demand of the driven equipment in the complete operating range (including run out condition) to take care of the system frequency/voltage variation.

Drive motors shall be connected directly to the line shaft of the pump.

4.00.00 **DESIGN AND CONSTRUCTION**

4.01.00 **Pump Type**

Pumps shall be of vertical shaft, single stage/multi-stage, submerged suction, complete with bowl, column & head assembly, and drive assembly. The pump design shall be of pullout/non-pull-out type as specified

4.02.00 **Discharge head**

The pump discharge shall be of above-floor type/sub- floor type. In certain cases of pump installation where expansion joint is located immediately at the pump discharge, the pump assembly will be subjected to the unbalanced hydraulic thrust. A thrust pad will be built in with the discharge head for transmitting the hydraulic thrust to external structures such that this hydraulic thrust is not transmitted to the foundation bolts for which they may not be designed.

4.03.00 **Column Pipe**

Column pipes shall be flanged and bolted and shall be complete with gaskets, nuts, and bolts.

4.04.00 **Impeller**

The impeller shall be closed, or semi-open or open as specified elsewhere.

4.05.00 **Wearing Rings**

Replaceable type wearing rings shall be provided for both casing and the impeller. For open impellers replaceable casing liners shall also be provided. The difference in hardness of the casing & impeller wearing rings shall be minimum 50 BHN.

4.06.00 **Impeller & Line Shaft**

Shaft size selected based on maximum combined shear stress must take into consideration the critical speed as per API - 610.

4.07.00 **Pump & Shaft Bearings - lubrication**

4.07.01 Adequate number of properly designed bearings shall be furnished. The type of lubrication i.e., self-water lubrication or forced water lubrication shall be provided.

4.07.02 **Self water Lubrication System**

The line shaft bearings shall be lubricated by the water being pumped. The main pump and line shaft bearings which are above minimum water level shall be of 'Thordon' type/

equivalent. For other line shaft bearings located below minimum water level, cutless rubber bearings can be used.

4.07.03 **Forced water lubrication system**

The line shaft shall be provided with shaft enclosing tube to exclude pumped water from shaft and bearings.

Lubricating water pumps shall be provided to supply lubricating water for bearings. These lubricating water pumps shall get supply from the overhead water storage tank.

4.08.00 **Thrust Bearings**

Single thrust bearing at motor top or separate thrust bearings at pump and motor shall be provided to take care of hydraulic thrust and weight of the rotating assembly. Thrust bearing shall be spherical roller type or superior, capable of absorbing axial thrust in both directions of rotation. Water required for cooling of thrust bearing shall be taken from pump discharge, wherever applicable.

The thrust bearing shall be rated for continuous operation with thrust as developed in shut-off condition with clearance between the wearing rings in worn out condition to be at least four (4) times the clearance between the wearing rings in new condition.

4.09.00 **Pump Motor Supports, Base plate etc.**

The pump and motor shall have a common support. The necessary supporting frame, base plates, mounting plates etc. as required shall be supplied under this specification.

4.10.00 **Stuffing Box**

Gland packing shall be provided at the top-of-the-line shaft. Shaft sleeves shall be provided at the stuffing box.

4.11.00 **Assembly and Dismantling**

Assembly and dismantling of each pump with drive motor shall be possible without disturbing the grouted base/sole plate or alignment.

5.00.00 **Technical Data Sheet (if not mentioned specifically elsewhere in the CW System technical specifications) of Pumps**

SN	Description	Parameters
1	Designation	As applicable
2	Total No. of Pumps	As applicable
3	No. of Working Pumps	As applicable
4	No. of Standby Pumps	
5	Guaranteed Flow & Total Head (Guaranteed)	
6	Operating Speed (Max.)	1500 rpm
7	Pumps and drives to be designed for	Outdoor duty & Continuous Operation
10	Type of Pump	Vertical Wet Pit & Non-Pull out type

13	Type of Discharge	Above Floor
14	Type of Impeller	Closed / Semi-open
16	Type of Lubrication	Forced water/ Self lubrication (as specified)
18	Minimum Water Level in sump	Min submergence level of pump plus 0.5.m
19	Maximum Water Level in sump	As per system requirement (Min 0.2 m below FGL)
21	Sump Invert Level	As per HIS
22	Operating Floor Level	Min. 0.5 M above FGL
23	Other dimensions of sump, Fore-bay etc	As per HIS & system requirement
25	Accessories to be provided with each pump	a. Required Instrumentation b. Companion flanges with nuts, bolts and gaskets, Anchor bolts, nuts, sleeves and inserts. c. Internal piping with valves, filters & Instruments for sealing/ cooling/ lubrication system up to and including isolating valve etc. d. Positioning dowels, Eye bolts, lifting etc. e. Ladders, Platforms & Other accessories
26	**MOC**	
i	Suction Bell, Casing / Bowl	2.5% Nickel Cast Iron, IS: 210 Grade FG 260; S-0.1% max. P-0.15% max.
ii	Casing Liner	Stainless steel (SS)
iii	Impeller	Austenitic SS ASTM A743/ CF8M Grade
iv	Wearing rings	SS-316
v	Impeller Shaft, Pump & line shaft, Pump & Shaft Coupling, Pump & Shaft Sleeves	SS - ASTM A 276 Gr. 410.
vi	Shaft bearings	Cutless rubber with bronze retainer for below minimum water level and Thordon type for above minimum water level.

vii	Column pipe	Fabricated steel as per IS: 2062 (minimum thickness - 10 mm) with 2 coats of epoxy coating inside & outside.
viii	Shaft Enclosing Tubes	Fabricated steel as per IS: 2062 (minimum thickness - 6 mm) with 2 coats of epoxy coating inside & outside.
ix	Discharge Head	Fabricated steel as per IS: 2062 (minimum thickness - 10 mm) with 2 coats of epoxy coating inside & outside.
x	Distance Piece (if applicable)	Fabricated steel as per IS: 2062 (min thickness 10 mm) with 2 coats of epoxy coating inside.
xii	Stuffing Box, Gland	2.5 % NI-CI to IS-210 FG-260
xiii	Gland Packing	Impregnated Teflon
xiv	Gaskets	Wire reinforced rubber gasket / Neoprene Rubber / Compressed Asbestos Fibre
xv	Ladders, Platforms & Other Accessories	Fabricated steel as per IS: 2062
xvi	Bolts & Nuts	Stainless Still AISI Type 316 for those coming in contact with water and for others material shall be High Tension Carbon Steel
xvii	Baseplate & Soleplate (min 12 mm thick), Matching flange	Fabricated steel as per IS: 2062

Annexure-3

SUBMERSIBLE PUMPS

1.00.00 SCOPE

1.01.00 This specification covers general requirements in respect of design, material, manufacture, construction, testing & inspection at Vendor's / sub-vendor's delivery to side, of submersible pumps. The minimum technical requirements and equipment shall include, but not be limited to the following:

2.00.00 CODES AND STANDARD

The design manufacture and performance of submersible pumps shall be complied with all currently applicable statues, regulation, and safely codes in the locality where the Equipment will be installed. The Equipment shall also conform to the latest applicable Indian standards listed below/equivalent standards.

2.01.00 **List of Applicable Indian Standards**

IS: 8034 - Submersible pumps for clear cold fresh water

IS: 5120 - Technical requirement of Rotodynamic Special Purpose pumps.

3.00.00 DESIGN AND PERFORMANCE REQUIREMENTS

a) The pump shall be of single stage mono - block type with non-clog design.

b) Components of Identical pumps shall be interchangeable.

c) Pumps shall have continuously rising head characteristics.

4.00.00 MOTOR RATING

Continuous motor rating (at 50 deg. C ambient) for pumps shall be at least ten percent (10%) above the maximum load demand of the driven equipment in the complete operating range to take care of the system frequency variations.

5.00.00 FEATURES OF CONSTRUCTION

a) Pumps shall be of Submersible, wet pit type.

b) Pumps shall be able to pass through solids up to 100 mm and capable of handling wastewater which may contain, sludge, plastic solids etc.

c) Coupling device shall ensure leak proof joint between the pump and discharge elbow. This shall also enable pump to be removed from the sumps without the necessity of dismantling any nuts, bolts etc.

d) Pumps shall be portable type and capable of using in any sump as and when required. Pump shall be provided with required stool, flexible, hose chain connection etc. for easy installation, removal, and maintenance. Adequate length of chain required for lowering the pump into the sump and flexible type discharge pipe shall be provided.

e) Impeller

Enclosed impellers shall be equipped with seal rings on their hubs. In case of open impeller, the pump shall be designed to take care of the additional thrust produced.

Annexure-4

1.00.0 **Control philosophy for CW System, ECW and Auxiliary Water Pumps including Aux CT pumps etc.**

1) The Pumps shall be controlled from the Control Room. The start/stop commands of these pumps, all associated auxiliaries/drives including all the motor operated discharge valves, shall be routed through control system where all interlocks & permissive shall be implemented and start/stop signals shall be issued to MCC/Switchgear. The operation of interconnecting valve and any other common drive shall be possible from pump house as well as DDCMIS. The exact details of the same shall be finalised during detailed engineering.
2) A local push button switch shall be used for emergency tripping of the motor. The pump can be started either with pump discharge valve partially open or in closed position depending upon contractor's standard practice.
3) Applicable for CW Pumps- The CW Pumps shall be controlled as specified in relevant chapters of Control & Instrumentation. Pump can be started only when either at least one of the flow circuits through the respective condenser to the discharge duct and cooling tower is established or re-circulation line to pump sump is open.
4) As applicable, an interlock shall prevent the starting of pump unless bearing lubricating water flow and motor bearing cooling water flow has been established over a period. Low flow of either pump or motor bearing cooling water when the pump is running will give alarm(s) and trip the pump with alarm in case of sustained low value over a preset time.
5) Low flow of either pump or motor bearing cooling water when the pump is running will give alarm(s) and trip the pump with alarm in case of sustained low value over a preset time.
6) In case of high pressure at pump discharge due to accidental closure of any of the butterfly valves, an alarm shall be generated.
7) In case of normal stopping, when a pump control switch is turned 'OFF', the butterfly valve at its discharge shall first close (25-30) % before the respective pump motor is de-energized. On tripping of motor due to any reason, the butterfly valve at the discharge shall close fully automatically.
8) If water level in pump sump is low, an alarm shall be initiated. Pump shall be tripped in case of very low level of water in the intake sumps and very high discharge header pressure.
9) Regulating the CW system makeup valve shall control the water level in the sump/fore bay.
10) Pump shall be tripped from very high winding temperature of motor and very high metal temperature of thrust bearings. Alarm shall be provided for high motor winding temperature and high motor/ pump bearing temperature.
11) The operation philosophy as detailed above is suggestive only and **shall be finalized with the successful bidder after award of contract and shall be subject to Employer's approval**.

2.00.00 **Instrumentation for CW System, ECW and Auxiliary Water Pumps including Aux CT pumps.**

2.01.00 Vibration monitoring system, if necessary, shall be provided. The alarm and trip signals from vibration system shall be connected to the Control system. Bidder shall provide Duplex temperature elements for bearing & winding temperature monitoring points if specified. The excessive bearing/winding temperature shall be used for alarm and tripping of pumps/ motors. Further, Bidder shall provide required level & pressure sensing instruments as specified elsewhere in relevant Subsections of Control & Instrumentation and/or tender drawings.

GENERAL TECHNICAL REQUIREMENTS FOR ELECTRICAL

(COMMON FOR TG & SG)

DATA SHEET B FOR MOTOR

(TO BE FILLED BY BIDDER AFTER AWARD OF CONTRACT)

(COMMON FOR TG & SG)

TECHNICAL DATA - PART - B (SUPPLIER DATA TO BE FURNISHED AFTER AWARD OF CONTRACT)

SL.NO		UOM	DETAIL
1.0	**GENERAL**		
i)	Manufacturer & Country of origin.		
ii)	Equipment driven by motor)		
iii)	Motor type		
iv)	Country of origin		
v)	Quantity	nos.	
2.0	**DESIGN AND PERFORMANCE DATA**		
i)	Frame size		
ii)	Type of duty		
iii)	Type of enclosure and method of cooling		
vi)	Type of mounting		
vii)	Direction of rotation as viewed from DE END		
viii)	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard	(KW)	
ix)	(A) Derated rating for specified normal condition i.e. 50 deg. C ambient temperature	(KW)	
	(B) Rating as specified in load list	(KW)	
xi)	Rated speed at rated voltage and frequency	rpm	
xii)	At rated Voltage and frequency		
	a) Full load current	A	
	b) No load current	A	
xiii)	Power Factor at		
	a) 100% load		
	b) At duty point		
	c) 75% load		
	d) 50% load		
	e) NO load		
	f) Starting.		
xiv)	Efficiency at rated voltage and frequrecy		
	a) 100% load		
	b) At duty point		
	c) 75% load		
	d) 50% load		
xv)	Starting current*(inclusive of IS tolerance)* at		
	a. 100 % voltage	A	
	b. Minimum starting voltage	A	
xvi)	Starting time with minimum permissible voltage		
	a. Without driven equipment coupled	sec	
	b. With driven equipment coupled	sec	
xvii)	Safe stall time with 110% of rated voltage		
	a. From hot condition	sec	

	b. From cold condition	sec	
xviii)	**Torques :**		
	a. Starting torque at min. permissible voltage	(kg-mtr.)	
	b. Pull up torque at rated voltage.	(kg-mtr.)	
	c. Pull out torque	(kg-mtr.)	
	d. Min accelerating torque available	(kg-mtr.)	
	e. Rated torque	(kg-mtr.)	
xix)	Stator winding resistance per phase (at 20 Deg.C.)	Ohm	
xx)	GD^2 value of motors		
xxi)	Locked rotor KVA input (at rated voltage)		
xxii)	Locked rotor KVA/KW.		
xxiii)	**Bearings**		
	a. Type		
	b. Manufacturer		
	c. Self Lubricated or forced Lubricated		
	d. Recommended Lubricants		
	e. Guaranteed Life in Hours		
	f. Whether Dial Type thermometer provided		
	g. Oil pressure Gauge/switch		
	i. Range		
	ii. Contact Nos. & ratings		
	iii. Accuracy		
xxiv)	**Vibration**		
	a) Velocity	mm/s	
	b) Displacement	microns	
xxv)	Noise level	db	
3	**CONSTRUCTIONAL FEATURES**		
i	Stator winding insulation		
	a. Class & Type		
	b. Tropicalised (Yes/No)		
	c. Temperature rise over specified max.		
	i. Cold water temperature of 38 DEG. C.		
	ii. Ambient Air 50 DEG. C.		
	d. Method of temperature measurement		
	e. Stator winding connection		
	f. Number of terminals brought out		
ii	Type of terminal box for		
	a. stator leads		
	b. space heater		
	c. Temperature detectors		
	d. Instrument switch etc.		
iii)	For main terminal box		
	a. Location		
	b. Entry of cables		
	c. Recommended cable size		
	d. Fault level	MVA	
iv)	Temperature detector for stator winding		
	a Type		
	b. Nos. provided		
	c . Location		
	d. Make		
	e. Resistance value at 0 deg. C	ohms	

vi)	Paint shade		
vii).	Weight of(approx)		
	a. Motor stator (KG)		
	b. Motor Rotor (KG)		
	c. Total weight (KG)		
4	Relevant motor curves		

CABLE SCHEDULE FORMAT

(COMMON FOR TG & SG)

CABLE SCHEDULE FORMAT

UNITCABLENO	FROM	TO	PURPOSE	CABLE SCOPE (BHEL PEM/ VENDOR)	REMARKS	CABLESIZE	PATHCABLENO	TENTATIVE CABLE LENGTH

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

1. For the purpose of clarity, it may please be noted that the information given in regard to the cables to be routed through WinPath as per the system elaborated below is called "Cable List", while the term "Cable Schedule" applies to the cable list with routing information added after routing has been carried out.
2. The cable list shall be entered as an MS Excel file in the format as per enclosed template EXT_CAB_SCH_FORMAT.XLS. No blank lines, special characters, header, footer, lines, etc. shall be introduced in the file. No changes shall be made in the title line (first line) of the template.
3. The field properties shall be as under:
    a. UNITCABLENO: A/N, up to sixteen (16) characters; each cable shall have its own unique, unduplicated cable number. In case this rule is violated, the cable cannot be taken up for routing.
    b. FROM: A/N, up to sixty (60) characters; the "From" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    c. TO: A/N, up to sixty (60) characters; the "To" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    d. PURPOSE: A/N, up to sixty (60) characters; the purpose (i.e. power cable/ indication/ measurement, etc.) to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
    e. REMARKS: A/N, up to forty (40) characters; Any information pertinent to routing to be specified here (e.g., cable number of the cable redundant to the cable number being entered). Information in excess of 40 characters will be truncated after 40 characters.
    f. CABLESIZE: A/N, 7 characters exactly as per the codes indicated below shall be specified here. The program cannot route cables described in any other way/ format.
    g. PATHCABLENO: Field reserved for utilization by the program. User shall not enter any information here.
4. One list shall be prepared for each system/ equipment (i.e., separate and unique cable lists shall be prepared for each system).
5. The cables shall be described as per the scheme listed below:

A	NN	A	NNN
|	|	|	|
Cable Voltage Code (see B below)	No. of cores (e.g. 01,03,3H, 07)	Cable code (See C below)	Cable size (e.g. 035,185,2.5, 0.5)

(A) SYSTEM VOLTAGE CODES:

(ac) A = 11KV, B = 6.6KV, C = 3.3KV, D = 415V, E = 240V, F = 110V

(dc) G = 220V, H = 110V, J = 48V, K = +24V, L = -24V

(B) CABLE VOLTAGE CODES:

A = 11KV (Power cables)

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

B = 6.6KV (Power cables)
C = 3.3KV (Power cables)
D = 1.1KV (LV & DC system power & control cables)
E = 0.6KV (0.5 sq. mm. Control cables)

(C) CABLE CODES

PVC Copper

A = Armoured FRLS	B = Armoured Non-FRLS
C = unarmoured FRLS	D = Unarmoured Non-FRLS

PVC Aluminium

E = Armoured FRLS	F = Armoured Non-FRLS
G = unarmoured FRLS	H = Unarmoured Non-FRLS

XLPE Copper

J = Armoured FRLS	K = Armoured Non-FRLS
L = unarmoured FRLS	M = Unarmoured Non-FRLS

XLPE Aluminium

N = Armoured FRLS	P = Armoured Non-FRLS
Q = unarmoured FRLS	R = Unarmoured Non-FRLS

S = FIRE SURVIVAL CABLES
T = TOUGH RUBBER SHEATH
U = OVERALL SCREENED
V = PAIRED OVERALL SCREENED
W = PAIRED INDIVIDUAL SCREENED
Y = COMPENSATING CABLES
I = PRE-FABRICATED CABLES
Z = JELLY FILLED CABLES

GENERAL TECHNICAL REQUIREMENTS FOR C&I

(COMMON FOR TG & SG)

PACKING REQUIREMENT FOR C&I ITEMS

(COMMON FOR TG & SG)

PACKING REQUIREMENT

Sl.no	DESCRIPTION
1	**Type of Packing:**
1.1	Item shall be fully covered with multi layered cross laminated colourless polyethylene sheet of at least 100 GSM and shall be packed inside wooden box or crate or fixed on wooden pallet depending upon the size.
1.2	Item shall be firmly fixed to the bottom of the packing box/crate/pallet with the help of supports/blocks to arrest the movement from all sides. The branch pipe ends and all opening shall be protected with polyethylene blind end caps.
1.3	Loose items/accessories like nipples, expander/reducer, root valves etc. shall be separately packed with polyethylene sheet of at least 100 GSM inside the packing box/crate.
2	**Quality of wood:**
2.1	**Quality of wood:** Wood used for packing box shall be Pinewood, Rubber wood, Mango wood, Fir wood, Silver Oak wood or other as per availability with moisture content not exceeding 30%.
3	**Cushioning material and moisture absorber:**
3.1	Suitable cushioning shall be provided by rubberized coir/ thermocol / expanded soft polyethylene foam.
3.2	Adequate quantity of packed desiccant shall be suitably placed inside the packing box.
4	**Packing slip & holder:**
4.1	Packing slip kept in polyethylene bag shall be placed inside the wooden box at appropriate place.
4.2	One copy of packing slip wrapped in polyethylene bag covered in galvanized iron tin sheet/ aluminium packing slip holder shall be fixed on the external surface the packing box.

DOCUMENTATION REQIREMENT FOR C&I

(COMMON FOR TG & SG)

DOCUMENTATION REQUIREMENT

DRAWINGS & DOCUMENTS TO BE SUBMITTED BY ALL THE BIDDERS ALONG WITH THE BID

	Sl. No.	DOCUMENT TITLE
	1	PQR CREDENTIALS
	2	COMPLIANCE SHEET

DRAWINGS & DOCUMENTS TO BE SUBMITTED BY SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT ALONG WITH SUBMISSION SCHEDULE

	Sl. No.	DOCUMENT TITLE	SUBMISSION SCHEDULE
	1	TECHNICAL DATASHEETS OF RANSMITTERS, LOCAL INSTRUMENTS, ANALYSERS, JB, ETC.	
	2	I/O & DRIVE LIST	
	3	TECHNICAL DATASHEET OF CONTROL VALVE	
	4	TECHNICAL DATASHEET OF FLOW ELEMENTS ALONGWITH CURVES	
	5	GA DRAWING OF ANALYSER RACKS, LIE, LIR & JB	
	6	INSTRUMENT SCHEDULE	
	7	CONTROL & OPERATIONAL WRITE-UP FOR THE SYSTEM WITH SET POINTS	
	8	VALVE SEQUENCE CHART/STEP LIST	
	9	CONTROL LOGIC DIAGRAM	
	10	CABLE SCHEDULE (IN EXCEL FORMAT)	
	11	CABLE INTERCONNECTION (IN EXCEL FORMAT)	
	12	UPS LOAD LIST	
	13	PLANT SCHEMATICS	
	14	ANNUNCIATION & SOE LIST	
	15	QUALITY PLAN DULY SIGNED & STAMPED FOR APPLICABLE ITEMS	
	16	CALIBRATION CERTIFICATES	

DRAWINGS & DOCUMENTS TO BE SUBMITTED AS FINAL/AS-BUILT DOCUMENT

	Sl. No.	DOCUMENT TITLE
	1	APPROVED DOCUMENTS
	2	CALIBRATION CERTIFICATES
	3	O&M MANUAL
	4	ALL TEST CERTIFICATES

SECTION-III
(COMMON FOR TG & SG)

LIST OF DOCUMENTS TO BE SUBMITTED ALONG WITH BID

1.0 Bidder to furnish following documents/information along with the bid:

- Compliance certificate. (Stamped & Signed)
- Schedule of Declaration. (Stamped & Signed)
- Un Price Schedule duly filled as “Quoted”. (Stamped & Signed)

Any other documents submitted by bidder except as asked in the bid’s specification shall not be evaluated & considered as null & void.

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnishing same with the offer:

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions/ deviations with regard to same.
2. QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification & QP enclosed therein.
3. QP will be subject to BHEL/Customer approval in the event of order & 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. The charges for 3rd party inspection (Lloyds, TUV or equivalent) for all components shall be included in the base price of the equipment by the bidder.
4. All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/Customer review/ approval.
5. There are no deviations with respect to specification.
6. The offered materials shall be either equivalent or superior to those specified. Also, for components where material is not specified it shall be suitable for intended duty, materials shall be subject to approval in the event of order.
7. The commissioning spares are supplied on ‘As Required Basis’ & prices for same included in the base price. (If bidders reply to this is “No commissioning spares are required” and if some spares are actually required during commissioning same shall be supplied by bidder without any cost to BHEL and Customer).
8. All sub vendors shall be subject to BHEL/CUSTOMER approval.
9. Any special tools & tackles, if required, shall be in bidder’s scope.
10. Performance guarantee test parameters shall stand valid till the satisfactory completion of Performance guarantee test and its acceptance by BHEL and Customer.

PRE-BID CLARIFICATION SCHEDULE

All clarification from the Technical Specification shall be filled in by the BIDDER clause by clause in this format only.

VOLUME	SECTION	CLAUSE NO.	PAGE NO.	SPECIFICATION REQUIREMENT	CLARIFICATION	REASONS FOR CLARIFICATION

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

SCHEDULE OF DECLARATION

I ……certify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/ system covered by our format proposal number Dated …… and there is no deviation to the specification.

I hereby certify that I am duly authorized representative of the Bidder's company whose name appears above my signature.

Bidders Company Name ……

Authorized Representative's Signature ……..

Name ……

Bidder's Name ……

The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated and giving compliance for **"NO Deviation to The Technical Specification".**