TALCHER THERMAL POWER PROJECT
STAGE-III (2X660 MW)

VOLUME – II B & III

TECHNICAL SPECIFICATION
FOR
PRE TREATMENT PLANT (PT PLANT)

SPECIFICATION NO.: PE-TS-497-158A-A001 REV 00

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

CONTENTS

VOLUME – II B

VOLUME III

SECTION - A
INTENT OF SPECIFICATION

SCOPE OF INQUIRY/ INTENT OF SPECIFICATION:

1.1 This specification is intended to cover design (i.e. Preparation and submission of drawing/ documents including " As Built " drawings and O&M Manuals), engineering, manufacture, fabrication, assembly, inspection & testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), fill of lubricants & consumables(excluding chemicals), mandatory spares along with spares for erection ,start up and commissioning as required, forwarding, proper packing, shipment and delivery at site ,unloading , handling transportation and storage at site, in site transportation, assembly, erection and commissioning, final painting at site, trial run, site testing, preparation of drawings in 3D, e-learning module, civil analysis & design of all civil structural & architectural works, Supervision of Complete civil structural, architectural & construction works, carrying out performance guarantee tests at site, training of customer/ client O&M staff & final handing over to end customer in flawless condition of entire **Pre Treatment Plant** complete with all accessories as per the details in different sections / volumes of this specification for **TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW).**

The bidder's scope shall also include any other services, etc. if called for in the succeeding sections of the specification.

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

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

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

1.5 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.

1.6 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.

1.7 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification 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.

1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.

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

1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder/vendor and Customer/Purchaser/Employer will mean BHEL and/or Customer (NTPC: National Thermal Power Corporation Limited) as interpreted by BHEL in the relevant context. Please refer GCC/SCC for better clarity.

1.11 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.

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

SECTION – B

PROJECT INFORMATION

TALCHER TPP STAGE-III (2X660 MW)

1.00.00 BACKGROUND

Talcher Thermal Power Project is situated near Talcher town in Angul district of Orissa having capacity of 460 MW (4x60 MW + 2x110 MW). The project was implemented by Orissa State Electricity Board (OSEB). Subsequently TTPS was taken over by NTPC on 03.06.1995. The present proposal is for expansion of TTPS by adding 2 units of 660 MW.

2.00.00 PROJECT HIGHLIGHTS

2.01.00 **Location**

The proposed site is located near Talcher town in Angul district of Orissa having latitude and longitude as 20°55' N and longitude 85°25' E respectively. The site is approachable from Banarpal–Talcher section of National Highway No. 23 at a distance of about 1 km from Anand Bazar. Nearest railway station is at Talcher on Talcher-Cuttack section of North Eastern Railway at about 4 Kms. The nearest commercial airport is Bhubaneswar at about 90 km.

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

3.00.00 BASIC INPUTS

3.01.00 **Land**

The plant facilities for this expansion stage would be accommodated within the land available in the existing power station and ash disposal shall be in mine voids.

3.02.00 **Water**

Make up water requirement for Talcher Thermal power project, Stage-III expansion (2x660 MW) would be about 40 Cusec with ash water recirculation system. Water requirement for the project will be met from upstream of the Samal barrage discharge on the River Brahmani and shall be pumped to the raw water reservoir located about 28 kms from intake well.

3.03.00 **FUEL**

3.03.01 **Coal Requirement, Availability and Linkage**

The Coal Linkage for the project granted by SLC(LT) and CLOA has allocated 5.854 MMTPA coal from MCL.

The primary fuel for the main steam generator shall be coal. The domestic coal quality parameters are indicated in **Annexure-IV-2** and imported coal parameters are indicated in **Annexure-IV-4** are to be considered for steam generator design.

3.03.03 **Coal Transportation**

The envisaged mode of coal transportation from the coal mines to the power plant is through Indian Railways network and will be unloaded in underground RCC Track Hoppers.

3.03.03 **Fuel Oil**

The fuel oil to be used for start-up, coal flame stabilization and low load operation of the steam generator shall be Light Diesel oil (LDO) having the characteristics given at **Annexure-IV-1** and HSD Oil characteristics given at **Annexure-IV-3**.

4.00.00 **STEAM GENERATOR TECHNOLOGY**

The steam generators shall be super critical 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.

5.00.00 **FLUE GAS DESULPHURIZATION SYSTEM (FGD) & SCR ready system:**

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

6.00.00 **CAPACITY**

Talcher TPP, Stage-III : 2x660 MW - Present proposal

7.00.00 **BENEFICIARY STATES**

The project is being implemented as a regional project for meeting the power demand of Eastern Region Beneficiaries including Orissa – the home-state. The exact allocation of power shall be subject to the approval of Ministry of Power, Govt. of India.

8.00.00 **METEOROLOGICAL DATA**

The meteorological data from nearest observatory is placed at **Annexure-II.**

9.00.00 **Plant Water Scheme**

The Plant water scheme is included in Part-E of Technical Specification.

9.01.00 **Condenser Cooling (CW) Water System**

It is proposed to adopt a recirculating type cooling water system with 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.

9.02.00 **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. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system.

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

9.03.00 **Other Miscellaneous Water Systems**

CW system blow down water shall be used for the FGD process requirement, ash slurry pumps sealing, sealing of Vacuum pumps (if applicable) of Ash Handling plant, make-up to fire water system. The service water shall be taken from clarified water tank of Pre-treatment plant. The service (wash water) water collected from various areas and coal handling plant shall be treated as per requirement and reused. The drinking water requirement shall be provided from water treatment plant.

The quality of Raw water is given in this sub-section at **Annexure-III**

10.00.00 POWER EVACUATION SYSTEM

In view of above and considering the present capacity of the project (1320 MW), it is proposed to adopt the step-up/power evacuation voltage as 400kV. Accordingly provision for 4 Nos. of 400 kV line bays has been considered in the generation switchyard. Station supply shall be derived directly from 400kV voltage level through 400kV Class station transformers. The issue of power evacuation of the project shall be taken up with appropriate Transmission Utility as per regulatory provision, based on final power allocation received from Ministry of Power.

11.00.00 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**.**

12.00.00 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.

13.00.00 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-I

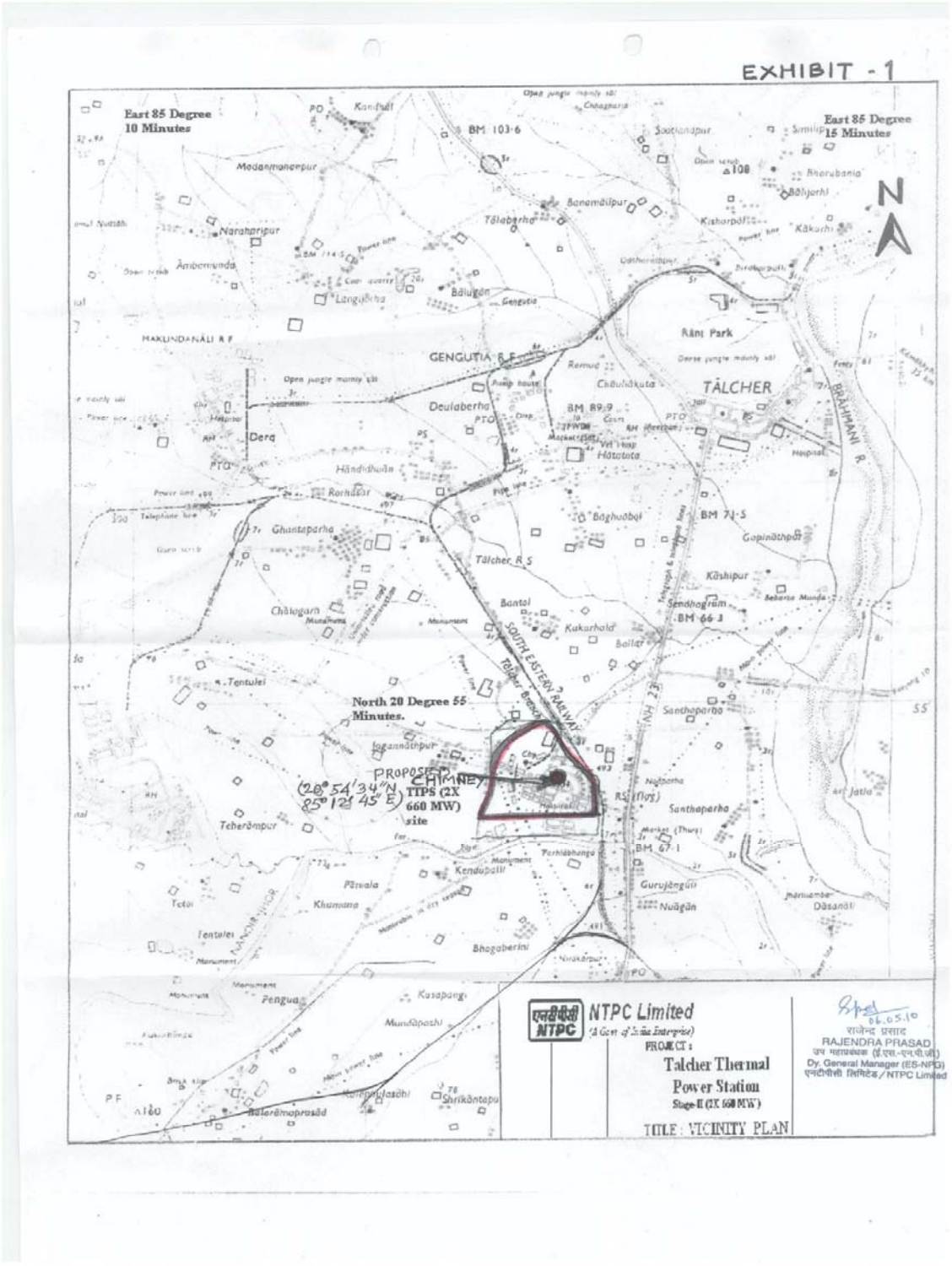
EXHIBIT - 1
East 85 Degree 10 Minutes
East 85 Degree 15 Minutes
North 20 Degree 55 Minutes.
N
TALCHER
GENGUTIA R.F
HAKUNDANALI R.F
Rani Park
BRAHMANI R.
Tālcher R.S
SOUTH EASTERN RAILWAY
PROPOSED CHIMNEY TIPS (2X 660 MW) site
(20° 54' 34" N 85° 12' 45" E)
NTPC Limited
(A Govt. of India Enterprise)
PROJECT : Talcher Thermal Power Station
Stage-II (2X 660 MW)
TITLE : VICINITY PLAN
RAJENDRA PRASAD
Dy. General Manager (ES-NPG)
06.05.10

जलवायवी सारणी
CLIMATOLOGICAL TABLE

केन्द्र : अंगुल STATION : Angul — अक्षांश LAT. 20°50' — देशांतर LONG. 85°06' — समुद्री स्तर से ऊंचाई HEIGHT ABOVE M.S.L. 139 METRES — आधारित BASED ON OBSERVATIONS 1971-2000

माह MONTH		स्टेशन स्तर पर वायुदाब STATION LEVEL PRESSURE	वायु तापमान AIR TEMPERATURE														आर्द्रता HUMIDITY		मेघ की मात्रा CLOUD AMOUNTS		वर्षा RAINFALL						
			माध्य MEAN								चरम EXTREMES															
			शुष्क बल्ब DRY BULB	वेट बल्ब WET BULB	दैनिक अधिकतम का माध्य DAILY MAX	दैनिक न्यूनतम का माध्य DAILY MIN	माह में उच्चतम तापमान HIGHEST IN THE MONTH	माह में निम्नतम तापमान LOWEST IN THE MONTH	उच्चतम तापमान HIGHEST	दिनांक और वर्ष DATE AND YEAR	निम्नतम तापमान LOWEST	दिनांक और वर्ष DATE AND YEAR													
		hPa	°C	°C	°C	°C	°C	°C	°C		°C		%	hPa					mm		mm		mm		Kmph
जनवरी JAN	I	1011.2	17.9	15.4	27.9	15.6	31.0	11.3	35.1	29 1994	5.5	2 1971	76	15.8	1.2	0.5	9.0	0.7	61.7	0.0	488	22 1995			
	II	997.6	25.7	18.5									47	15.6	1.1	0.5			1995						
फरवरी FEB	I	1000.1	21.1	18.0	30.9	18.2	35.3	12.7	39.3	23 1967	8.8	16 1971	72	18.3	2.0	1.1	20.9	1.6	370.1	0.0	118.1	6 1961			
	II	995.4	29.0	19.9									41	16.0	1.6	0.9			1961						
मार्च MAR	I	996.7	25.3	21.0	35.5	21.0	39.2	15.9	43.1	31 1999	10.2	2 1971	67	21.7	1.5	0.8	25.0	1.7	206.0	0.0	115.0	30 1990			
	II	992.6	33.5	22.1									35	17.4	1.8	1.1			1990						
अप्रैल APR	I	993.1	29.7	24.4	38.9	24.4	42.5	20.0	45.6	2 1941	14.4	19 1971	70	27.3	1.7	0.7	35.9	2.3	132.4	0.0	67.2	2 1965			
	II	988.4	35.6	24.4									38	21.5	2.6	1.6			1997						
मई MAY	I	989.4	30.6	25.9	39.8	26.0	44.3	21.6	47.2	24 1921	15.6	24 1964	68	29.7	1.9	0.9	75.6	3.6	333.1	0.0	105.0	30 1990			
	II	985.7	36.6	25.7									42	24.2	3.2	2.0			1995						
जून JUN	I	985.8	29.7	26.0	36.2	25.9	42.5	21.7	47.2	15 1967	17.4	1 1964	74	30.7	4.3	2.8	210.1	8.5	528.2	39.4	161.2	15 1990			
	II	982.5	32.8	26.3									62	29.0	5.1	3.7			1990	1965					
जुलाई JUL	I	986.1	27.9	25.4	32.1	24.4	36.2	22.4	41.1	3 1982	18.3	20 1971	81	30.5	5.4	3.6	258.3	12.1	552.5	102.4	249.8	25 1992			
	II	983.1	29.4	25.9									76	30.7	5.9	4.6			1992	1985					
अगस्त AUG	I	986.5	27.5	25.3	31.4	23.9	34.5	21.3	37.7	22 1983	14.3	28 1974	83	30.6	5.5	4.0	325.3	13.4	826.0	96.5	257.3	21 1991			
	II	983.9	28.8	25.8									78	31.1	5.9	4.5			1991	1937					
सितम्बर SEP	I	990.9	27.5	25.2	32.1	24.1	34.8	20.5	38.1	7 1977	12.8	24 1974	83	30.5	4.5	3.1	206.5	10.2	569.7	56.1	148.8	6 1939			
	II	987.8	28.9	25.6									76	30.3	5.3	4.0			1921	1919					
अक्टूबर OCT	I	995.8	26.2	23.6	32.3	20.7	34.4	18.6	37.7	21 2000	12.0	29 1974	80	27.2	2.9	1.7	100.8	5.1	404.5	0.0	194.2	18 1999			
	II	992.1	29.3	24.3									66	26.5	3.3	2.3			1973						
नवम्बर NOV	I	999.4	22.4	19.4	30.0	18.2	32.5	13.6	35.1	26 1997	5.6	30 1970	75	20.5	1.8	0.9	35.7	1.3	161.5	0.0	101.4	6 1999			
	II	995.8	27.3	20.9									54	19.7	1.9	1.0			1939						
दिसम्बर DEC	I	1011.7	17.8	15.3	27.7	15.1	30.3	11.5	32.1	23 1995	3.5	4 1974	75	15.5	1.0	0.4	3.1	0.3	39.8	0.0	48.8	14 1997			
	II	997.8	24.7	17.9									49	15.3	1.1	0.4			1991						
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I	993.8	25.2	22.0	32.9	21.5	44.1	9.1	47.2	24	3.5	4	75	24.9	2.8	1.7	1300.1	60.9	2693.4	756.1	257.3	21			
	II	990.2	30.1	23.1					5	1921	12	1974	56	23.2	3.3	2.2			1990	1957	8	1931			
वर्षों की संख्या NUMBER OF YEARS	I		26	18	18	17	17	17	89		89		18	18	26	26	30	30	94	94	100				

49

ANNEXURE-III

RAW WATER ANALYSIS

SN	Constituent	As	mg/l (except pH & turbidity)
1	Calcium	CaCO3	80
2	Magnesium	CaCO3	35
3	Sodium	CaCO3	20
4	Potassium	CaCO3	5
5	Total Cation	CaCO3	140
6	HCO3	CaCO3	85
7	p Alkalinity	CaCO3	0
8	Chlorides	CaCO3	35
9	Sulphate	CaCO3	20
10	Total Anion	CaCO3	140
11	Reactive Silica	SiO2	25
12	Silica non-Reactive	SiO2	5
13	Total Iron	Fe	0.5
14	pH value	-	6.8-8.0
15	Turbidity	NTU	2000
16	TDS	ppm	190
17	Temp	deg C	20-35
18	KMnO4	ppm	2
19	TOC	ppm	5
20	Total Suspended Solids	mg/l	2000

ANNEXURE-IV-1

TABLE-1

LIGHT DIESEL OIL CHARACTERISTICS

AS PER IS 15770-2008

	Characteristics	LDO
1.	Pour Point (max)	21 °C & 12°C for Summer and Winter respectively
2.	Kinematic viscosity in centistokes at 40 deg.C	2.5 to 15.0
3.	Sediment percent by mass (max)	0.10
4.	Total sulphur percent by mass (max)	1.5
5.	Ash percentage by mass (max)	0.02
6.	Carbon residue (Rams bottom) percent by pass (max.)	1.50
7.	Acidity inorganic	Nil
8.	Flash point (Min.) - Pensky Martens	66 deg.C
9.	Copper strip corrosion for 3 hours at 100°C	Not worse than No. 2
10.	Water content, % by volume (max)	0.25
11.	GCV(kcal/kg)	10,000

DOMESTIC COAL CHARACTERISTICS ANNEXURE-IV-2

TABLE-1 – A

S No.	Characteristics (As received basis)	Range of 95% coal supplies			Range of 5% coal supplies	
		Column -1	Column-2	Column-3	Range of Adequacy coal	
1.0	**PROXIMATE ANALYSIS**	**Design**	**Worst**	**Best**	**Worst**	**Best**
1.1	Total Moisture (%)	14	16	12	17	11
1.2	Ash (%)	41	45	38	46	34
1.3	Volatile matter (%)	22	19	24	18	25
1.4	Fixed carbon (%)	23	20	26	19	30
	Total (%)	100	100	100	100	100
2.0	**ULTIMATE ANALYSIS**					
2.1	Carbon (%)	34.04	30.53	37.84	29.33	41.7
2.2	Hydrogen (%)	2.73	2.45	2.8	2.1	3.1
2.3	Sulphur (%)	0.55	0.45	0.65	0.45	0.8
2.4	Nitrogen (%)	0.83	0.63	1.2	0.55	1.3
2.5	Oxygen (%) (By difference)	6.85	4.94	7.51	4.57	8.1
2.6	Total Moisture (%)	14	16	12	17	11
2.7	Ash (%)	41	45	38	46	34
2.8	Total (%)	100	100	100	100	100
2.8	GCV (kcal/kg)	3400	3100	3700	3100	4000
2.9	Hard grove index	50	45	60	45	65
2.10	YGP (mg/kg)	75	80	70	85	65
3.0	**ASH ANALYSIS**					
3.1	Silica (%)	57.61	55.60	59.62	53.10	60.50
3.2	Alumina (%)	29.65	30.20	28.67	32.38	28.10
3.3	Iron Oxide (%)	6.96	7.75	6.03	8.28	5.51
3.4	Titania (%)	1.60	1.50	1.70	1.40	1.80
3.5	Phosphoric Anhydride (%)	0.53	0.58	0.46	0.60	0.40
3.6	Lime (%)	0.89	1.10	1.50	0.80	1.70
3.7	Magnesia (%)	0.35	0.40	0.30	0.50	0.25
3.8	Sulphuric Anhydride (%)	0.05	0.05	0.05	0.05	0.05
3.9	Sodium Oxide (%)	0.30	0.30	0.50	0.25	0.55
3.10	Balance Alkalies(By Difference) (%)	2.06	2.52	1.17	2.64	1.14
4.0	**ASH FUSION RANGE** (Under reducing atmosphere)					
4.1	Initial Deformation Temperature (degree Celsius)	1100	1100	1150	1100	1150
4.2	Hemispherical temperature (degree Celsius)	1300	1250	1350	1250	1350
4.3	Flow temperature (degree Celsius)	1400	1400	1400	1400	1400

TABLE-2 **ANNEXURE-IV-3**

HIGH SPEED DIESEL OIL CHARACTERISTICS

[AS PER IS **1460-2005 (BS-II)**]

S. No.	Particulars	Unit	Value
1.	PHYSICAL PROPERTIES		
	a. Distillation volume recovery @ 350^0C	% vol. (min)	85
	b. Distillation volume recovery @ 370^0C	% vol. (min)	95
	c. Kinematic Viscosity @ 40 Degree C	cSt	2.0 – 5.0
	d. Density @ 15 Degree C	kg/m^3	820 – 860
	e. Pour Point		
	- Summer	Degree C (max)	15
	- Winter	Degree C (max)	03
	f. Cold Filter Plugging Point		
	- Summer	Degree C (max)	18
	- Winter	Degree C (max)	06
	g. Flash Point (Abal)	Degree C (max)	35
	h. Lubricity WSD 1.4 @ 60 Degree C	Microns (max)	460
2.	HEATING VALUE		
	a. Higher Heating Value (HHV)	Kcal/Kg	11,000
	b. Lower Heating Value (LHV)	Kcal/Kg	10,300
3.	ACIDITY		
	a. Inorganic	mg KOH/g	Nil
	b. Total	mg KOH/g	0.2 (max.)
4.	Copper Strip Corrosion 3 hours @100^0C	No.	1 (max)
5.	RCR on 10% residue	% wt.	0.3 (max)
6.	CONTAMINANTS		
	a. Ash	ppm (wt.)	100 (max)
	b. Sediments	% wt	0.05 (max)
	c. Total Sulphur	% wt	0.05 (max)
	d. Water Content	% volume	0.05 (max)
	e. Trace Metals		
	- Na + K	ppm (wt)	0.30 (max)
	- Vanadium	ppm (wt)	0.50 (max)
	- Lead	ppm (wt)	0.50 (max)
	- Calcium	ppm (wt)	2.0
	- Ni + Zn	ppm (wt)	Nil
7.	Nitrogen content (FBN)	% wt.	0.015

ANNEXURE-IV-4

TABLE – 4

TYPICAL IMPORTED COAL AND ASH CHARACTERISTICS

Sl.No.	Characteristics (as received basis)	Imported Coal	
		Worst	Best
1.0	**Proximate Analysis**		
1.1	Total Moisture (%)	20	16
1.2	Ash (%)	10	10
1.3	Volatile Matter (%)	30	45
1.4	Fixed Carbon (%)	40	29
1.5	Total (%)	100	100
2.0	**Ultimate Analysis**		
2.1	Carbon (%)	56.4	62.4
2.2	Hydrogen (%)	4.5	4.9
2.3	Sulphur (%)	0.9	0.8
2.4	Nitrogen (%)	0.9	0.5
2.5	Oxygen (%) (By difference)	7.3	5.4
2.6	Carbonates (%)	0	0
2.7	Phosphorous (%)	0	0
2.8	Total Moisture (%)	20	16
2.9	Ash (%)	10	10
	Total	100	100
2.10	GCV (Kcal/Kg)	5800	6500
2.11	Hard Grove Index	45	60
2.12	YGP (mg/kg)	100	70
3.0	**Ash Analysis**		
3.1	Silica (SiO_2) (%)	32.74	34.94
3.2	Alumina(Al_2O_3) (%)	30.5	28.43
3.3	Iron Oxides(Fe_2O_3) (%)	18.2	15.2
3.4	Titania (TiO_2)	1.56	1.76
3.5	Phosphoric Anhydride(P_2O_5) (%)	0.44	0.54
3.6	Lime (CaO) (%)	6.12	7.62
3.7	Magnesia (MgO) (%)	1.83	1.93
3.8	Sulphuric Anhydride (%)	6.95	7.65
3.9	Sodium Oxide (Na_2O) (%)	0.3	0.4
3.10	Balance alkalies (by difference)	1.36	1.56
	Total	100	100
4.0	**Ash Fusion Temperature reducing temperature**		
4.1	Initial deformation Temp (ºC)	1100	1250
4.2	Hemispherical Temp. (ºC)	1300	1350
4.3	Flow Temp. (ºC)	1400	1400

Annexure – IV-5

LIMESTONE CHARACTERISTICS

Chemical Analysis(% by mass)			
1.	CaO	%	47-51.0*
2.	MgO	%	0.9-3.8
3.	Fe_2O_3	%	0.45-1.0
4.	Al_2O_3	%	1.19-2.1
5.	Si_2O_3	%	2.1-4.5
6.	Mn_2O_3	%	<0.12
7.	P_2O_5,	%	Traces
8.	Cl_2	%	<0.015
9.	Na_2O	%	<0.16
10.	K_2O	%	<0.01
11.	TiO_2	%	<0.02
12.	Total Sulphur	%	<0.1
13.	LOI	%	39.0-41.3
Physical properties			
1	Bond Index	kWh/t	13
2	Granule size		Medium

Notes:

1. *Guaranteed parameters (guarantee on limestone consumption, auxiliary power consumption & gypsum purity) shall be based on available (reactive) CaCO3 content of 89%. The design of Flue Gas Desulphurisation (FGD) system & auxiliaries shall be based on available (reactive) $CaCO_3$ content of 79%.
2. For the purpose of volumetric computations of limestone handling & storage system the bulk density of limestone shall be taken as 1400 kg/m^3. However for torque, drive & structural load requirements the density of lime stone shall be taken as 1700 kg/m^3. For gypsum, the bulk density shall be taken as 900 kg/m^3 for volumetric computation and 1250 kg/m^3 for torque, drive & structural load requirements.
3. For the purpose of sizing of equipments and guarantee, $MgCO_3$ shall be considered as unreactive dolomitic form.

Annexure-IV-6

METHANOL CHARACTERSTICS

SN	Fuel Property	Unit	Methanol
1	Chemical Formula		CH3-OH
2	Fuel Carbon	Wt%	38
3	Fuel Oxygen	Wt%	12
4	Density at 20 deg C	kg/m3	792
5	LHV	Kcal/kg	4800
6	Boiling Temp	^{0}C at 1 bar	65
7	Vapour Pressure	bar at 20^{0}C	0.13
8	Kinematic viscosity	cSt at 20^{0}C	0.74
11	Auto Ignition	^{0}C	470
12	Heat of Vapourization	kcal/kg	260
15	Flammability limit	vol %	6-36
16	Flash Point	^{0}C	12

Annexure-IV-7(A)

S.N.	Technical Data	Unit	Specifications for Torrefied Pellet
1.	Base Material		**Agro residue:** Which means the leftover portion of the agriculture produce such as stubble/straw/stalk/husk of those agro residue which are surplus and not being used as animal fodder such as paddy, soya, arhar, gwar, cotton, gram, jawar, bajara, moong, mustard, seasam, til, maize, sunflower, jute, coffee etc., groundnut shell, coconut shell, castor seed shell etc., pine needle, elephant grass, sarkanda and horticulture waste such as dry leaves and trimmings generated during the maintenance and pruning of trees and plants. Wood obtained from tree cutting shall not be treated as agro residue and shall be not to be used as base material or mixing purpose whatsoever.
2.	Diameter	mm	In case of cylindrical shape: Diameter: Not more than 35 mm Length: Random For other shapes: No dimension should exceed 35 mm.
3.	Fines % (<3 mm) (ARB*)	Wt%	fines ≤ 5%
4.	Gross Calorific Value (GCVARB*)	Kcal/Kg	**Refer below**
5.	Moisture (ARB*)	Wt%	<= 15% (not more than 15%)
6.	Bulk density	Kg^3	600

*ARB – As Received Basis

Annexure-IV-7(B)

The sample was prepared by torrefying rice straw at 300 deg C with a holding time of one hour. Following analysis are carried out at NETRA using the powdered torrefied rice straw samples and the results of various testing for the specific sample is tabulated below:

a. Proximate Analysis (wt %, Air Dried Basis)

M	Ash	VM	FC
6.68	21.66	47.68	23.98

b. Ultimate Analysis (wt %, Air Dried Basis)

C	H	N	S	O
46.65	3.93	1.13	0.14	19.81

c. GCV : 4201 kcal/kg

d. Ash Fusion Temperature under reducing conditions: ^{0}C

IDT	ST	HT	FT
1134	1357	1374	1422

e. Ash Elemental Analysis (Elements expressed as Oxides in %w/w)

Na2O	MgO	Al2O3	SiO2	P2O5	SO3	K2O	CaO	TiO2	MnO	Fe2O3
2.423	7.783	4.623	67.48	1.9	1.9	6.15	4.21	0.39	0.03	2.83

Annexure-IV-7(C)

For the Torrefied Rice Straw Pellets (Prepared by torrefaction of rice straw at 300 deg C with holding time of 1 hr) tested at NETRA, the test results are as follows:

A. For Anion (ISO 16994:2016 E-Solid Biofuels- Determination of total content of sulphur and chlorine)-reported as wt % dry basis

a. Chlorine (Cl): 0.32%

b. Fluorine (F) : 0.09%

B. For Cation (ISO 16967:2015 E-Solid Biofuels- Determination of major elements …)- Reported as wt % dry basis

a. Sodium (Na): 0.31%

b. Potassium (K): 2.04%

Note: The above details as at Annexure-IV-7(A), IV-7(B & IV-7(C) are indicative only and shall vary based on the exact raw material and its subsequent processing.

SECTION-C1
(SPECIFIC TECHNICAL REQUIRMENT-MECHANICAL)

1.0 GENERAL

This specification is intended to cover design (i.e. Preparation and submission of drawing/ documents including " As Built " drawings and O&M Manuals), engineering, manufacture, fabrication, assembly, inspection & testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), fill of lubricants & consumables(excluding chemicals), mandatory spares along with spares for erection ,start up and commissioning as required, forwarding, proper packing, shipment and delivery at site ,unloading , handling transportation and storage at site, in site transportation, assembly, erection and commissioning, final painting at site, trial run, site testing, preparation of drawings in 3D, e-learning module, civil analysis & design of all civil structural & architectural works, Supervision of Complete civil structural, architectural & construction works, carrying out performance guarantee tests at site, training of customer/ client O&M staff & final handing over to end customer in flawless condition of entire **Pre Treatment Plant** complete with all accessories for **TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW).**

2.0 REFERENCE DOCUMENTS

A. PE-DG-497-158A-A001 : P & ID FOR PRE TREATMENT PLANT
B. DATASHEET – A : FOR ABOVE SYSTEM
C. PE-DG-497-100-M001 : PLOT PLAN
D. PE-DG-497-158A-A002 : LAYOUT OF PRETREATMENT PLANT

3.0 SCOPE OF SUPPLY (MECHANICAL)-

Bidder to note that Pre-treatment Plant for cooling water system (PT-CW) ,DM system (PT-DM) & potable water system (PT-Potable) shall include associated Mechanical, Electrical, Control & instrumentation work. All the work i.e. Mechanical work, C&I, Electrical works (refer electrical, C&I for respective scope), Broad scope of supply has been listed below: -

1) Raw water inlet piping to each aerator complete with piping, fitting and valves. Each inlet piping is to include motorized butterfly type control valve (With Position Transmitters) with manual upstream and downstream isolation valves along with by-pass motorized butterfly valve with necessary instrumentation.
2) Two (2) number Aerator and Two (2) number stilling chamber of RCC Construction of required capacity along with isolation gates at the inlet channels for PT-CW & PT-DM system clarifiers.
3) Channel from Aerator to Stilling Chamber as per P & ID enclosed for pre-treatment plant.
4) Four (4) numbers of inlet chambers of RCC Construction.
5) Four (4) numbers of inlet channels with flow measuring element in each channel (parshall flume) of RCC Construction.
6) One (1) number bypass channel of RCC Construction to by-pass PT-CW clarifier(s) with required isolation gate(s).
7) One (1) number bypass channel of RCC Construction to by-pass PT-DM clarifier with required isolation gate(s).
8) Four (4) nos. High Recovery Solid Contact Type Clarifiers with sampling points at different elevation of clarifiers.(03 Nos. For PT-CW & 01 No. for PT-DM as detailed in specification.)
9) Clarifiers bridges assemblies, hand railings, required motors, valves, piping, insert plates, instrumentation etc.
10) Outlet channels of RCC Construction from Clarifiers up to the Clarified Water Storage Tank/Clarified water distribution chamber, PT-DM & PT Potable Gravity Filters.
11) Interconnection between the clarified water outlet channel and outlet channel of PT-DM System.
12) Sludge disposal system from clarifiers, with piping, valves, instrumentation up to sludge collection pit as indicated in P & ID of Pre-treatment plant.
13) One (1) no. RCC Sludge Pit (in twin section) with common sump interconnected through valves along with Puddle pipes etc..
14) Two (2) Air Blowers for air agitation system of the sludge pit & backwash sump with acoustic enclosure, piping, valves, instrumentation etc.
15) Three (3) nos. Sludge Disposal Pumps with piping, valves, fittings and instrumentation up to ash slurry sump/tank.
16) Two (2) nos. Gravity Filters (twin section) of RCC construction including necessary shuttering plates & filter medium with piping, Nozzles, instruments, valves, etc. up to Filter Water Reservoir of potable water.
17) One (1) number filtered water reservoir (in twin sections located below the filters) of RCC Construction of each of required capacity, filtered water sump and common filtered water pump house for PT–Potable water & PT DM systems.

18) Two (2) number of air blowers of oil free type of required capacity, its drives and associated accessories, air (Galvanised CS) piping from blowers to each section of the PT- Potable Gravity filters for air scouring of filters during backwash operation.
19) Two (02) Nos Potable Water Pumps for Plant along with motors, piping, valves, fittings, instrumentation etc.
20) Two (02) Nos Potable Water Pumps for Colony along with motors, piping, valves, fittings, instrumentation etc.
21) Two (2) nos. conductivity analyser (indicating corresponding TDS values) (Range 0-2000 ppm) is to be provided each at the outlet of potable water pumps discharge header.
22) Two (2) nos. Gravity Filters (twin section) including necessary shuttering plates & filter medium with piping, instruments, valves, etc. up to Filter Water Reservoir of DM plant.
23) One (1) number filtered water reservoir (in twin sections located below the filters) of RCC Construction of each of required capacity, filtered water sump and common filtered water pump house for PT–Potable water & PT DM systems.
24) Two (2) number of air blowers of oil free type of required capacity, its drives and associated accessories, air (Galvanised CS) piping from blowers to each section of the PT- DM Gravity filters for air scouring of filters during backwash operation.
25) Required interconnecting air (Galvanised CS) piping, valves, instrumentation etc from the blowers to each Gravity filter for air scouring of filters during backwash operation for both PT-Potable & PT-DM Gravity Filters.
26) One (1) number electrically operated monorail hoist along with mono rail and trailing cable (common for both PTDM & PT-Potable System) in gravity filters pump house of required capacity for handling all the pumps, blowers, drives etc.
27) Pipe & Valves to facilitate future expansion for both PT DM & PT-Potable System, as detailed in tender specification.
28) One (1) no. RCC Filter Backwash Pit (in twin section) for both PTDM & PT-Potable System with common sump interconnected through valves along with Puddle pipes etc..
29) Two (2) nos. Filter Backwash Pumps with piping, valves, fittings and instrumentation up to Stilling Chambers of PT-CW & PT-DM Clarifiers.
30) One (1) no. two story chemical house building to store chemicals, tanks, pumps, etc. for both Pre-treatment plant. Along with the chemical tanks (Other than RCC), dosing pumps, transfer pumps, instruments, piping, valves, platforms along with handrails, weighing & handling equipment, ladders, piping supports, puddle pipe auxiliary structures for pipe fixing etc. along with all structural steel, inside the chemical house shall be in the scope of bidder.
31) Two (2) nos. Lime slaking tanks (RCC Construction is in BHEL's Scope) with motorized stirrer, flushing arrangement, instrumentation, valves, fittings and piping up to the Lime preparation tank.
32) Two (2) nos. Lime slurry transfer Pumps with Piping, valves & instrumentation etc.
33) Three (3) nos. Lime Solution dosing Tanks (RCC Construction is in BHEL's Scope) with motorized stirrer, flushing arrangement, instrumentation, valves, fittings and piping up to the Clarifiers.
34) Two (2) nos. Lime dosing Pumps with Piping, valves & instrumentation etc.
35) Four (4) nos. Alum Solution Preparation Tanks (RCC Construction is in BHEL's Scope) with motorized stirrer, flushing arrangement, instrumentation, valves, fittings and piping up to the Clarifiers.
36) Six (6) nos. Alum Dosing Pumps [4 nos. (3W + 1S) for PT-clarifiers of CW system], [2 nos. (1W + 1S) for PT-clarifiers of DM system] with Piping, valves & instrumentation etc.
37) Two (2) nos. Coagulant aid Preparation Tanks with motorized stirrer, flushing arrangement, instrumentation, valves, fittings and piping up to the all Clarifiers.
38) Two (2) nos. Coagulant aid dosing Pumps with Piping, valves & instrumentation etc for all the clarifiers.
39) Two (2) nos. PAC storage Tanks with flushing arrangement, instrumentation, valves, fittings and piping up to the all Clarifiers.
40) Two (2) nos. PAC unloading Pumps with Piping, valves & instrumentation etc for all the clarifiers.
41) Two (2) nos. PAC Preparation/dosing Tanks with motorized stirrer, flushing arrangement, instrumentation, valves, fittings and piping up to the all Clarifiers.
42) Two (2) nos. PAC dosing Pumps with Piping, valves & instrumentation etc for all the clarifiers.
43) One (1) No. Filtered Water Overhead Storage Tank (RCC Construction is in BHEL's Scope). The associated float type valve, overflow & drain arrangement, valves, instrumentation etc shall be in bidder's scope.
44) Two (2) nos. Weighing Scales, two (2) nos. electrically operated monorail hoist with trailing cable in chemical house for Pre treatment plant.
45) Two (2) nos. flushing pumps shall be provided by the bidder for flushing chemical and sludge lines including connection of all drains through a common header to stilling chamber/sludge sump.
46) Mandatory spares. .(Refer attached, Annexure-V/Section-C1).Bidder to consider all applicable spares, in case any spares is not applicable the relevant equivalent spares shall be provided by bidder within quoted price.
47) Start-up and commissioning spares as required.
48) All piping, valves, instruments as required for the system completion.

49) All motorized valves shall be provided with integral starter.
50) All motorized valves to be supplied with Non-intrusive Profibus based Electric Actuator for PT plant package along with necessary interface units for linking to corresponding Control System as applicable.
51) Bidder to provide Profibus based PT(Pressure Transmitters)/DPT(Differential Pressure Transmitters/TT(Temperature Transmitters) for entire PT Plant package.
52) Operating platforms shall be provided for all the structures such as aerator, stilling chamber, clarifier, sludge chamber, thickener etc. along with ladders and hand railing.
53) All pipes, puddle Pipes, fittings, structural steel etc. required for hand railing, platforms, and ladders shall be in the scope of bidder. All insert plates, nuts and bolts, counter flanges wherever applicable shall be in the scope of bidder.
54) Edge angle required in a proper shape for edge protection in civil works will be provided by bidder.
55) Hand railing will be provided by bidder for safety purpose in all civil structures. Supply and erection of all Hand railing as desired for safety purpose will be in bidder's scope.
56) **Hand Railings and Ladders-**All handrails and ladders shall be galvanised at the rate of 610 Gms / Sq. as per IS : 4736.
57) All sluice gates along with suitable protection shall be in the scope of bidder only.
58) All auxiliary steel structures (U-clamps, nuts, bolts, channels etc.) for fixing the pipe on the pedestal or trestles shall be in the scope of bidder.
59) First fill/charge of all lubricants, grease, etc.
60) Wherever terminal points between BHEL and bidder indicated, bidder shall provide pipes with counter flange.
61) One set of all special tools & tackles of reputed make necessary for proper maintenance or adjustment of the equipment being supplied by the bidder, packed in permanent box.
62) Sufficient numbers of portable type ladders with plate form to be supplied for ease of maintenance.
63) Necessary pipe, piping, fitting, valves, drains, vents, sampling etc. required for the complete PT Plant. Pipe racks shall be provided by BHEL wherever available. Wherever pipe racks are not available, pipe shall be laid on pedestal. All auxiliary steel structure (U-clamps, nuts, bolts, channels etc.) for fixing pipes on pedestal or racks for complete pre-treatment plant shall be in bidder's scope.
64) All the sumps, tanks, reservoirs and other water retaining structures shall be provided with access ladders/rungs from operating platforms/ ground level as the case may be and de-watering pits one for each section.
65) 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.
66) All channels & brackets, mounting plates as required for mounting of motors, pumps, stirrers, tank etc.
67) Six (6) 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 by the bidder. Two (2) number safety shower units and adequate nos. of eye fountains to protect against any chemical hazard shall also be provided by the bidder.
68) All other things are also included in scope of supply as specified in other part of the specification including under design criteria and technical details.

69) 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, puddle pipes, flanges Hangers and supports, embedment plates with lugs etc required for the below given piping shall also be provided by the bidder.

a. All piping within the Pre-Treatment Plant.
b. puddle pipe ,Inlet and outlet pipes, for each sumps, pits, pumps, other equipments, etc. with pipe connections to the respective sumps, pits, equipment.
c. Minimum 900 NB of 20 meter Raw water inlet piping to PT plant clarifiers as per Terminal point.
d. Minimum 250 NB of 1400 meter Sludge Transfer piping up to the ash slurry sump/tank as per Terminal point.
e. Service water piping, instrument air piping, service air piping, potable water piping, etc. as applicable as per the Terminal Points.

In addition, any additional piping and associated accessories required to complete the system shall be in bidder's scope.

4.0 SCOPE OF SUPPLY (ELECTRICAL)

Complete electrical as per specification and details indicated in Section C2 (Specific Technical requirement-Electrical).

5.0 SCOPE OF SUPPLY (C&I)

Complete C&I as per specification and details indicated in Section C3 (Specific Technical requirement -C&I).

6.0 SCOPE OF SERVICES

The bidder's scope also includes following services for scope under this specification:

1) Erection and commissioning, unloading, storage and handling at site.
2) Complete civil analysis & design of all civil structural & architectural works of complete Pre Treatment Plant.
3) Supervision of Complete civil structural, architectural & construction works of complete Pre Treatment Plant for One Hundred Eighty (180) man-days.(Refer Section-D for details).
4) Arrangement of all instruments, reagents, monitoring gadgets for monitoring, & lab facilities to carry out, pre commissioning, trial run, commissioning, Performance guarantee test & till handover.
5) Monitoring gadgets, instruments and equipment required for maintenance.
6) Complete grouting for equipment, fixing and any concreting inside the vessels and lining.
7) All personnel required during maintenance, Commissioning and Performance guarantee test.
8) Trial run for requisite period.
9) Performance guarantee test.
10) Painting shall be as specified in "Surface Preparation & Painting" Sec-D1 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.
11) Final touch up paint at site.
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.

7.0 TERMINAL POINTS

1) PT Plant inlet-As per P&I diagram of Pre Treatment Plant. (Pressure at inlet of control valves shall be of 1.2 kg/cm2 (g).
2) Potable water to Colony & Plant- As per P&I diagram of Pre Treatment Plant.
3) Filtered water to DM plant- As per P&I diagram of Pre Treatment Plant.
4) Sludge transfer piping to ash slurry sump- At the inlet of ash slurry sump.
5) 25 NB Instrument air supply at 5 to 7 kg/cm2 (g) – At 5 meter distance from PT Plant Chemical House. However distribution and piping inside PT Plant area shall be in bidder's scope.
6) 25 NB Service air supply at 5 to 7 kg/cm2 (g) - At 5 meter distance from PT Plant Chemical House. However distribution and piping inside PT Plant area shall be in bidder's scope. If service air required is more than provided by BHEL, bidder to provide necessary compressors/blowers and associated valves, piping, fittings, flanges, instruments etc. to meet the system requirement.
7) Service water connection (50 NB connections) at 5 meter distance from PT Plant Chemical House. Piping inside PT Plant area for mentioned services will be in bidder's scope.
8) Drinking water (or potable water) of 25 NB connections to PT Plant - At 5 meter distance from PT Plant Chemical House. However, distribution and piping inside PT Plant area shall be in bidder's scope.
9) Potable water pipe to Plant shall be terminated at 5 meter from pump discharge. The pressure at Terminal Point will be 6 Kg/cm2(g) with respect to the elevation FGL.
10) Potable water pipe to Colony shall be terminated at 5 meter from pump discharge. The pressure at Terminal Point will be 6 Kg/cm2(g) with respect to the elevation FGL.
11) Filtered Water line from Overhead tank to Chlorine di oxide dosing plant of 50 NB (Min) at a distance of 5 m From outside of chemical house.

8.0 EXCLUSIONS

1) Civil structural, architectural & construction works of complete Pre Treatment Plant.
2) Dismantling or rerouting of any underground pipeline/ buried utilities.
3) All chemicals.
4) Air conditioning, 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.
5) Other exclusions are mentioned in the electrical & C&I parts of this specification.

9.0 QP AND SUB VENDOR APPROVAL

1) The quality assurance plan is enclosed as Annexure-I/section-C1**.** However requirement of detailed QP, inspection checklist, certificate of conformance etc. for each equipment and sub-vendor shall be finalized during detailed engineering stage; decision of BHEL/customer shall be binding on vendor in this regard. Any changes/additional tests insisted upon by Owner during approval of QAP's shall be accepted by bidder without any commercial and delivery implication to BHEL/Customer. Bidder shall submit the quality plans in BHEL format during detailed engineering stage. Bidder to note further that during detailed engineering all the QAP's/check lists etc. shall be submitted to Customer/BHEL for approval. All inspection & testing etc. shall be carried out accordingly.

2) The sub vendor list enclosed as Annexure-II/section-C1 is indicative only and is subject to approval / acceptance by customer (NTPC). Bidder to propose his sub vendor list with back up documents (experience list, end user certificate as applicable) etc. The same shall subject to BHEL and Customer approval during detailed engineering stage without any technical, commercial & delivery implication to BHEL.

10.0 PERFORMANCE GUARANTEE TEST

The Performance guarantee test shall be as per Annexure-III/Section-C1.

11.0 DESIGN CRITERIA AND TECHNICAL DETAILS

In addition to the requirements of Section C & D the following shall also be complied under scope of this specification. The P&ID for Pre Treatment Plant (**Dwg.No.- PE-DG-497-158-A001**) is enclosed herein in this section for bidders compliance.

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 subject to BHEL / Customer approval during detail engineering without any commercial & delivery implication to BHEL.

The other technical requirement shall be as per Technical Requirement of water treatment system. Please refer Section-D1 of this specification.

12.0 DRAWING/DOCUMENTS REQUIREMENT

For the Drawings/Documents Requirement & Distribution submission schedule, please refer **Annexure-IV/Section-C1.**

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.

13.0 ADDITIONAL REQUIREMENT

1) Engineering for this project is to be carried out in Integrated Intelligent Engineering environment at BHEL end. For Details Refer Drawings/Documents Requirement & Distribution submission schedule.
2) Initial charge of all lubricants & grease.
3) All special tools necessary for proper maintenance or adjustment of the equipment packaged in permanent box.
4) Finish paints for touch-up painting of equipment after erection at site in sealed container.
5) Wherever pipe racks are not available, pipes shall run on pedestals or below ground. All fixing items such as U clamps, nuts, bolts etc. required to lay the pipes on pedestals shall be in bidder's scope of work. Coating, wrapping and protection required for buries pipes shall be in bidder's scope of work.
6) 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.
7) The pumps shall be designed to operate under discharge valve open and close condition.
8) Pump suction valves, re-circulation valves and discharge valves shall be provided with required limit switches for interlock & control.
9) 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).
10) All the first fill and one Year's topping requirements or 10 % of first fill quantity, whichever is more of consumable such as greases, oil, lubricants, servo fluids/control fluids, gases 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.
11) Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
12) 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.
13) 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.

14) 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.
15) The complete system shall be proven and necessary design documentation in support of proveness shall be submitted by the successful bidder in support of the systems, if asked by the customer without any price and delivery implication to BHEL and customer.
16) Preparation of all necessary drawings/data/ documents for obtaining necessary Approval of statutory authorities like CCOE , IBR , Weight & Measures Department and any other agency/ competent authority ,on behalf of the customer, related to installation of PT plant (if required) is included in bidder's scope. All expenses required to obtain the approval shall also be borne by the successful bidder. Successful bidder shall inform customer well in advance requirement of authority letter along with format for the same. After issuance of authority letter by customer, it will be vendor's responsibility to regularly follow up with the concerned authorities to obtain timely approval from these authorities. Any delay on account of the same, unless any specific information related to above approval to be furnished by customer is delayed by customer, shall be to vendor's account and shall not be used as a reason for extension in contract completion.
17) Vendor to attend regular engineering meeting with BHEL and customer fortnightly in BHEL or customer office as decided during detail engineering. Vendor will depute all his concerned engineering representative along with the project manager for discussion and approval. Meeting can be held at site also.
18) Space available for PT Plant is attached, elsewhere in this specification. Bidder to accommodate their equipment within the space provided.
19) Bidder to submit BBU during detailed engineering after approval of Basic documents. Incomplete BBU shall not be reviewed by BHEL.
    The Break-up (%) of Supply prices of Pre-treatment plant package in the BBU shall be in line with the details provided below:

Break-up (%) of Supply prices of Pre Treatment plant package. (To be used during contract execution for payment).	
Lump sum firm price for supply of Atmospheric tanks inclusive of all taxes, duties and other levies as applicable.	8 % of Total supply price of Pre Treatment plant package.
Lump sum firm price for supply of Valves inclusive of all taxes, duties and other levies as applicable.	24 % of Total supply price of Pre Treatment plant package.
Lump sum firm price for supply of Instruments inclusive of all taxes, duties and other levies as applicable.	10 % of Total supply price of Pre Treatment plant package.
Lump sum firm price for supply of Pumps, Blowers, agitators & strainers inclusive of all taxes, duties and other levies as applicable.	19 % of Total supply price of Pre Treatment plant package.
Lump sum firm price for supply of Piping & Fittings inclusive of all taxes, duties and other levies as applicable.	12 % of Total supply price of Pre Treatment plant package.
Lump sum firm price for supply of mechanism for clarifiers etc inclusive of all taxes, duties and other levies as applicable.	21 % of Total supply price of Pre Treatment plant package.
Lump sum firm price for supply of Balance items inclusive of all taxes, duties and other levies as applicable.	4 % of Total supply price of Pre Treatment plant package.
Lump sum firm price for preparation of drawings in 3D, e-learning module inclusive of all taxes, duties and other levies as applicable.	2 % of Total supply price of Pre Treatment plant package.

20) Preparation of drawings / document / P&ID's in 3D modelling software and providing soft copy of same to BHEL.
21) Preparation of e-learning package/module and providing the same to BHEL & NTPC for the complete pre-treatment plant. The necessary requirement shall be as per detail specified elsewhere in this specification.
22) Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance.

23) Any statutory requirement / clearance required for the packages from government / local body shall be in bidder's scope. Any change arising out of any new government norms, statutory requirements during the course of execution of the project shall also be complied by the bidder without any commercial implication.
24) Instrument, valves, & piping shown in the flow diagram/ P&IDs are bare minimum requirement. Any additional instrument, valves, and piping required as per system requirement, shall be in the bidders scope.
25) Wherever gravity flow is not possible the bidder shall provide suitable storage & pumping system (2x100%) along with Piping, valves & instrumentation etc to meet the system & process requirement.
26) Service water shall be available near to pre-treatment plant/ system building/ 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 two (2) nos. cooling pump/lubrication pump for pre-treatment plant.
27) Capacity of monorail hoists, chain pulley block wherever indicated in Datasheet– A are minimum and capacity of such hoists, chain pulley block etc. shall be suitable for handling 125% of maximum weight to be handled during erection and maintenance of the equipments in the pump house, buildings etc. as the case may be.
28) Wherever local instruments for measurement of Flow, Pressure, Level is indicated in the P&ID, Bidder to provide Diaphragm seal type instrument for Chemical (all type and concentration), corrosive, viscous fluids application.
29) Slings & Lifting lugs shall be provided in all equipment.
30) In case of any conflict and repetition of clauses in the specification, the more stringent requirements among them
31) are to be complied with.
32) Latest version of all codes and standards to be followed.
33) All civil drawings will have bill of quantity (BOQ) in every revision/submission.
34) Editable soft copy of design and drawing including auto Cad copy shall be submitted by bidder.

14.0 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.

ANNEXURE-I

QAP FOR PRE TREATMENT PLANT

CLAUSE NO — QUALITY ASSURANCE

Items / Components \ Test/Check	Material Test	WPS/PQR/Welder	DPT/MPI	Assembly Fit up	Dimension	RT	Hydraulic test / Pneumatic test / Vacuum test	Performance Test	Test as per relevant Std / Appd. Data Sheets	Other Tests	Remarks
COMMON ITEMS:											
1. Horizontal Centrifugal Pumps				Y	Y			Y^1	Y		
1.1. Casing	Y^a		Y^b		Y		Y				
1.2. Impeller	Y^a		Y^b		Y					Y^d	
1.3. Shaft	Y^a		Y		Y					Y^c	
2. Vertical Pumps				Y	Y			Y^1	Y		
2.1. Casing	Y^a		Y^b		Y		Y				
2.2. Impeller	Y^a		Y^b		Y					Y^d	
2.3. Shaft	Y^a		Y		Y					Y^c	
2.4. Fabricated Parts	Y^a	Y	Y^b		Y	Y^2	Y				
3. Dosing/ Metering Pumps	Y^a				Y		Y	Y^1	Y		
4. Gate/ Globe/ Check Valves	Y^a		Y^b		Y		Y	Y	Y	Y^3, Y^6	
5. Dual Plate Check Valves	Y^a		Y^b		Y		Y	Y	Y	Y^6, Y^{12}	
6. Diaphragm Valves	Y^a				Y		Y		Y	Y^4, Y^3	
7. Butterfly Valves (Low Pr.)				Y	Y		Y	Y	Y	Y^3	
7.1 Body & Disc (Cast	Y^a		Y^b		Y						
7.2 Body and Disc (Fabricated)	Y^a	Y	Y^b		Y				Y	Y^2	
7.3 Shaft	Y^a		Y^b		Y					Y^c	
8. Plug/ Ball Valves (Low Pr.)	Y^a		Y^b	Y	Y		Y	Y	Y	Y^3	

LEGENDS: Applicable tests are identified by 'Y'.

Y^a : One per Heat / Heat Treatment batch / Lot.

Y^b : On machined surfaces only. Also 100% on Butt Welds & 10% on Fillet Welds.

Y^c : UT shall be done for shafts with Dia 50 mm or above & Plates of Thickness 25 mm or above.

Y^d : Dynamic Balancing per IS: 21940, Grade 6.3 minimum shall be conducted for rotating assy.

Y^1 : As per Pump governing standard. Tolerences as per HIS, USA.

Y^2 : Random 10% RT to be conducted on butt welds for Thk ≥10 mm.

Y^3 : Seat Leakage Test for actuator operated valves shall be done by operating the valve with job actuator.

Y^4 : Tests on Rubber Diaphragms shall be conducted per batch of Rubber mix for Tensile, Elongation, Hardness, Thickness, Bleed Resistance. In addition, Type Test for 50,000 cycles for each type of diaphragm shall also be conducted.

Y^6 : Blue Matching, Wear Travel for Gate Valves and reduced pressure test

CLAUSE NO — QUALITY ASSURANCE

Items / Components \ Test/Check	Material Test	WPS/PQR/Welder	DPT/MPI	Assembly Fit up	Dimension	RT	Hydraulic test / Pneumatic test / Vacuum test	Performance Test	Test as per relevant Std / Appd. Data Sheets	Other Tests	Remarks
9. Blowers/ Compressors	Y^a		Y^b	Y	Y			Y	Y	Y^c, Y^d	
10. Tanks/ Pressure Vessels	Y^a	Y	Y^b	Y	Y	Y^8	Y		Y	Y^7	
11. Rubber Lining	Y^a				Y				Y	Y^9	
12. Strainers	Y^a	Y	Y^b	Y	Y		Y		Y		
13. Pipe & Pipe Fittings	Y^a	Y	Y		Y	Y^8	Y		Y		
14. Agitators /Flash Mixer/ Flocculator	Y^a	Y	Y^b	Y	Y			Y		Y^{10}	
15. Ventilation/Exhaust Fan	Y^a		Y^b	Y	Y			Y^{11}	Y	Y^c, Y^d	
16. Hoists & Cranes	Y^a	Y	Y^b	Y	Y	Y^8		Y	Y		
17. Wrapping & Coatig Material	Y				Y				Y		
18. Package/ Split AC	Y							Y	Y	Y^{14}	
PT & LET PLANT:											
1. Clariflocculator / Reactor Clarifier / Plate or Tube Settler	Y^a	Y	Y^b	Y	Y				Y	Y^{10}	

for check valves shall be conducted as per relevant standards.

Y^7 : Heat Treatment of the Tank/Vessel shall be done per fabrication code requirement. Welded dished ends shall be stress relieved. Dished ends manufactured by cold working shall also be stress relieved as per the requirement of code.

Y^8 : RT as per fabrication code requirements. However, dished ends welds, if manufactured by using welded plates shall be subjected to 100% RT.

Y^9 : Rubber Lining Mix shall be subjected to Bleed Resistance Test on mould sample. Adhesion Test, Spark Test and Hardness Test for the Rubber lined jobs shall also be conducted.

Y^{10} : Gear Boxes shall be checked for smooth No Load Operation at shop to verify noise and vibration levels. Gear Ratio and Kerosene Leak Test shall also be conducted.

Y^{11} : One Fan of each type & size shall be routine performance tested as per corresponding code for air flow, static pressure, total pressure, speed, efficiency, power consumption, noise & temperature rise. Also all Fans shall be subjected to run test of 4 hours during which noise, vibration, temperature rise and current drawn shall be measured.

Y^{12} : Dry cycle test on valve spring for 1, 00,000 cycles shall be carried out as

CLAUSE NO — QUALITY ASSURANCE

Items / Components \ Test/Check	Material Test	WPS/PQR/Welder	DPT/MPI	Assembly Fit up	Dimension	RT	Hydraulic test / Pneumatic test / Vacuum test	Performance Test	Test as per relevant Std / Appd. Data Sheets	Other Tests	Remarks
2. Pressure / Vacuum Relief valve / Pressure Regulating Valve	Y[a]			Y	Y		Y	Y	Y		type test, if not carried out earlier, for the similar MOC, size and type of spring. Y[13]: :Test as per approved supplier practice. Y[14] : Electronic leak test for condenser & evaporator unit. Note: 1.The complete Piping system along with valves & fittings shall be hydraulically tested at 1.5 times design pressure or 2 times working pressure whichever is higher after erection at site. 2. In case of items other than those identified above, the quality requirements shall be decided based on system design requirements.
DM PLANT											
1. Resins / Activated Carbon									Y		
2. Filter Membrane					Y				Y		
3. RO Pressure tube	Y[a]				Y		Y		Y		

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.	CW PUMPS, 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.	BUTTERFLY VALVES						Y[7]		Y	Y	Y		Y[8]	Y	
1	Body & Disc (Cast)	Y[a]	Y[b]												
2	Body & Disc (fabricated)	Y[a]	Y[b]	Y[c]									Y[9]		
3	Shaft	Y[a]	Y[b]	Y[c]											
4	EH Actuators	Y[a]	Y				Y	Y	Y		Y				
C.	RE JOINTS	Y[a]					Y[10]		Y	Y			Y[11]		
D.	R & W PIPES	Y[a]	REFER NOTE 13												
E.	CRANES & HOISTS	REFER RESPECTIVE QA CHAPTERFOR FOR CHECKS ON EOT CRANES AND HOISTS													

F.	**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]		
H.	GATE, GLOBE, CHECK VALVES, PIPINGS, & SPECIALITIES	Y[a]	Y[b]	Y[c]			Y[15]		Y	Y	Y	Y	Y[15]	Y	

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 CW 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 IS:3400 Part 20, Aging test, Adhesion strength of Rubber to Fabric and Rubber to Metal shall be carried out.
12	Smooth operation and Leakage test shall be carried out at site.
13	Followings are the testing requirements for fabrication of pipes at site

Tests	Quantum of Check
WPS, PQR, Welder Qualification Test	100%
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 Technique/PAUT	5%
DPT on finished butt weld joints	10%
Hydraulic Test	100%, 1.5 times the design pressure or 2 times the working pressure which ever is higher.

	Note:- After erection, the complete piping system shall be tested at 1.5 times, the design pressure or two times the maximum working pressure whichever greater. No leakage/seepage is acceptable. Butt weld joints which would not be hydro-tested shall be subjected to 100% RT test/ 100% UT by TOFD /PAUT Technique.
14	Type / Routine tests as per requirements of BS-6540/ ASHRAE-52-76 for Dust arrestance shall be carried out.
15	a. All pipes and fittings shall be tested as per applicable code. b. All strainers shall be subjected to Hydraulic pressure test for leakage. c. All valves shall be hydraulically tested for body, seat and back-seat (if applicable) as per relevant standard. Check valves shall also be tested for leak tightness test at 25% of the specified seat test pressure. d. Valves shall be offered for hydro test in unpainted condition. e. Functional checks of the valves for smooth opening and closing shall also be done. f. Anti-corrosive protection shall be tested as per applicable code.

1) The above mentioned requirement are bare minimum. However any additional comments provided by BHEL / Customer shall be adhered by successful bidder without any commercial and delivery implication to BHEL/Customer.

QAP FOR LOW PRESSURE PIPING (LP 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.

QAP FOR EOT CRANES AND HOISTS

	Shop Test for T.G.Hall EOT Cranes, Other Cranes & Hoist
1.0	**HOOKS**
1.01	ALL TESTS INCLUDING PROOF LOAD TEST AS PER RELEVANT IS/BS/DIN SHALL BE CARRIED OUT.
1.02	MPI/DPT SHALL BE CARRIED OUT AFTER PROOF LOAD TEST.
2.0	**STEEL CASTING**
2.01	DPT ON MACHINED SURFACE SHALL BE CARRIED OUT.
3.0	**GIRDERS, END CARRIAGE,CRAB, GEAR BOX AND ROPE DRUM**
3.01	THE PLATES OF THICKNESS 25MM AND ABOVE SHALL BE ULTRASONICALLY TESTED.
3.02	NDT REQUIREMENTS ON WELDMENTS SHALL BE AS FOLLOWS: a) BUTT WELDS IN TENSION:- 100% RT AND 100% DPT b) BUTT WELDS IN COMPRESSION:- 10% RT AND 100% DPT c) BUTT WELDS IN ROPE DRUM:- 100% RT AND 100% DPT d) FILLET WELDS:- RANDOM 10% DPT
4.0	**FORGING (WHEEL, GEARS, PINIONS, AXLE, HOOKS & HOOK TRUNION)**
4.01	ALL FORGINGS GREATER THAN OR EQUAL TO 50 MM DIAMETER OR THICKNESS SHALL BE SUBJECTED TO ULTRASONIC TESTING.
4.02	DPT/MPI SHALL BE DONE AFTER HARDFACING AND MACHINING.
5.0	WIRE ROPE SHALL BE TESTED AS PER RELEVANT STANDARD.
6.0	REDUCTION GEARS SHALL BE TESTED FOR REDUCTION RATIO, BACKLASH & CONTACT PATTERN. GEAR BOX SHALL BE SUBJECTED TO NO-LOAD RUN TEST TO CHECK FOR OIL LEAKAGE, TEMPERATURE RISE, NOISE AND VIBRATION.
7.0	THE CRANES SHALL BE COMPLETELY ASSEMBLED AT SHOP FOR FINAL TESTING. ALL TESTS FOR DIMENSION, DEFLECTION, LOAD, OVERLOAD, HOISTING MOTION, CROSS TRAVEL ETC. AS PER IS-3177 SHALL BE CARRIED OUT AT SHOP.
8.0	ALL ELECTRIC HOISTS SHALL BE TESTED AS PER IS-3938 AND CHAIN PULLEY BLOCKS SHALL BE TESTED AS PER IS-3832.
9.0	**LIFTING BEAM**:
9.01	THE PLATES OF THICKNESS 25MM AND ABOVE SHALL BE ULTRASONICALLY TESTED.

9.02	NDT REQUIREMENTS ON WELDMENTS SHALL BE AS FOLLOWS: e) BUTT WELDS IN TENSION:- 100% RT AND 100% DPT f) BUTT WELDS IN COMPRESSION:- 10% RT AND 100% DPT g) FILLET WELDS:- RANDOM 10% DPT
9.03	ALL FORGINGS GREATER THAN OR EQUAL TO 50 MM DIAMETER OR THICKNESS SHALL BE SUBJECTED TO ULTRASONIC TESTING.
9.04	DPT/MPI SHALL BE DONE AFTER MACHINING.
9.05	Lifting Beam will be subjected to overload testing at @1.25 X SWL of Lifting Beam at manufacturer works.

ANNEXURE-II

SUB-VENDOR LIST (INDICATIVE)

INDICATIVE VENDOR LIST

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 / Main Contractor.

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 Main Contractors 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 Clause no: 19.1 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 Main Contractor's design requirements may not be in the range of the listed sub-vendor's manufacturing process/capability. As such the main contractor to ascertain the vendor's capability to meet his specific requirements before considering a sub-vendor.

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.

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**

DOC. NO./ दस्तावेज सं.**:**	
REV. NO.:	
DATE/ तिथि **: 03.02.2022**	
PAGE/ पृष्ठ **: PAGE 1 OF 50**	

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)**	**Applicable Note**
1	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		

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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)	Applicable Note
		$			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		
		$									
		$			SALZGITTER MANNESAMANN PRECISION	FRANCE	A		CS(RIFFLED)		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 3 OF 50**

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)	Applicable Note
		$			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		
2	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		
		$			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		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 4 OF 50**

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)**	**Applicable Note**
		$			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		

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)**	**Applicable Note**
		$			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		
		$									
3	PLATES AND ROLLED SECTION	$			INDUS STEEL	BELGIUM	A		CS-SA515 AS UP T0 GR-91		
		$			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		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 6 OF 50**

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)**	**Applicable Note**
		$			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.		
		$			REFER TO SUB-VENDORS MENTIONED IN THE TECHNICAL SPECIFICATIONS SEC-VI, PART-B		A		(CS-IS 2062 STRUCTURAL STEEL GRADES)		
		$					A				
		$			OUTOKUMPU	SWEDEN	A		SS PLATES UP TO 20 MM THK		
		$			INDUSSTEEL	BELGIUM	A		GRADE-304,309,310,316		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 7 OF 50**

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)**	**Applicable Note**
		$			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		
4	SEPARATOR & STORAGE TANK	I			ALSTOM	USA	A				
		I			BHEL	TRICHY	A				
		I			GE INDIA	DURGAPUR	A				
		I			DOOSAN	SOUTH KOREA	A				
		I			L&T-MHPS BOILERS PVT LTD	HAZIRA	A				
5	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				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 8 OF 50**

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)**	**Applicable Note**
6	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				
7	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				
8	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				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 9 OF 50**

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)**	**Applicable Note**
		I			DEE DEVELOPMENT	PALWAL	A				
		I			BENTEC	USA	A				
		I			L&T PIPING CENTRE	HAZIRA	A				
		I			SEONGHWA IND CO LTD	SOUTH KOREA	A				
9	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				
10	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		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**

DOC. NO./ दस्तावेज सं.**:**	
REV. NO.:	
DATE/ तिथि **: 03.02.2022**	
PAGE/ पृष्ठ **: PAGE 10 OF 50**	

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)**	**Applicable Note**
		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		
11	MIXING SPHERES	I			GE INDIA	DURGAPUR	A				
		I			BHEL	TRICHY	A				
		I			ALSTOM	USA	A				
		I			DOOSAN	SOUTH KOREA	A				
12	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				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 11 OF 50**

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)	Applicable Note
13	AIR COOLED OIL GUN ASSEMBLY	I			BHEL	TRICHY	A				
		I			SIGMA POWER	TRICHY	A				
		I			DOOSAN	SOUTH KOREA	A				
14	HFO/LFO PUMPS										
		I			ALEKTON	CHENNAI	A				
		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				
15	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		

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		I			CLYDE BERGEMANN	GERMANY	A				
		I			DIAMOND POWER SPECIALITY LTD	SCOTLAND	A				
		I			DAIEYOUNG MACHINERY	KOREA	A				
16	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		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 13 OF 50**

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)	Applicable Note
		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		
17	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				
18	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				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**

DOC. NO./ दस्तावेज सं.**:**	
REV. NO.:	
DATE/ तिथि **: 03.02.2022**	
PAGE/ पृष्ठ **: PAGE 14 OF 50**	

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)**	**Applicable Note**
		I			TLT ENGG. PVT. LTD.,	MEHSANA	A				
19	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			NADI AIR TECH P LTD	CHENNAI	A				
20	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				
21	QUICK ERECT FURNACE SCAFFOLDING	II			BSL	UK	A				
		II			INSTANT UPRIGHT	IRELAND	A				
		II			EASTMAN IMPEX	LUDHIANA	A		CARBON STEEL SCAFFOLDING		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 15 OF 50**

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)	Applicable Note
		II			BSL	HARIDWAR	A				
		II			ARUFASE	SPAIN	A				
22	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.)		

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)	Applicable Note
		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				

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)**	**Applicable Note**
23	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		
					FLEXATHERM EXPANLLOW PVT LTD	VADODARA	A		UPTO 2000 NB		
24	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				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 18 OF 50**

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)	Applicable Note
		II			JAMSHEDPUR MINERAL WOOL	JAMSHEDPUR	A				
		II			ROXUL ROCKWOOL	DAHEJ	A				
25	CLH & VLH	I			BHEL	TRICHY	A				
		I			MID AMERICA	USA	A				
		I			MANNESMANN	GERMANY	A				
		I			ITT	GERMANY	A				
		I			PIPE SUPPORTS	UK / THAILAND					
		I			UNISON	SOUTH KOREA	A				
		I			PIPE HANGER SUPPORTS PVT LTD	TANJAVORE	A				
		I			GILLARDINI	ITALY	A				
		I			LISEGA	GERMANY	A				
		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				

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)**	**Applicable Note**
		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		
26	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		

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)**	**Applicable Note**
		I			VELAND VALVE CORP.	USA			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		
		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		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 21 OF 50**

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)**	**Applicable Note**
		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 (FORGED(80 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		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**

DOC. NO./ दस्तावेज सं.**:**	
REV. NO.:	
DATE/ तिथि **: 03.02.2022**	
PAGE/ पृष्ठ **: PAGE 22 OF 50**	

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)**	**Applicable Note**
		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			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		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 23 OF 50**

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)	Applicable Note
		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		
27	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			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		

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)**	**Applicable Note**
		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		
28	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		
29	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		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 25 OF 50**

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)**	**Applicable Note**
30	BOILER STRUCTURE & FABRICATION ITEMS(MAIN & AUX COLUMNS, CEILING GIRDERS, BUILT-UP BEAMS, BRACINGS & BUCKSTAY), COAL BUNKER AND ESP STRUCTURE	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		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 26 OF 50**

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)**	**Applicable Note**
		I			INDOFAB	TRICHY			CEILING GIRDERS		
		I			SANTHI ENGG. UNIT-II	PUDUKKUDI	A		CEILING GIRDERS		
		I			MASTERFAB UNIT-II	DEVARAYANERI	A		CEILING GIRDERS		
		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)		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**

DOC. NO./ दस्तावेज सं.**:**
REV. NO.:
DATE/ तिथि **: 03.02.2022**
PAGE/ पृष्ठ **: PAGE 27 OF 50**

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)**	**Applicable Note**
		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		
		I			SEAM INDUSTRIES LIMITED	NAGPUR	A		WELDED STRUCTURE UPTO 15T.FABRICATION AND SUPPLY OF BUNKERS & BUNKER STRUCTURES, BUCKSTAYS AND DUCTS.		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 28 OF 50**

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)	Applicable Note
		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)		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 29 OF 50**

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)**	**Applicable Note**
		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		
		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)		

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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)**	**Applicable Note**
		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			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		
31	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					
		II			PINAX STEEL INDUSTRIES PVT LTD	PATNA	A				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**

DOC. NO./ दस्तावेज सं.**:**	
REV. NO.:	
DATE/ तिथि **: 03.02.2022**	
PAGE/ पृष्ठ **: PAGE 31 OF 50**	

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)**	**Applicable Note**
		II			GREATWELD STEEL GRATING PVT. LTD	PUNE	A				
		II			VIN FAB ENGG. PVT LTD.,	MUMBAI	A				
32	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			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		
33	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.)		

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		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		
		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			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.		

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 33 OF 50**

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)**	**Applicable Note**
		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			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		
34	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				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 34 OF 50**

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)**	**Applicable Note**
		I			POSITIVE METERING SYSTEM	NASIK	A				
		I			PSI ENGG SYSTEM	CHENNAI	A				
35	SG CW BOOSTER PUMP/ ECW	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				
36	COAL MILL STATIC & ROTATING PARTS	I									
	PGB	I			SIEMENS	GERMANY	A				
		I			BHEL	HYDERABAD	A				
		I			SIEMENS LTD	Chennai	A				
		I			ELECON ENGG CO. LTD.	VALLABH VIDYA NAGAR	A				
		I			HYOSUNG	KOREA	A				

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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)**	**Applicable Note**
	PGB INTERNALS	I			SIEMENS, WELTER	GERMANY	A				
	PGB HOUSING	I			NS ENGG.	HYDERABAD	A				
		I			SIMPLEX	BHILAI	A				
		I			KCP	CHENNAI	A				
		I			BROWN'S HITECH STRUCTURES	BHEL ANCILLARIES	A				
		I			SRI SRI ENGG. WORKS	JEEDIMETLA	A				
		I			GVR ASSOCIATES	PATANCHERU	A				
	GRINDING ROLL	I			AIA ENGINEERING	AHMEDABAD/ NAGPUR	A				
		I			MAGATTOEUX	RAJKOT	A				
	BULL RING SEGMENTS	I			AIA ENGINEERING	AHMEDABAD/ NAGPUR	A				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 36 OF 50**

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)**	**Applicable Note**
		I			MAGATTOEUX	RAJKOT	A				
	SEPARATOR BODY	I			KCP	CHENNAI	A				
		I			NS ENGG.	HYDERABAD	A				
		I			ALSTOM PROJECTS INDIA LTD	SHAHABAD	A				
		I			SIMPLEX	BHILAI	A				
		I			PREMIER ENGG. INDUSTRIES	JEEDIMETLA	A				
		I			BHEL – HPVP	VISAKHAPATNAM	A				
		I			BHEL – CSU (FP)	JAGDISHPUR	A				
		I			L&T- MHPS BOILERS PVT. LTD.	HAZIRA	A				
		I			ISGEC HEAVY ENGINEERING	YAMUNA NAGAR	A				
		I			GTV ENGG	MANDIDEEP	A				

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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)	Applicable Note
	SEPARATOR TOP	I			KCP	CHENNAI	A				
		I			SIMPLEX	BHILAI	A				
		I			NS ENGG.	HYDERABAD	A				
		I			ALSTOM PROJECTS INDIA LTD	SHAHBAD	A				
		I			BHEL – HPVP	VISAKHAPATNAM	A				
		I			YOGASREE	BENGALURU	A				
		I			BHEL – CSU(FP)	JAGDISHPUR	A				
		I			L&T- MHPS BOILERS PVT. LTD.	HAZIRA	A				
		I			ISGEC HEAVY ENGINEERING	YAMUNA NAGAR	A				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 38 OF 50**

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)	Applicable Note
		I			GTV ENGG	MANDIDEEP	A				
	MILL DISCHARGE VALVE (VALVE OUTLET & ADAPTOR	I			BHEL - EPD	BANGALORE	A				
		I			BHEL – IP	JAGDISHPUR	A				
	MILL MOTOR COUPLING	III			SIEMENS	GERMANY	A				
37	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				
38	CERAMIC LINED BEND COAL PIPES	II			BHEL EDN	BANGALORE	A				
		II			BMW	HATHRAS/ROURKEE	A				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**

DOC. NO./ दस्तावेज सं.**:**
REV. NO.:
DATE/ तिथि **: 03.02.2022**
PAGE/ पृष्ठ **: PAGE 39 OF 50**

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)**	**Applicable Note**
		II			CARBORANDUM UNIVERSAL	HOSUR	A				
		II			BHEL IP	JAGDISHPUR	A				
39	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"		
40	RAPH (STATIC COMPONENTS, ROTATING COMPONENTS, GUIDE/SUPPORT BEARINGS	I			Bharat Heavy Electrical Limited	Ranipet	A				
	RAPH Rotor Parts	I			Diffusion Engineers	Nagpur	A				
		I			Baroda Equipment and Vessels	Vadodara	A				
		I			NR Air-preheater	Pudukudi	A				
	RAPH Static Parts	I			Indira Ind.	Ranipet	A				
		I			Diffusion Engineers	Nagpur	A				
		I			NR Air-preheater	Pudukudi	A				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 40 OF 50**

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)**	**Applicable Note**
41	FD, PA & ID FANS(STATIC, ROTATING COMPONENTS	I			Bharat Heavy Electrical Limited	Ranipet	A				
	FAN STATIC PARTS	I			Diffusion Engineers	Nagpur	A				
		I			Baroda Equipment and Vessels	Vadodara	A				
		I			GTV Engg. Ltd						
		I			Efficient Envirotech Pvt. Ltd.	Pune					

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 41 OF 50**

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)	Applicable Note
	BLADES	I			a) M/s Masta Machinery stores Pvt Ltd, b) b) M/s HAL, Bangalore c) M/s Vedanta Meta Cast Pvt Ltd, Pune, M/s d) d) TLT, e) Howden Solyvent India	Ahmedabad Bangalore Pune, Germany, Chennai	A A A A A				
	Hydraulic Actuating Device	I			M/s TLT	Germany	A				
		I			HAROLD BECK & SONS, INC.	USA	A				
		I			Rotork	Banglore	A				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 42 OF 50**

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)**	**Applicable Note**
42	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				
43	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			GUILLOTINE GATE(2700 MM HEIGHT)		
		I			DAMPER TECHNOLOGY INDIA PVT LTD	COIMBATORE	A				
44	ESP COLLECTING ELECTRODE				BHEL	Ranipet	A				
	,	I			L&T Hazira works	Hazira	A				

FORMAT NO./ प्रारूप सं**: QS-01-QAI-P-1B/F1-R0**		Engg. Div. / QA&I

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 43 OF 50**

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)	Applicable Note
		I			Penner Industries	Medak-Telengana	A				
		I			Dewas Metal	Dewas, MP	A				
		I			Auro Impex	Kolkata	A				
45	ESP EMITTING ELECTRODE	I			The G Engineers	Pune	A				
		I			Auro Impex	Kolkata	A				
		I			Patco Tech	Kolkata	A				
		I			Siva springs	Madurai	A				
		I			Venkateshwara Steel & springs	Coimbatore	A				
		I			Nagappa Springs	Ranipet	A				
		I			Kwality coils	Madurai	A				
		I			Best coils	Ranipet	A				
		I			Vishnu wire forms	Madurai	A				
46	**PA Fans**	I			Bharat Heavy Electrical Limited	Ranipet	A				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 44 OF 50**

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)	Applicable Note
		I			L&T- Howden Private limited	Hazira	A				
		I			TLT-Turbo GmBH	Germany	A				
		I			Howden	Denmark	A				
47	**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				
48	**FD Fan**	I			Bharat Heavy Electrical Limited	Ranipet	A				
		I			L&T Howden Private Limited	Hazira	A				
		I			TLT-Turbo GmBH	Germany	A				
		I			Howden	Denmark	A				

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**

DOC. NO./ दस्तावेज सं.**:**	
REV. NO.:	
DATE/ तिथि **: 03.02.2022**	
PAGE/ पृष्ठ **: PAGE 45 OF 50**	

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)**	**Applicable Note**
49	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				
50	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				
51	Boiler Start Up Drain Re-Circulation Pump	I			Torishima Pump Mfg Co. Ltd.,	Japan	A				
		I			Hayward Tyler Limited	UK	A				
					KSB AG	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	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
52	Air Pre-Heaters	I			Bharat Heavy Electricals Limited	Ranipet	A				
					L&T Howden Private Limited	Hazira	A				
					Arvos India Pvt.LTd.	Chennai	A				
53	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				
54	ESP	I			Bharat Heavy Electricals Limited	Ranipet	A				
		I			Larsen & Toubro Limited	Hazira	A				
		I			GE Power India	India	A				
	ITEMS WITH MAIN CONTRACTOR APPROVED SOURCES AND INSPECTION CATEGORY-III										
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						

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 47 OF 50**

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)**	**Applicable Note**
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						

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 48 OF 50**

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)**	**Applicable Note**
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						

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**:SG(MECH)**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 49 OF 50**

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)	Applicable Note
	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**.** **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.										

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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)	Applicable Note
	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 जाए 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 एनटी 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 " 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 एनटीप 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 do 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 अनुमो 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 Conf (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.									

एनटीपीसी NTPC		Project/ परियोजना : Talcher - III				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							REVISION NO : 00		
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 17.01.22		
		Contract No./ अनुबंध सं.:				SUB-SYSTEM उप-प्रणाली: FGD					
Sr. No.	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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Talcher Clause	Equipment rating for which the vendor is approved
1	**SLURRY RECIRCULATION PUMP**	I			KSB LTD	INDIA	A		Note-1	4.26.2	Flow-12710 m3/hr Head-25.7 m
		I			DUCTHING PUMPEN	GERMANY	A		Note-1	4.26.1	Flow-12500 m3/hr Head-24.4 m
							A				
2	**WET BALL MILL**	I			CHRISTIAN PFEIFFER	INDIA	A		Note-1	4.26.2	Capacity-41.8 TPH
		I			THYSSENKRUPP INDIA	INDIA	A		Note-1	4.26.2	Capacity- 92 TPH
3	**OXIDATION BLOWER**	I			SWAM PNEUMATICS PVT LTD. (POSITIVE DISPLACEMENT)	INDIA	A		Note-1	4.26.1	Flow-14000 Nm3/hr Head-11000 mmwc
		I			SWAM PNEUMATICS PVT LTD. (CENTRIFUGAL)	INDIA	A		Note-1	4.26.3	Flow-21370 Nm3/hr Head-9381 mmwc
		I			BOLDROCCHI INDIA PVT LTD(SINGLE STAGE CENTRIFUGAL)	INDIA	A		Note-1	4.26.3	Flow-18000 Nm3/hr Head-11318mmwc
		I			GARDNER DENVER INDIA (MULTISTAGE CENTRIFUGAL)	INDIA	A		Note-1	4.26.2	Flow-30000 Nm3/hr (wet) Head-98 Kpa(g)
		I			TLT BABCOCK (CETRIFUGAL)	INDIA	A		Note-1	4.26.2	Flow-21500 Nm3/hr Head-11000 mmwc
4	**Vacuum Belt Filter**	I			M/S. TENOVA INDIA	INDIA	A		Note-1	4.26.1	Capacity-55TPH
5	**SLURRY PUMP**	I			WEIR MINERALS	INDIA	A		Note-1	4.26.2	
		I			METSO INDIA PVT LTD	INIDA	A		Note-1	4.26.2	
6	**AGITATORS**	I			MUT-TSCHAMBER (TOP ENTRY)	GERMANY	A			4.26.1	

		I			REMI PROCESS MACHINERY (SIDE/TOP ENTRY)	INDIA	A		Note-1	4.26.5	
		I			EKATO INDIA PRIVATE LIMITED (TOP ENTRY) INDIA	India	A		Note-1	4.26.2	
7	**BOOSTER FAN**	I			L&T HOWDEN	INDIA	A		Note-1	4.01.01	Capacity :763 m3/hr Head :-573 mmwc
					TLT TURBO INDIA PVT LTD	INDIA	A		Note-1	4.01.03	Capacity :874 m3/hr Head :-592 mmwc
		I			BHEL,Ranipet	INDIA	A		Note-1	4.01.02	Capacity :747 m3/hr Head :-1221 mmwc
	Note-1 :- For final Sub-Qr approval , document required to be submitted as per specification Sub-QR requirements of Talcher										

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
1	**HP/IP Outer Casing Casting (1.25Cr & 2.25Cr)**	I			Voestalpine	Austria	A				
					JCFC	Japan	A				
					JSW	Japan	A				
					GE	Poland	A				
					Kobe Steel	Japan	A				
					Starwire	Faridabad	A				
					Sande Stahlguss GmBH	Germany	A				
					ISGEC	Muzaffarnagar	A		Weight upto 38 T, 1.25 Cr Grade		
					LMB Heavy Casting Unit	Hazira	A				
					BHEL-CFFP	Haridwar	A				
2	**HP/IP Inner Casing Casting (9 Cr)**	I			Voestalpine	Austria	A				
					JCFC	Japan	A				
					JSW	Japan	A				
					GE	Poland	A				
					Kobe Steel	Japan	A				
					Starwire	Ballabhgarh	A		Weight Upto 22T		
					Sande Stahlguss GmBH	Germany	A				
					Gruppo Cividale	Italy	A		Weight Upto 20T		
					LMB Heavy Casting Unit	Hazira	A				
					BHEL-CFFP	Haridwar	A				
					Sande Groditz	Germany	A		Weight Upto 20T		
3	**HP/IP Inner & Outer Casing Machining**	I			LMTG	Hazira	A				
					MHPS	Japan	A				
					FUZI ELECTRIC	Japan	A				
					ROSSEL DUSO	Venice	A				
					Toshiba works	Japan	A				
					TJPS	Chennai	A				
					GE	Sanand	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					BRUNO PRESEZZI	Italy	A				
					NUGO ROMANO	Italy	A				
					BHEL (HEEP)	Haridwar	A				
					Siemens	Germany	A				
					GMW	Germany	A				
					Sharp	Pune	A		HP/IP Inner Casing		
					BILFINGER MAS.GMBH	Austria	A		Previous Name:MCE		
4	**HP/IP/LP Turbine shaft Forging**	I			JCFC (Japan Casting & Forging Corp.)	Japan	A				
					SAARSCHMIEDE	Germany	A				
					JSW	Japan	A				
					Pacific Steel Mfg Co Ltd	Japan	A				
					Schmiedewerke Gröditz	Germany	A				
					Buderus Edelstahl	Germany	A				
					Cruesot Forge	France	A				
					Kobe Steel	Japan	A				
					SDF	Italy	A				
5	**Turbine shaft machining**	I			Siemens	Germany	A				
					Franco Tosi	Italy	A		HP/IP		
					BHEL (HEEP)	Haridwar	A				
					ROSSEL DUSO	Italy	A				
					BRUNO PRESEZZI	Italy	A		HP/IP		
					NUGO ROMANO	Italy	A				
					MCE MAP (Voist Alpine)	Austria	A		HP		
					GE	Poland/Switzerland/France/Sanand	A				
					Toshiba	Japan	A				
					TJPS	Chennai	A				
					MHPS	Japan	A				
					LMTG	Hazira	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					FUZI ELECTRIC	Japan	A				
6	**HP/IP/LP Stationary & Moving Blades Bar stock**	I			Böhler	Austria	A				
					Bohler Schmiedetechnik	Germany	A				
					WELZEWERKE REVENE	Germany	A				
					DIODO	Japan	A				
					Hitachi	Japan	A				
					Starwire	Ballabhgarh	A				
					Gloria Material Technology Corp	Taiwan	A				
					Acciaierie Valbruna S.p.a.	Italy	A				
					BGH Edelstahl GmbH	Germany	A				
					Carpenter Technology Co.	USA	A				
					Daido	Japan	A				
					Sz-metal Ravne D.o.o.	Slovenia	A				
					Einsal	Germany	A				
					Walzwerke Einsal	Switzerland	A				
					Nichia Tanko Co Ltd	Japan	A		LP Blades		
7	**HP/IP/LP Stationary & Moving Blades Machining(From Bar)**	I			SET	Hungary	A				
					MHPS	Japan	A				
					Leistritz-Numberg	Germany	A				
					Energietechnik Einsal	Germany	A				
					Prawest	Germany	A		FOR LP STATIONARY BLADES		
					ZEMA	Italy	A		FOR LP STATIONARY BLADES		
					LMTG	Hazira	A				
					GE	Switzerland/Germany/Sanand	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					Enem Excel	Hyderabad	A				
					TJPS	Chennai	A				
					Toshiba	Japan	A				
					BHEL (HEEP)	Haridwar	A				
					Siemens	Germany	A				
					QTPL	Bangalore	A		For Guide Blades		
					AZAD ENGG	Hyderabad	A				
8	**LP Forged Blades(Drop)-Material**	II			MHPS	Japan	A				
					GE	Switzerland	A				
					Leistritz Turbinenkomponenten	Germany	A				
					SMB SA	Switzerland	A		For L1 stage(Last but one) blades		
					C-BLADE SPA	Italy	A				
					BOHLER	Austria	A				
					PIETRO ROSA	Italy	A				
9	**LP Forged Blades(Drop) Machining**	I			MHPS	Japan	A				
					C Blade	Italy	A				
					Sumitomo (Manfg. by Sumiju Precision Forgings	Japan	A				
					PIETRO ROSA	Italy	A				
					Leistritz Turbinenkomponenten	Germany	A				
					Bohler	Austria	A				
					Toshiba	Japan	A				
					ALSTOM	Switzerland	A				
					AZAD ENGG	Hyderabad	A				
10	**LP Cast Blades(material) & Machining**	I			Zollern	Germany	A				
					Consolidated Precision Product	Belgium	A		Previous Name:ESCO		
					Formetal (cismocisco)	Italy	A		For casting		
					Juergens	Germany	A		For casting		
					GE Power Systems	Germany	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					IPCL	Bhavnagar	A				
					EXCEL HITECH	Ghaziabad	A		For casting		
					AK ALLOYS	Ahmedabad	A				
					PTC	Lucknow/Mehsana	A				
					AMBE ENGG)- For Machining only	Ghaziabad	A				
11	**LP Hollow Blades**	I			Binder	Switzerland	A				
					Prime Hi-Tech Engineering Limited	Naidupet, AP	A				
12	**LP Inner/Outer casing Fabrication**	I			LMTG	Hazira	A				
					BHEL (HEEP)	Haridwar	A				
					SHARP	Pune	A				
					Shape Engg.	Haridwar	A				
					GE	Croatia/Shahabad	A				
					D&N	Germany	A				
					KCP	Chennai	A				
					ISGEC(Weight upto 38T)	Yamunanagar	A				
13	**LP Inner casing Casting (GGG40)**	I			GE Power sp. Z.o.o	Poland	A				
					L&T	Kansbahal	A				
					FWH Freidrich Wilhems-Hute GmBH	Germany	A				
					Heidenheimer Giessen GmBH	Germany	A				
					Pilsen Steel	Czech	A				
					Buderus Spezialguss GmBH	Germany	A				
14	**LP Inner/Outer casing Machining**	I			LMTG	Hazira	A				
					BHEL (HEEP)	Haridwar	A				
					TJPS	Chennai	A				
					MHPS	Japan	A				
					SHARP	Pune	A				
15	**LP Crossover Pipe**	I			LONE STAR	Chennai/Cheyyar	A				
					Hatec	Germany	A				
					Rohr-und Anlagenbau (ROBA)	Germany	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					Seonghwa	S Korea	A				
					Dee Development	Ballabhgarh	A				
					HKR	S Korea	A				
					Babylon	Germany	A				
					Eichhoff	Germany	A				
					LMTG	Hazira	A				
					Mech engineers	Valsad	A				
16	**Electro-Hydraulic Actuators**	I			MHPS	Japan	A				
					GE	Germany	A				
					Horst Thiele	Germany	A				
					Bosch Rexroth	Germany	A				
					MOOG	Japan	A				
17	**Hydraulic Power Pack Unit**	I			Bosch Rexroth	Germany	A				
					Bosch Rexroth	Ahmedabad	A				
					Hydac	Germany	A				
					Hydac	Coimbatore	A				
18	**Actuator & Valve For CRH-NRV & QC-NRV**	I			Weir	USA	A				
					Cesare Bonetti	Italy	A				
					BABCOCK	Spain	A				
					ADAMS	Germany	A				
					BHEL	Trichy	A		Upto 850NB & Class upto 900 special		
					SEMPELL	Germany	A				
19	**HP/IP/LP Shaft Seals**	II			TPT	S Korea	A				
					Starwire	Ballabhgarh	A		For INGOTS		
					Kolhapur Steel	Kolhapur	A				
					Silbitz Guss	Germany	A				
					StahlgussSaar	Germany	A				
					GE	Sanand	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					PMT	Pune	A				
					Wellbore	Ahmedabad	A				
					Bharat Forge	Pune	A				
					Indo air	Ahmedabad	A				
					Toshiba	Japan	A				
20	**TG Bearings**	I			GE	Germany	A		For Thrust Bearing		
					Kingburry	USA	A				
					Omega	Bhopal	A				
					Eurobearing	Italy	A				
					John Crane Bearing	Germany	A				
					BHEL (HEEP)	Haridwar	A				
					Wuakesha Bearing	UK	A				
					Euro Bearings	Faridabad	A				
					Kingsburry	USA	A				
21	**MOP/EOP**	I			Allweiler	Germany	A				
					ABB	Switzerland	A				
					Bosch Rexroth	Germany/ Switzerland	A				
					Toshiba	Japan	A				
					Ebara Yoshikura Hydrotec Ltd.	Japan	A				
22	**Jacking Oil Pump**	I			Bosch Rexroth	Germany /Switzerland	A				
					Allweiler	Germany	A				
					Leistritz	Germany	A				
					MITTEN MANUFACTURING, INC	USA	A				
					PARKER HANIFIN	Japan	A				
					Allweiler	Daman	A				
23	**Oil Purification Unit**	I			Facet	Spain	A		Coalescer Type		
					Pall Corporation	USA	A		For control fluids		
					Alfa Laval	Pune	A		Centrifuge Type		
					Hilliard	USA	A		Coalescer Type		

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					Kaydon Filtration	USA	A		Coalescer Type		
					Westfalia Separator India Pvt.Ltd.	Germany/Bangalore	A				
					Rotring	Germany	A				
					Rockfin Group	Poland	A				
24	**Duplex Oil Filter With Oil Changeover Valve**	I			Hydac	Germany	A				
					Boll & Kirch	Germany	A				
					Rockfin	Poland	A				
25	**Turbine Integral Piping**	I			BHEL Piping Center	Chennai	A				
					Unitech	Saharanpur	A				
					Bend Joints	Bhopal	A				
					Pal Engineering	Yamunanagar	A				
					Seonghwa	S Korea	A				
					L&T Piping Center	Hazira	A				
					Dee Development	Ballabhgarh	A				
26	**Oil Module including Central Lubrication System**	I			Kelag	Switzerland	A				
					VDL Delmas	Germany	A				
					Hydac India Pvt. Ltd.	Coimbatore	A				
					AEL	Germany	A				
					Flenco	Italy	A				
					Hydac	Germany	A				
					King Dynamics	Switzerland	A				
					Southern Lubrication	Bangalore	A				
					ENPRO	Pune	A				
27	**Thermal Insulation**	II			Eugen Arnold GmbH	Germany	A				
					Heinrich Tapp GmbH	Germany	A				
					Lloyds Insulation	India	A				
					Minwool Rock Fibre	Bhilai	A				
					Thermocare	Rajnandgaon	A				
					Dhanbad Rockwool Insulation	Dhanbad	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					Minsulate Manufacturing Co.	Jamshed	A				
28	**Condenser (water cooled) (Sub QR Item)**	I			MHI	Japan	A				
					THERMAL ENGG INTERNATIONAL (TEI)	USA	A				
					TJPS	Chennai	A				
					TOSHIBA CORPORATION LTD	Japan	A				
					LMTG	Surat	A				
					BHEL	Haridwar	A				
					ABFPL	Sanand	A				
					GE	Switzerland	A				
29	**Condenser Fabricator (water cooled)**	I			ISGEC	Yamunanagar	A				
					GE Power india Ltd.	Durgapur	A				
					Godrej & Boyce Manufacturing Company Ltd.	Mumbai	A				
					TEMA India Ltd.,	Thane	A				
30	**HP Heaters (Sub QR Item)**	I			TOSHIBA CORPORATION LTD	Japan	A				
					TJPS	Chennai	A				
					SPX Heat Transfer Inc. (Erstwhile Yuba Heat Transfer)	USA	A				
					GE	France	A				
					ABFPL	Sanand	A				
					BHI	S Korea	A				
					THERMAL ENGG INTERNATIONAL	USA	A				
					HOLTEC	USA	A				
					L&T	Hazira	A				
					BHEL	Hyderabad	A				
31	**LP/HP Heater Fabricator**	I			ISGEC	Yamunanagar	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुती करण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					Godrej & Boyce Manufacturing Company Ltd.	Mumbai	A				
					TEMA India Ltd.,	Thane	A				
32	**LP Heaters (Sub QR Item)**	I			TOSHIBA CORPORATION LTD	Japan	A				
					TJPS	Chennai	A				
					SPX Heat Transfer Inc. (Erstwhile Yuba Heat Transfer)	USA	A				
					GE	Switzerland	A				
					ABFPL	Sanand	A				
					BHI	S Korea	A				
					THERMAL ENGG INTERNATIONAL	USA	A				
					BHEL	Hyderabad	A				
					L&T	Hazira	A				
					HOLTEC	USA	A				
33	**Condensate Extraction Pump (CEP) (Sub QR Item)**	I			KSB	Chinchwad, Pune	A				
					BHEL	Hyderabad	A				
					SULZER Pumps	Mumbai	A				
					Clyde Pumps India pvt. Ltd.	Ghaziabad	A				
34	**Condenser Air Evacuation Pumps (Sub QR Item)**	I			GARDNER Denver/Nash	Germany	A				
					GARDNER Denver/Nash	Pune	A				
					Tsurumi pumps	Japan	A				
					Edwards	UK	A				
35	**Deaerator (Sub QR Item)**	I			TJPS	Chennai	A				
					BHEL	Hyderabad	A				
					BGR	Chennai	A				
36	**Deaerator Fabricator**	I			Godrej	Mumbai	A				
					ISGEC	Yamunagar	A				
					Altech	Bhiwadi	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुती करण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					TEMA India Ltd.,	Mumbai	A				
					BGR Energy System Ltd.	Chennai	A				
37	**Booster Pump**	I			KSB	Germany	A				
					KSB	Pune	A				
					Sulzer Pumps	Mumbai	A				
					Sulzer	UK	A				
					Flowserve	Switzerland	A				
					FLOWSERVE	Coimbatore	A				
					Flowserve	Spain	A				
					Hitachi	Japan	A				
					Ebara Corporation	Japan	A				
					MHI	Japan	A				
					BHEL	Hyderabad	A				
38	**Boiler Feed Pump (BFP) (Sub QR Item)**	I			Ebara Corporation	Japan	A				
					Flowserve	Spain	A				
					KSB	Germany	A				
					KSB	Pune	A				
					Mitsubishi Heavy Industry	Japan	A				
					HITACHI PLANT TECHNOLOGY	Japan	A				
					BHEL	Hyderabad	A				
					Sulzer Pumps	Mumbai	A				
					SULZER	UK	A				
40	**Drive Turbine for BFP**	I			Siemens	Germany	A				
					Hitachi	Japan	A				
					GE Thermodyne	France	A				
					GE India Industrial Pvt. Ltd.	Pune	A				
					Toshiba	Japan	A				
					TJPS	Chennai	A				
					Power machines(Kaluga)	Russia	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					BHEL	Hyderabad	A				
					MHI	Japan	A				
					Skoda	Czech republic	A				
41	**HP Bypass Valves (Sub QR Item)**	I			CCI	Sweden/ Switzerland/Czech Republic	A				
					CCI	Chittor,AP	A				
					Bomafa	Germany	A				
					Bomafa	Ahmedabad	A				
42	**LP Bypass Valves (Sub QR Item)**	I			CCI	Sweden/ Switzerland/Czech Republic	A				
					CCI	Chittor,AP	A				
					BOMAFA	Ahmedabad	A				
					BOMAFA	Germany	A				
43	**Condensor On-load Tube cleaning system (COLTCS) (Sub QR Item)**	I			GEA BGR	Chennai	A				
					Multitex Filtration	Greater Noida	A				
44	**Hydraulic Coupling for BFP**	I			Voith	Hyderabad	A				
					Voith	Germany	A				
45	**Hangers & Supports; Pipe Support components including Spring Hangers**	I			Pipe Support	Chennai	A				
					Lisega	Germany	A				
					Lisega	Ahmedabad	A		Load upto to 100KN		
					Seonghwa	S Korea	A				
					Pipe supports	UK	A				
					GILLARDINI	Italy	A				
					BERJEN	Chittor,AP	A				
					NHK SPRIING	Japan	A				
					Yamashita Seisakusho Co. Ltd	Japan	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुती करण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					MHI	Japan	A				
					SANWA TEKKI CORPORATION	Japan	A				
					CARPENTER AND PETERSON	UK	A		CLH Upto 30 T AND VLH Upto 32 T		
					CARPENTER & PATERSON INDIA PRIVATE LTD.	Vellore	A		CLH Upto 23.8T & VLH Upto 20.7T		
					AAA Supports Private Limited	Vadodara	A		For CLH, VLH and Rigid supports Max. Load 1.5 MT		
					Carpentor & Patterson	USA/Thailand	A				
46	**Metallic Expansion Joint**	I			Lonestar	Chennai	A		For size up to NB9200		
					Flexicon	Vadodara	A		For size upto 2200NB		
					Witzemann	Germany	A				
					Munro & Miller	UK	A				
					Flexatherm	Vadodara	A		For size upto 2200NB		
					Bird Precision	UK	A				
					Metallic Bellows	Chennai	A		For size up to 1600 NB		
					M B Metallic Bellows	Chennai	A		For size upto 2200NB		
					Athulya Bellows and Engineering Pvt. Ltd	Vadodara	A		For size up to NB 3400		
					HKR	S Korea	A				
47	**HP Piping -Fabrication (Based on Design and Drawings of Qualified Vendor)**	I			BHR	Germany	A				
					Seonghwa	S Korea	A				
					Finow	Germany	A				
					TOSHIBA	Japan	A				
					BHEL	Piping Center, Chennai &Thirumayam	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
एनटीपीसी NTPC	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					L&T	Hazira	A				
					Dee development	Ballabhgarh	A				
					Bendtec	USA	A				
48	**HP Pipes and Fittings (Mills)**	II			Wyman-Gordon	USA	A				
					Sumitomo	Japan	A				
					Tenaris	Italy	A				
					V&M	Germany	A				
					V&M	France	A				
					IBF	Italy	A				
					SUNGWANG BEND	S Korea	A		UP TO 24INCH IN CS/AS MATERIAL		
					Productos Tubulares	Spain	A				
					JFE	Japan	A				
					Bentler	Germany	A				
					TK CORPORATION	S Korea	A		UP TO 24INCH IN CS MATERIAL		
					TUBOS REUNIDOS	Spain	A				
					MEGA	Italy	A		For Fittings Only		
					Petrol Raccord,	Italy	A		UP TO 24INCH IN CS MATERIAL & UP TO 18 INCH IN AS MATERIAL		
					Benkan Japan KK	Japan	A		UP TO 24INCH IN CS MATERIAL		
49	**Elastomer Large Bellows or Flexibles Rubber Bellows**	I			Cori Engineers Pvt. Ltd.	Chennai	A		UP TO 2700 NB		
					SRM Ecoflex	Kolkata	A		UP TO 2700 NB		
50	**Heater Drains Recovery Pumps (Drip Pump)**	I			KSB	Germany	A				
					Nasosenergomash	Ukraine	A				
					Sulzer Pumps	Mumbai	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुती करण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					KSB	Pune	A				
					Hyundai	S Korea	A				
					KBL	Pune	A				
					Flowserve	Coimbatore	A				
51	**Debris Filter/ Self Cleaning Strainer**	I			GEA-BGR	Chennai	A				
					Multitex	Gr.Noida	A				
52	**LP Pipes & Fittings (CS & SS)**	I			Remi	Tarapur,India	A		SS		
					Apex	Alwar	A		SS (up to 150NB)		
					Ratnamani	Ahmedabad	A		SS		
					ISMT	India	A		CS (up to 400 NB)		
					Maharashtra Seamless Ltd.	Maharashtra	A		CS (up to 400 NB)		
					Tube Products Incorporate	Ahmedabad	A				
					TK Corporation	S Korea	A				
					Dee development	Palwal	A				
					Jindal Saw	India	A		CS (up to 400 NB)		
					Tata	India	A		ERW		
					Surya	India	A		ERW		
					JINDAL PIPES LTD	India	A		ERW		
					WELSPUN	India	A		ERW		
					Lalit Pipes & pipes Ltd.,,	Thane	A		EFW Pipes		
					Ratnamni Metals and Tubes Ltd.,	Gandhinagar	A		EFW Pipes		
53	**Butterfly Valves (* Also for steam services)**	I			Fouress Engg. *	Bangalore	A		upto 2600 NB		
					IL *	Palakkad	A		upto 2200 NB		
					BHEL *	Bhopal, India	A				
					Kriloskar Bros. Ltd	Pune	A				
					L&T	Chennai	A				
					Trillium Flow	Hubli	A				
					Tyco	Halol	A				
					L&T	Coimbatore	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
एनटीपीसी NTPC	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					Intervalve	Pune	A				
54	**Valves (gate/ globe/check) for LP application**	I			L&T	Chennai/Coimbatore	A				
					Velan	Canada/Coimbatore	A				
					KSB	Germany/Coimabtore	A				
					ToA	Japan	A				
					Fouress Engg	Aurangabad	A				
					Trillium Flow	Hubli	A				
					Crane	USA	A				
					Samshin	S Korea	A				
					KBL	Pune	A				
					Weir	UK	A				
					Leader	Jalandhar	A				
					BHEL	Trichy	A				
					Pentair (Tyco Sempel)	Trichy	A				
					HP Valves(Key Valves Technology)	Netherlands	A				
					IL	Palakkad	A				
					Steel Strong	Mumbai	A				
55	**HP Feedwater Heaters Automatic (String Bypass) Isolation Valves**	I			KSB	Germany	A				
					Tyco Sempell	Germany	A				
					Strack	Germany	A				
					BHEL	Trichy	A				
					Weir Valves & Controls UK Ltd.	UK	A				
56	**Water Steam Cycle HP Valves**	I			KSB	Germany /Coimbatore	A				
					L&T	Chennai	A				
					L&T	Coimbatore	A				
					Velan	Coimbatore	A		up to 2inch, #4500 (up to P92 grade)		
					HP Valves	Netherlands	A		Previous Name:Key Valves Technology		

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					Weir Valves & Controls UK Ltd.	UK	A				
					BHEL	Trichy	A				
					Crane	USA	A				
					Samshin	S Korea	A				
					Pentair(Tyco Sempell)	Germany	A				
					Velan	Canada	A				
					ToA	Japan	A				
					Tyco	USA	A				
57	**Safety Valves**	I			BHEL	Trichy	A				
					Dresser	USA	A				
					Tyco	USA	A				
					Babcock	Spain	A				
					Flainger	Germany	A				
					Bopp & Reuther	Germany	A				
					Flainger	Nasik	A				
					Reineke	Germany	A				
					Valve Technology	USA	A				
58	**Forged Seel Valves up to 2" , Class 800 (FCS/FSS)**	I			KSB	Coimbatore	A				
					Leader	Jallandhar	A				
					L&T	Chennai	A				
					Velan	Canada	A				
					Fouress Engg	Ahmadnagar	A				
					Trillium Flow	Hubli	A				
					Velan	Canada	A				
					Steel Strong	Mumbai	A				
					L&T	Coimbatore	A				
59	**Condenser Tubes**	I			Plymouth	USA	A				
					Ratnamani	Kutchh	A				

	Project/ परियोजना : Talcher - III	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची	Doc. No./ दस्तावेज सं.:		
	Package/ पैकेज : EPC PACKAGE		REVISION NO : 00		
	Supplier/ आपूर्तिकर्ता:		DATE/ तिथि : 04.02.2022		
	Contract No./ अनुबंध सं.:	SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
					Neotiss Limited	Medak,AP	A		Remarks:Formerly Vallourec Heat exchanger Tubes Ltd/ CST Valinox Ltd.		
					REMI Edelstahl Tubulars Ltd.	Tarapur	A				
					Shin han Metal	S Korea	A				
					Valtimat	France	A				
					Nippon Steel Corp.	Japan	A				
					Ratnadeep Metal & Tubes Ltd	Mehsana	A				
					Scholler Werke GmbH	Germany	A				
60	**HP/LP Heater tubes**	I			Plymouth	USA	A				
					Ratnamani	Kutchh	A				
					Ratnamani	Mehsana	A				
					Valtimat	France	A				
					Nippon Steel Corp.	Japan	A				
					Scholler Werke	Germany	A				
					Heavy Metals and Tubes	Gandhinagar	A				
					Shin han Metal	S Korea	A		LP Heater		
					Apex	Alwar	A		LP Heater		
					Ratnadeep Metal & Tubes Ltd	Mehsana	A		LP Heater		
					REMI Edelstahl Tubulars Ltd.	Tarapur	A				
					Neotiss Limited	Medak,AP	A		Remarks:Formerly Vallourec Heat exchanger Tubes Ltd/ CST Valinox Ltd.		
61	**Turbine Bearing Pedestal**	I			Main Contractor Approved Sources						
62	**Chemical Dosing System**	I			Main Contractor Approved Sources						
63	**Vapour Exhauster With Motor**	II			Main Contractor Approved Sources						
64	**Drain Cooler & Misc Tanks**	II			Main Contractor Approved Sources						

एनटीपीसी NTPC		Project/ परियोजना : Talcher - III				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			Doc. No./ दस्तावेज सं.:		
		Package/ पैकेज : EPC PACKAGE							REVISION NO : 00		
		Supplier/ आपूर्तिकर्ता:							DATE/ तिथि : 04.02.2022		
		Contract No./ अनुबंध सं.:				SUB-SYSTEM उप-प्रणाली: TG-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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुती करण की सूची	Remarks/ टिप्पणी	Provenness Clause (Refer Note-1)	Applicable Note
65	**Oxygen/NAOH Dosing System**	II			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.											
LEGENDS/ संकेतिका											
*** - Inspection category will be decided during vendor evaluation.**											
1.0 SYSTEM SUPPLIER / SUB SUPPLIER APPROVAL STATUS CATEGORY प्रणाली आपूर्तिकर्ता / सब –वेंडर की स्वीकृति की स्थिति की श्रेणी											
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											
2.0 QP INSPECTION CATEGORY : क्यूपी / निरीक्षण की श्रेणी:											
CAT - I : For those items the Quality Plans are approved by Customer and final acceptance will be on physical inspection witness by Customer.इन मदों के लिए गुणवत्ता योजनाओं को एनटीपीसी द्वारा अनुमोदित किया											
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											
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											
UNITS/WORKS : Place of manufacturing- Place of main supplier of multi units/works.											
FORMAT NO./ प्रारूप सं: QS-01-QAI-P-1B/F1-R0											

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC Package** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**: TG HALL EOT CRANE**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 22.05.2021** **PAGE/** पृष्ठ **: PAGE 1 OF 2**

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
1.	TG HALL EOT CRANE ALONG WITH LIFTING BEAM (IF APPLICABLE) **(Sub-QR Item)**	I			FAFCO	Vadodara/ Mumbai	A		Vadodara - upto 150 MT, Mumbai - Upto 200 MT
		I			Mukand	Thane	A		Upto 300 MT
		I			WMI Konecranes	Pune	A		Upto 300 MT
		I			Anupam Industries	V U Nagar	A		Upto 300 MT
		I			Unique Industries Handlers	Nasik	A		Upto 300 MT
		I			CRANEX	GHAZIABAD	A		Upto 140 MT
		I			HEC	Ranchi	A		Upto 265 MT. Main Contractor to ensure availability of Load / Overload testing facility at Shop.

NOTE -1 : For final Sub-QR approval , document required to be submitted as per Sub-QR requirements given in the specification.

FORMAT NO./ प्रारूप सं**: QS-01-QAI-P-1B/F1-R0**		Engg. Div. / QA&I

एनटीपीसी NTPC	**Project/** परियोजना **: Talcher III** **Package/** पैकेज **: EPC Package** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**: TG HALL EOT CRANE**	**DOC. NO./** दस्तावेज सं.**:** **REV. NO.:** **DATE/** तिथि **: 22.05.2021** **PAGE/** पृष्ठ **: PAGE 2 OF 2**

LEGENDS/ संकेतिका

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 ।

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.

एनटीपीसी NTPC	Project/ परियोजना : TALCHER-III Package/ पैकेज : EPC Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:	INDICATIVE LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क़्वालिटी 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 : 04-02-2022 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 की सूची	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			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		SINGLE GIRDER EOT CRANE & ELECTRIC HOIST UPTO 15 MT ONLY. GEARBOX FROM	
					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	
					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				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	

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	Applicable Systems
		I			NADI AIRTECHNICS PVT LTD	CHENNAI	A		Up to 15000 CMH	
					ADVANCE VENTILATION PVT LTD	KUNDALI. SONEPAT	A		up to 40000 CMH	
					SK SYSTEMS PVT LTD	KUNDALI PHASE-II, SONEPAT, HARYANA	A		up to 50000 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	
					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	
					CAPACITE STRUCURES PVT LTD	THANE	A		406.4 MM TO 3874 MM OD	
5	PIPES & FITTINGS-GRP	I			EPP COMPOSITES PVT LTD	RAJKOT			UP TO 900MM	WTP,CT
					GRAPHITE INDIA	NASIK			UP TO 1000MM	
					SHRIRAM SEPL COMPOSITES LTD	CHENNAI			UP TO 1100MM	
					BALAJI FIBER REINFORCE PVT LIMITED	VADODARA			UP TO 650MM	
					MEGHA FIBRE GLASS INDUSTRIES PVT LTD	MEDAK			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	

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	Applicable Systems
					BELCO POLLUTION CONTROL PVT LTD	GREATER NOIDA	A		UPTO 3200MM DIA & THICKNESS UPTO 30 MM	
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	
					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	
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			

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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			TRILLIUM FLOW	HUBLI	A		SS BALL VALVES UP TO 500MM AND CLASS #600, CS BALL VALVES UP TO 250 MM AND CLASS# 900, CS/ SS BALL VALVES UP TO 100 MM AND CLASS # 1500.	WTP, CPU,FDPS,CAS,FOH,CHP, LHP&GHP,AHP
					MICRO FINISH VALVES PVT. LTD.	HUBLI	A		400NB CLASS#600 AND UP TO 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	
					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 UPTO 2000NB	WTP, CW,CT,CPU,FDPS,CAS, AC& VENTILATION, MUW,CHP, LHP&GHP,LP PIPING,AHP
					TRILLIUM FLOW	HUBLI	A		CI/ DI BUTTERFLY VALVE UP TO 1000MM AND PN16 AND UP TO 1800MM AND PN10,CCS UP TO 1050MM CLASS 150 AND UP TO 1800MM AND PN16 SS - UP TO 400NB PN-16 ,FABRICATED 800MM CLASS#150.	
					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 UPTO 2800NB, PN6.	
					FOURES ENGINEERING	BANGALORE	A		CAST SGI/CI/ MS FABRICATED- UP TO 1200 PN-10, UP TO 350 PN-16 ,2400 MM	
					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 FABRICATED 2800NB, PN6.	
					R & D MULTIPLE	VALSAD	A		CAST SGI/CI/MS FABRICATED- UP TO 1800 MM PN-10/CLASS # 75, ,1100MM PN25,1400MM CLASS#150 ,MS FABRICATED	
					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	

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	Applicable Systems
					L & T VALVES LIMITED	COIMBATORE	A		UP TO 900MM CLASS 150	
					DEMBLA VALVES	THANE	A		UP TO 2200MM CLASS#75	
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			650 MM CLASS 600, 50 NB CLASS 800.	
					TRILLIUM FLOW	HUBLI	A		CONVENTIONAL CCS GATE / GLOBE / CHECK VALVES UP TO 600MM AND CLASS # 1500, CSS GATE/ GLOBE/ CHECK VALVES UP TO 200MM AND CLASS # 600, FCS GATE / GLOBE / CHECK VALVES UP TO 50MM AND CLASS # 2500.	
9.E	VALVE- DIAPHGRAGM TYPE	I			CRANE PROCESS FLOW	SATARA	A		UP TO 300NB PN10	WTP,CPU
					WEIR BDK	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			TRILLIUM FLOW	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	
10	PUMP -SUBMERSIBLE>= 30KW	I			KSB	NASHIK	A		130 KW	WTP,CT, CPU,CHP, LHP&GHP, FOH,AHP.LP PIPING,FDPS
					KIRLOSKAR BROTHERS LTD	KIRLOSKARWADI	A			
					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				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	

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	Applicable Systems
		I			M/S COFIMCO FAN (CHANGSHU) CO. LTD.	CHINA	A		UP TO 11 METER 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			
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) ,	CW
					HYDAC (INDIA) PVT. LTD	COIMBATORE	A		HYDRAULIC POWER PACK-HYDAC COIMBATORE, HYDRAULIC CYLINDER -HYDAC	
18	IMPELLER CASTING - CW PUMP	II			ISGEC	MUZAFER NAGAR	A		FINISHED CASTING UP TO 4.0 MT APPROX	CW
					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	
					MATHER FOUNDARY LTD	UK	A		FINISHED CASTING UP TO 3.6 MT APPROX	

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	Applicable Systems
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			
					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			
26	CENTRIFUGAL FAN (≥ 5KW) MOTOR FROM NTPC ACCEPTED SOURCE	I			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	
					WOLTER VENTILATORS INDIA (P) LTD	BHIWADI,	A		UP TO 200000 CMH	
					C DOCTOR &CO PVT LTD	KOLKATA	A		UP TO 250000 CMH	
					[illegible]	[illegible]	A		UP TO 190000 CMH	

एनटीपीसी NTPC	Project/ परियोजना : TALCHER-III 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 : 04-02-2022 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 की सूची	Remarks/ टिप्पणी	Applicable Systems
					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					CUMMINS	PUNE	A		Up to 2000 KVA	DG SET,FDPS
					PERKINS	AURANGABAD	A		UP to 313 HP	
	DIESEL ENGINE	I			GREAVESS COTTON	AURANGABAD	A		Up to 1750 KVA	
28					SAIL	ROURKELA	A			MUW
	3 LPE COATED PIPE	I			RATNAMANI	KUTCH	A		UP TO 1100 NB	
					PSL LTD	KUTCH/ VIZAC	A		UP TO 1100 NB	
29					TRANTER INDIA	PUNE	A		HT PLATES & GASKETS FROM TRANTER SWIDEN/USA.HT PLATES FROM HISKA JAPAN	ECW
					KELVION INDIA PVT LTD	PUNE	A			
	PLATE HEAT EXCHANGER	I			ALPHA LAVAL	SATARA	A		HT PLATES & GASKETS FROM ALPHA LAVAL SWIDEN	
					IDMC	ANAND	A		HT PLATES & GASKETS FROM SONDEX DENMARK	
					SONDEX INDIA	VADODARA	A		HT PLATES FROM SONDEX DENMARK/INDIA (MODEL S188)	
30					JINDAL SAW(J161)	KUTCH	A		UP T0 DN 900 CLASS K7 & K9	MUW
	DI(Ductile Iron) PIPE & FITTINGS	I			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		I			ATLAS COPCO	Pune (Dapodi)	A			
		I			INGERSOL RAND INDIA	AHMEDABAD	A		UPTO MODELSH 300 (36 NM3/MIN) . AIR ENDS FROM GHH RAND - GERMANY & OTHER	CAS, CHP, LHP, GHP, MRHS, AHP
	SCREW TYPE AIR COMPRESSORS	I			ELGI	COIMBATORE	A		UPTO 2830 CFM, AIR ENDS FROM HITACHI-JAPAN. ASSEMBLY AND TESTING AT ELGI	
		I			KIRLOSKER PNEUMATIC COMP LTD	PUNE	A		FLOW CAPACITY 45.3 NM3/MIN , AND PRESSURE RATING 9.3 KG/CM2	
33					SUMMITS HYGRONICS	COIMBATORE	A		FOR REFRIGERANT DRYER, 11893 M3/HR , REGENERATIVE DRYERS BLOWER	
					MELLCON ENGRS PVT LTD	GR NOIDA	A		Refrigerant type 60 m3/hr & REGENERATIVE DRYERS HOC TYPE 2548 M3/HR	
	AIR DRYER	I			DELAIR INDIA LTD	GURGAON	A		Refrigerant type 7500 m3/hr & REGENERATIVE DRYERS HOC TYPE 3000	CAS
					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	
34					KIRLOSKAR CHILLER	PUNE	A		UP TO 350TR	
	SCREW CHILLER	II			DAIKIN	NEEMRANA	A		UP TO 185 TR	AC& VENTILATION

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	Applicable Systems
					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			
37	ALLOY CAST IRON PIPE, FITTINGS AND LINER	I			CRAWLEY & RAY	KOLKATA	A			MRHS, AHP
					ALLIED FOUNDRIES	BELGAUM	A			
					PARAMOUNT CASTINGS	NAGPUR	A			
					NORTHERN ALLOY	BHAVNAGAR	A			
					MENON METALLIK	KOLHAPUR	A			
					KOLHAPUR STEEL	KOLHAPUR	A			
					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				AHP
					MACAWBER BEEKAY	KESHWANA	A			
					MINING AND MATERIAL HANDLING EQUIPMENT	KOLKATA	A			
					DCL	HYDERABAD	A			
39	BAG FILTER / SILO VENT FILTER				FLAKT	KOLKATA	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	Applicable Systems
		II			ORIENT FANS (ACCO)	KOLKATA	A			AHP,MRHS
					THERMAX	PUNE	A			
					RIECO	PUNE	A			
					MELCO	FARIDABAD	A			
					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 / MECHANICAL EXHAUSTER [WATER SEAL RING TYPE]	I			KAKATI KARSHAK	HYDERABAD	A			AHP
					VACUNAIR	AHEMDABAD	A			
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	
43	SLURRY DUTY KNIFE GATE VALVE	I			BRAY CONTROLS INDIA PVT LTD, VAAS KNIFE GATE VALVE DIVISION	CHENNAI	A		UPTO PN 10 RATING	AHP
					FOURESS ENGINEERING	BANGALORE	A		UPTO PN 10 RATING	
					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

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	Applicable Systems
		I			WEIR MINERALS	AUSTRALIA	A		MANUFACTURING AT WEIR MINERALS BANGALORE	AHP
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	
					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			
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			

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	Applicable Systems
					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	
					L&T	KANSBAHAL	A		JET PUMP	
					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			
60	STACKER RECLAIMER & RECLAIMER	I			MCNALLY	KUMARDHUBI / ASAN	A			CHP
					L&T	KANCHEEPURAM	A			
					THYSSENKRUPP	PUNE	A			
					ELECON	V V NAGAR	A			
					TRF	JAMSHEDPUR	A			
					SANDVIK	PUNE	A			
					PROMAC	BANGALORE	A			
					HUNAN CHANGZHONGMACHINERY CO. LTD	CHINA	A			
					THYSSENKRUPP	HYDERABAD	A		* Hyderabad works approved for some of assemblies for Stacker Reclaimer - Counter	
61	WAGON TIPPLER & SIDE ARM CHARGER	I			ELECON	V V NAGAR	A			CHP
					FAMAK S.A. (IN ASSOCIATIONWITH MBE-ASANSOL)	POLAND	A			
					L & T	KANSBAHAL	A			
					THYSSENKRUPP	PUNE	A			
					TRF	JAMSHEDPUR	A			
					PROMAC	BANGALORE	A			
62					THYSSENKRUPP	HYDERABAD	A		UPTO 2400 TPH	
					L&T	KANSBAHL	A		UPTO 2200 TPH	
					ELECON	V V NAGAR	A		UPTO 2200 TPH	

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	Applicable Systems
	APRON FEEDER WITH DRIBBLE CONVEYOR (1600 TPH	I			TRF	JAMSHEDPUR	A		UPTO 2400 TPH Extended Warranty of 3 years over & above of contractual warranty on parts other than the parts treated as consumables	CHP
					MCNALLY SAYAJI	KUMARDHUBI	A		UPTO 2200 TPH	
63					PENNSYLVANIA CRUSHERCORPORATION	USA	A		UP TO 1760 TPH	
					AMERICAN PULVERISER	USA	A		UPTO 1875 TPH	
					THYSSENKRUPP	PUNE	A		UP TO 2035 TPH	
	RING GRANULATOR	I			TRF	JAMSHEDPUR	A		UP TO 1800 TPH TRF shall give extended warranty of 5 years over & above Contractual Warranty	CHP
					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					TECHNO VIBRAZIONI	ITALY	A		UPTO 1875 TPH	
					ELECON	V V NAGAR	A		UP TO 1320 TPH	
					GENERAL KINEMATICS	USA	A		UP TO 2000TPH	
					THYSSENKRUPP	PUNE	A		UP TO 2035 TPH	
	VIBRATING SCREEN FEEDER	I			TRF	JAMSHEDPUR	A		UP TO 1800 TPH TRF shall give extended warranty of 5 years over & above Contractual Warranty	CHP
					MCNALLY SAYAJI	KUMARDHUBI	A		UPTO 1210 TPH	
64.B					TECHNO VIBRAZIONI	ITALY	A		UPTO 1875 TPH	
					ELECON	V V NAGAR	A		UP TO 1320 TPH	
					GENERAL KINEMATICS	USA	A		UP TO 2000TPH	
					THYSSENKRUPP	PUNE	A			
	VIBRATING FEEDER	I			TRF	JAMSHEDPUR	A		UP TO 1800 TPH TRF shall give extended warranty of 5 years over & above Contractual Warranty	CHP
					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					BENGAL TOOLS	KOLKATA	A			
					THYSSENKRUPP	PUNE / HYDERABAD	A			
					ELECON	V V NAGAR	A			
					MBE	KUMARDHUBI	A			
	TRAVELLING TRIPPER	I			TRF	JAMSHEDPUR	A			CHP
					HMTC	KOLKATA	A			
					L & T - MACNIL	CHENNAI	A			
					L & T	KANSBAHAL	A			
					L & T - EWL	KANCHEEPURAM	A			
66					PHOENIX CONVEYOR BELT	KOLKATA	A		FABRIC BELT UPTO 2200 MM WIDTH, STEEL CORD BELT (FR GRADE UPTO 2400 MM WIDTH)	
					IMASS S.A	GREECE	A		FABRIC BELT UPTO 2400 MM WIDTH , STEEL CORD BELT (FR GRADE UPTO 2400 MM WIDTH	
					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	
	FABRIC BELTING(FR GRADE) / STEEL CORD BELTING(FR GRADE)	I			RAVASCO TRANSMISSION LTD.	VAPI	A		FABRIC BELT UPTO 2200 MM WIDTH	CHP, LHP/GHP
					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 2000 MM WIDTH)	

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	Applicable Systems
					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)	
67	IDLERS	I			ELECON	V V NAGAR	A			CHP , LHP/GHP
					MBE	KUMARDHUBI	A			
					KALI	KUMBAKONAM	A			
					AMPS	JAMSHEDPUR	A			
					A.ADAK	HOWRAH	A			
					BTL EPC	KOLKATA	A			
					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	
					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.r.l	ITALY	A		(Earlier name - BREVINI)	
					SEW EURODRIVE GMBH & CO.	GERMANY	A			
71	FLUID COUPLING (SCOOP AND TRACTION TYPE)	I			FLUIDOMAT	DEWAS	A		Scoop type upto SC-1330	CHP,LHP/GHP
					PTL	AURANGABAD	A		SCOOP TYPE UPTO PST 1150	
					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 tube out 1000 times on first coupling of each model. 2. M/s Elecon will conduct full load test for each type and model of coupling as per approved quality plan.	
					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	

एनटीपीसी NTPC	Project/ परियोजना : TALCHER-III 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 : 04-02-2022 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 की सूची	Remarks/ टिप्पणी	Applicable Systems
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			
					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 HAGGLUNDS)	SWEDEN	A			
					PARKER CALZONI	ITALY	A			
					MAHA HYDRAULICS	CHENNAI	A		UP TO 100 LITRE CAPACITY	
					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 INDIA	PUNE	A			
					ECOMAN	BARODA	A		UPTO 150TPH	
78	SHOP FABRICATED STRUCTURE	I			INDIANA GRATINGS PVT. LTD.	PUNE	A			CHP/LHP/GHP
					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			
					JSW SEVERFIELD STRUCTURES LTD(JSSL)	BELLARY	A			
					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			
					GOODLUCK STEEL	SIKANDRABAD	A			
					THYSSENKRUPP INDUSTRIES INDIA	HYDERABAD	A			

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एनटीपीसी NTPC	Project/ परियोजना : TALCHER-III 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 : 04-02-2022 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 की सूची	Remarks/ टिप्पणी	Applicable Systems
1	BRANCH PIPE , COUPLING & NOZZLE (SS & GM)	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
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
25	DUST SUPPRESSION SYSTEM (DRY FOG)	I			MAIN CONTRACTOR's APPROVED SOURCES				BOIs SHALL BE FROM NTPC APPROVED SOURCES	CHP, LHP/GHP
26	PIPE-SS ASTM A 312	II			MAIN CONTRACTOR's APPROVED SOURCES					
27	PIPE-CS SEAMLESS ASTM A 106	II			MAIN CONTRACTOR's APPROVED SOURCES					
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										
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										
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				

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
1	**GENERATOR**	**CAT I**							
					BHEL	Haridwar	A		
					Siemens	Germany	A		
					GE	Sanand	A		
					GE	POLAND	A		
					MELCO	JAPAN	A		
					LMTG	Hazira	A		
					Hitachi	Japan	A		
					Toshiba	Japan	A		
					TJPS	Chennai	A		
2	**IPBD**	**CAT I**							
					BHEL	Rudrapur	A		
					C&S ELECTRIC	Haridwar	A		
3	**Power Transformers (400 KV)**	**CAT 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
					TELK	Angamally	A		Up to 400 KV Class
4	**Shunt Reactor (400 KV)**	**CAT 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

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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5	**Auxiliary Oil Filled Transformers**	**CAT 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
6	**LT Switchgear -Floor mounted Draw out type indoor switchgear Panel (MCC etc.)**	**CAT I**							
					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		
7	**LT Switchgear - Floor mounted Fixed type indoor LT Switchgear Panel (ACDB / DCDB)**	**CAT I**							
					Schneider (formerly L&T)	Mumbai / Coimbatore/ Ahmednagar	A		
					C&S Electric	Noida/ Haridwar	A		
					Schneider	Nasik	A		
					Siemens	Kalwa	A		
					Schneider	Vadodara	A		
8	**11KV/3.3KV Switchgear- (MV Switchgear Panel)**	**CAT 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

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
8.1	Fast Bus Transfer panel along with relay	CAT I							
					Aartech	Parwanoo	A		conditions apply
					ABB	Vadodara	A		conditions apply
					SEL	Delhi	A		conditions apply
9	HT Motor								
9.1	HT Motors (CW PUMP MOTOR)	CAT I							
					WEG	BRAZIL	A		UPTO 3405KW,11KV
					HYOSUNG	S.KOREA	A		UPTO 2800KW,6.6KV
					BHEL	BHOPAL	A		
9.2	HT MOTORS (BFP Motor)	CAT I							
					HYOSUNG	SOUTH KOREA	A		UPTO 11KV 13.5 MW
					BHEL	BHOPAL	A		RQP
					HYUNDAI	SOUTH KOREA	A		UPTO 11KV 17 MW
9.3	HT MOTORS (ID Fan Motors)	CAT 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
9.4	HT MOTOR FOR OTHER EQUIPMENTS	CAT - 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

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					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
10	**H.T. CABLE upto 33KV**	**CAT 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		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
11	1.1 KV LT Power Cables (Type- XLPE Insulated, PVC sheathed (incl FRLS)	CAT I							
					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		
					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	LT Control Cable 1.1 KV, Type - PVC (incl FRLS)	CAT II							For cable total quantity above 10 km per size / type- 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		

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
					Torrent Cable Ltd	Nadiad	A		
					Universal Cable Ltd.	Satna	A		
13	EHV Cables	CAT 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
14	DG SET(ASSMEBLER & TESTING)	CAT 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
14.1	ALTERNATOR	CAT 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
14.2	DG Set Control panel / Synchronising panel	CAT 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		
		I			Hindustan Control & equipment Ltd	Kolkata	A		With fabrication & painting at unit II & MP Electrical Narendrapur

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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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
					Maktel	Vadodara	A		
					Jakson	Greater Noida	A		
					Vidyut Control	Gaziabad	A		
					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		
15	DC Batteries (Ni-Cd type BATTERY)	CAT 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

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
16	BATTERY CHARGER (48V/110V/220V)	CAT 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
17	Dry Type Transformer	CAT 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
18	OIP/RIP BUSHING	CAT I							
18.1	OIP/CONDENSER BUSHING	I			BHEL	Bhopal	A		Up to 400 KV class
		II			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		
					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
18.2	RIP Bushing	CAT 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

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
19	INSULATING OIL	CAT 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		
20	ON LINE DGA ANALYZER	CAT 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		
21	GIS	CAT I			GE T&D	CHENNAI	A		
					ABB	BARODA	A		
22	CAPACITIVE VOLTAGE TRANSFORMER (CVT)	CAT 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
23	CURRENT TRANSFORMER	CAT I							
					Mehru Electrical	Bhiwadi	A		UP TO 132 KV
					GE T&D	Hosur	A		UP TO 765 KV
					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

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
24	CIRCUIT BREAKER	CAT 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
25	ISOLATOR	CAT 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
26	'SURGE ARRESTOR	CAT 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
27	CLAMPS & CONNECTORS & WELDING SLEEVES	CAT 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		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
27.1	ACSR CONDUCTOR	CAT 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		
27.2	ALUMINIUM TUBE	CAT 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		
28	SUB STATION AUTOMATION SYSTEM '(BCU, GRP, ENERGY METER, NUMERICAL RELAYS, SWITCHYARD PROTECTION)	CAT I							
					GE T&D	CHENNAI	A		
					ABB	PEENYA	A		
					SCHNEIDER	NOIDA	A		
					SIEMENS	KALWA/GOA	A		
					BHEL	BHOPAL	A		
29	AB Tariff energy meter	CAT I							
					SEMS	Udaipur/Solan	A		
					Elster	Mumbai	A		
					L&T	Mysore	A		For Model ER300P With CMS software.

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
30	Power Conditioning Unit (PCU)	CAT I							
					Schneider	Bangalore	A		Conditions apply
					ABB	Bangalore	A		Conditions apply
					Bongfiglioli	Germany	A		Conditions apply
					Fecon	Germany	A		
					AEG	Bangalore	A		Conditions apply
					Hitachi-Hirel	Gandhinagar	A		Conditions apply
					Hitachi-Hirel	Sananad	A		Conditions apply
					Vacon	Bangalore	A		Conditions apply
30.1	String Monitoring Box (SMB)	CAT 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
31	SPV module	CAT 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		
32	Lighting mast with raise & lower type lantern carriage/ Lighting poles polygonal type	CAT I							
					Bajaj	Pune	A		
					BP Projects	Hoogly	A		
					Skipper	Howrah	A		
					Transrail	Silvasa	A		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
33	132 KV cable termination & straight through jointing kits	CAT I							
					Iljin	South Korea	A		
					ABB Kabeldon	Sweden	A		
					Pfisterer AG	Switzerland	A		
					Tyco Electronics Raychem GmbH	Germany	A		
34	Air Insulated Non Segregated phase type LT busduct	CAT I							
					C&S Electric	G.Noida	A		
					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		
34.1	Sandwitched type LT Busduct	CAT I							
					Henikwon	Malaysia	A		
					C&S	HARIDWAR	A		
35	SPBD	CAT 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		
36	LT MOTOR	CAT 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

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
					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
36.1	**DC Motor**	**CAT I**							
					CGL	MANDIDEEP	A		
37	**LT VFD Control Panel**	**CAT 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

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
37.1	MV VFD Control Panel	CAT I							
					HITACHI HI REL POWER ELECTRONICS PVT. LTD.	SANAND	A		3.3 KV, 1050 KW
					TMEIC INDUSTRIAL SYSTEMS INDIA PRIVATE LIMITED	TUMKUR	A		2200 KVA, 1050 KW, 3.3 KV
38	Elevator (GEAR TYPE)	CAT 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		
39	HVR Transformer & EC Panel	CAT I							
					ADOR Powertron	Pune	A		
					BHEL	Jhansi	A		
40	Panel Type Hopper Heater	CAT 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		
41	Neutral Grounding Transformer	CAT II							
					Pragati Electrical Pvt. Ltd.	Mumbai	A		
					Bharat Bijlee Ltd.	Navi Mumbai	A		
					Prayog Electrical Ltd.	Pune	A		
					Andrew Yule	Chennai	A		
42	LT Switchgear - Floor mounted Fixed type indoor LT Switchgear Panel (MLDB)	CAT 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
					Jakson	Greater Noida	A		
					Vidyut Control	Gaziabad	A		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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					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		
43	Rectifier Panel For Hydrogen Generation Plant	CAT I							
					RUTTONSHA INTERNATIONAL RECTIFIERS LTD	HALOL, GUJRAT	A		
					Hind Rectifier	MUMBAI / NASIK	A		
	A- MAJOR COMPONENTS OF BHEL MAKE GENERATOR (AS PER OEM SPECIFIC DESIGN)::								
44	STATOR FRAME FABRICATION	CAT I							
					BHEL-HEEP	HARIDWAR	A		
44.1	STATOR FRAME MACHINING	CAT II							
					BHEL-HEEP	HARIDWAR	A		
45	SPRING BASKET	CAT II							
					BHEL-HEEP	HARIDWAR	A		

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45.1	CORE BAR	CAT II							
					BHEL-HEEP	HARIDWAR	A		
45.2	FLUX TRAP	CAT II							
					BHEL-HEEP	HARIDWAR	A		STAMPINGS FROM BHEL CSU JAGDISHPUR
45.3	FLAT SPRINGS AND BASKET ASEMBLY	CAT II							
					BHEL-HEEP	HARIDWAR	A		
45.4	RIPPLE SPRING	CAT II							
					KREMPAL GMBH	GERMANY	A		
45.5	TENSION BOLT FOR STATOR CORE (INSULATED)	CAT II							
					BHEL-HEEP	HARIDWAR	A		
45.6	CORE PRESS RING	CAT II							
					BHEL-HEEP	HARIDWAR	A		
46	ETS MATERIAL	CAT II							
		II			THYSSEN KRUPP ELECTRICAL STEEL	NASIK	A		
		II			ARCELOR MITTAL INTERNATIONAL	LUXAMBOURG	A		
		II			THYSSENKRUPP MATERIAL TRADING	GERMANY	A		
		I			POSCO	RAIGARH	A		
		I			JSW	BELLARY	A		
		II			ALLOVERZE	GERMANY	A		
47	STATOR LAMINATION	CAT II							
					BHEL-CSU	JAGDISHPUR	A		
48	BUS BAR CONNECTION TUBES	CAT II							
					LUVATA PORI	FINLAND	A		
					BUNT METAL	AUSTRIA	A		
					KME GERMANY GMBH & CO. KG	GERMANY	A		
48.1	CONNECTING BUS BAR	CAT I			BHEL	HARIDWAR	A		
49	SOLID COPPER CONDUCTOR (FOR STATOR BAR)	CAT I							
		I			PEARL INSULATIONS	BANGLORE	A		
		I			MAHENDRA INDUSTRIES	BANGLORE	A		
		II			VONROLL	SWITZERLAND	A		
		II			GEBAUER & GRILLER	AUSTRIA	A		

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49.1	HOLLOW SS CONDUCTOR (STATOR BAR)	CAT II							
		II			FINE TUBES LTD.	ENGLAND	A		
50	OVER HANG SUPPORT RING	CAT II							
					ROECHLING ENGINEERING PLASTICS	GERMANY	A		
					POWER & COMPOSITE TECHNOLOGIES	USA	A		
51	WATER SUPPLY HOSE (INSULATED)	CAT I							
		II			DR SCHNABEL GMBH & CU KG LIMBURG	GERMANY	A		
		II			CRANE RESISTOFLEX	USA	A		
		I			MIL INDUSTRIES LIMITED	CHENNAI	A		
52	BAFFLE RING & BAFFLE RING CARRIER MACHINING	CAT I							
					BHEL-HEEP	HARIDWAR	A		
53	STATOR WINDING BAR	CAT I							
					BHEL-HEEP	HARIDWAR	A		
54	GENERATOR SHAFT FORGING	CAT II							
					BUDERUS EDELSTAHL	GERMANY	A		
					JSW	JAPAN	A		
					SAARSCHMIEDE	GERMANY	A		
					JCFC	JAPAN	A		
					PJSC Energomashpetstal	Ukraine	A		
					DOOSAN HEAVY INDUSTRIES & CONSTRUCTION CO. LTD.	SOUTH KOREA	A		
					SDF-TURNI	ITALY	A		
54.1	GENERATOR SHAFT MACHINING	CAT I							
					BHEL-HEEP	HARIDWAR	A		
55	CURRENT CARRYING BOLTS FOR ROTOR	CAT II							
					BHEL HEEP	HARIDWAR	A		
56	SILVER BEARING COPPER HOLLOW STRIPS (ROTOR COIL)	CAT II							
					BUNT METAL	AUSTRIA	A		
					BOASHIDA SWISS METAL	SWITZERLAND	A		
57	ROTOR COIL FORMING	CAT II							
					BHEL HEEP	HARIDWAR	A		
58	ROTOR SLOT ANGLE	CAT II							
					SAHNEY KIRKWOOD PVT. LTD.	NASIK	A		
					ABB SWITZERLAND LTD.	SWITZERLAND	A		
					VON ROLL ISOLA	FRANCE	A		

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58.1	WEDGES FOR ROTOR (DAMPER +SLOT)	CAT II							
					KM EUROPA	GERMANY	A		
					BOASHIDA SWISS METAL	SWITZERLAND	A		
					LUVATA (OUTO KUMPU PORI)	FINLAND	A		
					BUNT METAL	AUSTRIA	A		
59	RETAINING RING	CAT II							
					SAARSCHMIEDE	GERMANY	A		
					ENERGIETECHNIK	GERMANY	A		
					JSW	JAPAN	A		
59.1	RETAINING RING MACHINING	CAT I							
					BHEL-HEEP	HARIDWAR	A		
60	FAN BLADE FOR COMPRESSOR M/C	CAT I							
					BHEL-HEEP	HARIDWAR	A		
60.1	FAN BLADE FOR COMPRESSOR (RAW MATERIAL) - HW10786 –X20Cr 13	CAT I							
					Refer Steam Turbine List for same grade material for blade bars		A		
60.2	COMPRESSOR HUB M/C & ASSEMBLY	CAT I							
					BHEL-HEEP	HARIDWAR	A		
61	BEARING SHELL FORGING (GENERATOR)	CAT II							
					BHEL-CFFP	HARIDWAR	A		
62	BEARING COMPLETE (EXCITER)	CAT I							
					RENK AG	GERMANY	A		
					ZOLLERN	BRAZIL	A		
					EURO BEARINGS	ITALY	A		
63	END SHIELD FABRICATION & MACHINING	CAT I							
					BHEL-HEEP	HARIDWAR	A		
64	TERMINAL BOX FABRICATION	CAT I							
					BHEL-HEEP	HARIDWAR	A		
64.1	TERMINAL BOX MACHING	CAT I							
					BHEL-HEEP	HARIDWAR	A		
65	HYDROGEN COOLER MAIN ITEMS	CAT I			BHEL-HEEP	HARIDWAR	A		
65.1	TUBES FOR COOLERS (BRASS / COPPER TUBES)	CAT II							
					MULTIMETALS	KOTA	A		
					Mehta Tubes Pvt Ltd	VAPI	A		
					METAL ALLOYS	JAMNAGAR	A		
65.2	FINNING OF COOLER TUBES	CAT I							

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					LAXMI ENGINEERING INDUSTRIES	BHOPAL	A			
					LORD VISHWAKARMA HEAT EXCHANGE	HARIDWAR	A			
					FITWELL CORPORATION	BHOPAL	A			
65.3	HYDROGEN COOLER	CAT I								
					BHEL-HEEP	HARIDWAR	A			
66	PW COOLER & SEAL OIL COOLER	CAT I								
					BHEL-HEEP	HARIDWAR	A			
					ALFA LAVAL (INDIA) LIMITED	PUNE	A			
					TRANTER INDIA PVT. LIMITED	PUNE	A			
67	SEAL OIL PUMP & PRIMARY WATER PUMP	CAT I								
					TUSHACO PUMPS	DAMAN	A			
					KSB INDIA	PUNE	A			
					SULZER INDIA	NAVI MUMBAI	A			
68	PW SYSTEM/SKID	CAT I								
					BHEL-HEEP	HARIDWAR	A			
69	SEAL OIL SYSTEM/SKID	CAT I								
					BHEL-HEEP	HARIDWAR	A			

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70	**TERMINAL BUSHING**	**CAT II**							
					TRENCH FRANCE SAS	FRANCE	A		
					HSP HOCHSPANNUNGSGERAETE GMBH	GERMANY	A		
71	**HYDROGEN DRIER (REFRIGERANT TYPE)**	**CAT I**							
					JINDAL ELECTRONICS	ROORKEE	A		
					MELLCON ENGS PVT	NEW DELHI	A		
					SPAN	ROORKEE	A		
72	**RC BLOCK**	**CAT I**							
					ZENTRONICS SYSTEMS	HYDERABAD	A		
NOTE	**1. CHECKS FOR STATOR CORE ASSLY, STATOR WINDING ASSEMBLY, ROTOR WINDING ASSLY.(GEN.), GENERATOR ROTOR -FINAL, BEARING ASSEMBLY/SHAFT SEAL ASSEMBLY, EXCITER ASSLY (MAIN & PILOT), EXCITER TEST RUN, GENERATOR ASSEMBLY AT WORKS INCLUDING TERMINAL BUSHING & GENERATOR WORKS RUN TEST SHALL BE FINALIZED DURING DETAILED ENGINEERING/MQP FINALIZATION FOR THE RESPECTIVE OEMs.** **2. For Raw Material/Components/Items of Generator which are not appearing in the above list, their OEM approved sources shall be tied up during Detailed Engineering/ MQP finalization.**								
	B- MAJOR COMPONENTS FOR L&T MAKE GENERATOR (AS PER OEM SPECIFIC DESIGN):								
73	**STATOR FRAME WITH MAN HOLE COVER FABRICATION & MACHINING (Generator Stator Frame fabrication & Machining)**	**CAT I**							
					MITSUBISHI ELECTRIC	JAPAN	A		
					LMTG	HAZIRA	A		
74	**CORE BOLT ASSEMBLY (Core Bolt assembly in stator frame)**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			LMTG	HAZIRA	A		
75	**BORE RING FOR STATOR FABRICATION (Bore ring Fabrication & M/c)**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			LMTG	HAZIRA	A		
		I			MANJUNATH	BANGALORE	A		
76	**END PRESSURE PLATE (CORE PRESSURE RING AND FINGER (Finger Plate)**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			RV ENGG	BALLABGARH	A		
77	**STATOR CORE PUNCHING & SHIELD CORE PUNCHING**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			PITTI LAMINATION	HYDERABAD	A		

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78	**TENSION B0LT FOR STATOR CORE(INSULATED}(CORE BOLT)**	**CAT II**							
					MITSUBISHI ELECTRIC	JAPAN	A		
79	**LEAD BOX FABRICATION & MACHINING**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			LMTG	HAZIRA	A		
		I			JSPL	RAIPUR	A		
80	**OVER HANG SUPPORT RING(RESIN CONE)**	**CAT II**							
		II			HITACHI CHEM	JAPAN	A		
		II			PCT	USA	A		
		II			ROCHLING	GERMANY/ France	A		
81	**CORE TENSION BOLT (UNINSULATED) FOR STATOR (Core bolt)**	**CAT I**							
		II			MITSUBISHI	JAPAN	A		
		I			STAR WIRE	BALLABGARH	A		
82	**OVERHANG SLIDING SYSTEM (Part of stator winding Assembly)**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			LMTG	HAZIRA	A		
83	**BUS RING FABRICATION (Phase Ring)**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			LMTG	HAZIRA	A		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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84	**RIPPLE SPRING**	**CAT III**							
		III			MITSUBISHI ELECTRIC	JAPAN	A		
		III			AUGUST KREMPEL	GERMANY	A		
85	**SOLID COPPER CONDUCTOR (FOR STATOR BAR)**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		II			UNIMAC	JAPAN	A		
		I			MAHENDRA IND	BANGALORE	A		
		II			GEABUR AND GRILER	AUSTRIA	A		
		II			HITACHI MAGNET WIRE	JAPAN	A		
		I			PEARL INSULATION	BANGALORE	A		
		I			COSMOS	BANGALORE	A		
86	**HOLLOW COPPER CONDUCTOR (STATOR BAR)**	**CAT I**							
		II			UNIMAC	JAPAN	A		
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		II			ISOLA	SWITZERLAND	A		
		I			MAHENDRA INDUSTRIES	BANGALORE	A		
		I			PEARL	BANGALORE	A		
		I			COSMOS	BANGALORE	A		
87	**TERMINAL BUSHING (CONDENSER TYPE) (Lead Bushing)**	**CAT II**							
		II			EMIL HAFLEY(TRENCH)	SWITZERLAND	A		
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		II			TRENCH	SWITZERLAND	A		
88	**SUPPORT BRACKET**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			LMB	HAZIRA	A		
89	**CONNECTING BUS BAR (PHASE BELTS) FABRICATION**	**CAT II**							
		II			SUMIKEI COPPER	JAPAN	A		
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		II			HITACHI CABLE	JAPAN	A		
		II			ORIENTAL COPPER	THAILAND	A		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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90	**INSULATING HOSES FOR STATOR (WATER SUPPLY HOSES)**	**CAT I**							
		II			SAKURA RUBBER	JAPAN	A		
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		II			CRANE RESISTOFLEX	USA	A		
					DR SCHNABEL	GERMANY	A		
91	**SHIELD PLATES / SHIELD CLAMPER**	**CAT I**							
		III			MITSUBISHI ELECTRIC	JAPAN	A		
		I			RV ENGG	FARIDABAD	A		
		I			AK Multi metal	PUNJAB	A		CS Casting for Generator Bracket Hub of Bearing bracket, Ni-alloy casting for Generator Blower Shroud & Shield clamper, nodular cast iron casting for Shroud support.
92	**STATOR WINDING ASSLY**	**CAT I**							
		I			MITSUBISHI ELECTRIC	JAPAN	A		
		I			LMTG	HAZIRA	A		
93	**GENERATOR SHAFT FORGING**	**CAT II**							
					SAARSCHMIEDE	GERMANY	A		
					Buderus Edelstahl	GERMANY	A		
					JSW	JAPAN	A		
					SDF	ITALY	A		
					CRUIST FORCE	FRANCE	A		
					OMZ	RUSSIA	A		
					FORGE MASTER	UK	A		
					JCFC	JAPAN	A		
94	**GENERATOR ROTOR MACHINING**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		II			NUGO ROMANO	ITALY	A		
		I			LMTG	HAZIRA	A		
95	**ETS MATERIAL (Core material)**	**CAT I**							
		I			THYSSON KRUPP	NASIK	A		
		II			NIPPON	JAPAN	A		
		II			JFE	JAPAN	A		
		I			POSCO	RAIGARH	A		
		I			JSW	BELLARY	A		
		II			MITSUBISHI	JAPAN	A		
96	**RETAINING RING FORGING(MAT-CrMn 1818)**	**CAT II**							
					SAARCSHMIEDE	GERMANY	A		
					JSW	JAPAN	A		
					KOBE STEEL	JAPAN	A		
					FORTEH	FRANCE	A		
97	**RETAINING RING MACHINING**	**CAT I**							

एनटीपीसी NTPC		Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL			Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022
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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			LMTG	HAZIRA	A		
98	SILVER BEARING COPPER HOLLOW STRIPS (ROTOR COIL)	CAT II							
					ORIENTAL COPPER	THAILAND	A		
					HITACHI CABLE	JAPAN	A		
					FURUKAWA ELECTRIC	JAPAN	A		
					KM EUROPA	GERMANY	A		
					OTOKUMPUTURI (Luvata)	FINLAND	A		
					GINDRE	FRANCE	A		
99	FIELD LEAD CORE BAR FOR ROTOR WITH D LEAD(RAW MATERIAL) (Field lead)	CAT II							
					ORIENTAL COPPER	THAILAND	A		
					BAOSHIDA SWISS METAL	GERMANY	A		
					KME	GERMANY	A		
					Agarwal industries (Fabrication)	Mandideep	A		
					Rachna Metals (Raw material)	GHAZIABAD	A		
					INDIAN METAL & ALLOY	KOLKATA	A		
					HITACHI CABLE	JAPAN	A		
100	CURRENT CARRYING BOLTS FOR ROTOR (Radial Lead)	CAT II							
					MITSUBISHI ELECTRIC	JAPAN	A		
101	ROTOR COIL FORMING	CAT I							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			LMTG	HAZIRA	A		
102	STATOR Coil Manufacturing	CAT I							
					MITSUBISHI ELECTRIC	JAPAN	A		
					LMTG	HAZIRA	A		
103	ROTOR SLOT WEDGES & DAMPER WEDGES FABRICATION & MACHINING (Rotor wedge & Damper bar)	CAT II							
					MITSUBISHI ELECTRIC	JAPAN	A		
					MURAKAMI	ompress	A		
					FIAV	ITALY	A		
					OTOKUMUPORI (LUVATA)	FINLAND	A		
					METALLURGICA MINOTI	ITALY	A		
					Damper Wedges - Gindre India Components Pvt. Ltd	Gurgaon	A		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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104	**ROTOR WINDING ASSLY (GEN) INCL ROTOR WEDGES (Rotor winding)**	**CAT I**							
					MITSUBISHI ELECTRIC	JAPAN	A		
					LMTG	HAZIRA	A		
105	**GENERATOR ROTOR-FINAL assembly & Balancing Process (Rotor final assembly & HSB)**	**CAT I**							
					MITSUBISHI ELECTRIC	JAPAN	A		
					LMTG	HAZIRA	A		
106	**COMPRESSOR BLADE ASLY ON ROTOR (Part of generator final assembly)**	**CAT I**							
					MITSUBISHI ELECTRIC	JAPAN	A		
					LMTG	HAZIRA	A		
107	**D LEAD (FL CORE BAR) & CONTACT BOLT FOR SLIP RING (Axial lead)**	**CAT II**							
					MITSUBISHI ELECTRIC	JAPAN	A		

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108	**TUBES FOR CONNECTING BUS BAR (Phase ring tubes)**	**CAT II**							
					ORIENTAL COPPER	THAILAND	A		
					ALCOBEX	JODHPUR	A		
					S H Copper	Japan	A		
					IPCL	BHAVNAGAR	A		
					HITACHI CABLE	JAPAN	A		
109	**END SHIELD FABRICATION & MACHINING (Generator Bearing Bracket)**	**CAT I**							
					MITSUBISHI ELECTRIC	JAPAN	A		For End Shield Fabrication Only
					SHAPE	HARIDWAR	A		
					MANJUNATH	BANGLORE	A		
110	**BEARING SHELL(GEN& SLIP RING)-FORGING (part of generator Bearing)**	**CAT II**							
					MITSUBISHI ELECTRIC	JAPAN	A		
					OMEGA THERMIT	BHOPAL	A		
					DUM DUM	KOLKATA	A		
					EURO BEARING	ITALY	A		
111	**CENTERING RING FORGING (END PLATE)**	**CAT I**							
		I			GOODLUCK	GHAZIABAD	A		
		II			NISHIMAKI IRON WORKS	JAPAN	A		
		I			BAY FORGE	CHENNAI	A		
112	**BEARING SHELL (GEN & SLIP RING) M/C (Generator bearing)**	**CAT III**							
					DSE	KOREA	A		
					DYM	KOREA	A		
					MITSUBISHI ELECTRIC	JAPAN	A		
					OMEGA THERMIT	BHOPAL	A		
					DUM DUM	KOLKATA	A		
					EURO BEARING	ITALY	A		
					WAUKESHA BEARING	USA	A		
113	**INTERMEDIATE RING FORGING (Space ring forging)**	**CAT I**							
					Good luck (For forging)	FARIDABAD	A		
					LMTG (For m/c)	Hazira	A		
114	**PRIMARY WATER PUMP**	**CAT I**							
					MATHER & PLATT	PUNE	A		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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					KSB INDIA	Nasik	A		
					SULZER PUMPS	NAVI MUMBAI	A		
					EBARA SEISAKUSHO	JAPAN	A		
115	**HYDROGEN DRIER**	**CAT I**							
		I			JINDAL	ROORKEE	A		
		II			MITSUBISHI ELECTRIC	JAPAN	A		
116	**TUBES FOR COOLERS (BRASS/COPPER TUBES) (GENERATOR) (Gas cooler tubes)**	**CAT I**							
					ALCOBEX	JODHPUR	A		
					MULTIMETAL	KOTA	A		
117	**PW PUMP & FILTER UNIT ASSEMBLY (SKID)**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		II			JIMC	KOREA	A		
		I			LMTG	HAZIRA	A		
		I			LINCOLN	PUNE	A		
118	**PW COOLER & SEAL OIL COOLER**	**CAT I**							
		I			ALFA LAVAL	PUNE	A		
		II			JIMC	KOREA	A		
		I			TRANTER	PUNE	A		
119	**SLIP RING FORGING & MACHINING**	**CAT II**							
					LMTG (For machining)	Hazira	A		
					Good luck (For forging)	FARIDABAD	A		
120	**DC LEAD ASSLY FOR SLIP RING (Slip ring lead)**	**CAT I**							
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			LMTG	HAZIRA	A		
121	**SLIP RING ASSLY (Part of Generator Final assembly)**	**CAT I**							
					LMTG	HAZIRA	A		
122	**SLIP RING SHAFT ASSLY**	**CAT II**							
					MITSUBISHI ELECTRIC	JAPAN	A		
123	**AIR COOLER FOR BRUSH GEAR (Slip ring fan)**	**CAT I**							
					LMTG	Hazira	A		
124	**SEAL OIL PUMP**	**CAT I**							
		I			TUSHACO PUMP	DAMAN	A		
		II			KOSAKA LABORATORY	JAPAN	A		
		II			SHIMADZU	JAPAN	A		
125	**FAN BLADE FORGING & MACHINING (Blade for slip ring fan)**	**CAT I**							
		II			MURAKAMI SEISAKUSHO	JAPAN	A		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
		I			STAR WIRE	BALLABHGARH	A		
		II			MITSUBISHI ELECTRIC	JAPAN	A		
		I			GOODLUCK ENGG	GHAZIABAD	A		
126	**SEAL OIL VALVE RACK**	**CAT II**							
					JIMC	KOREA	A		
127	**SEAL OIL STORAGE TANK (LOOP SEAL TANK)**	**CAT I**							
					JIMC	KOREA	A		
					Gujarat infra	Vadodara	A		
					Shree sarjan	Vadodara	A		
128	**HYDROGEN COOLER (Gas cooler)**	**CAT I**							
					KITASHIBA ELECTRIC	JAPAN	A		
					ENERGEN	KOREA	A		
					GEA	GERMANY	A		
					LAXMI	BHOPAL	A		
129	**CARBON BRUSH**	**CAT II**							
					MERSEN	CHINA	A		
					MORGAN	KOREA	A		
					MERSEN	BANGLORE	A		
					VIDYUT CARBON	HARDWAR	A		
					ASSAM CARBON	KOLKATA	A		

एनटीपीसी NTPC		Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL			Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022
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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
130	**EXCITATION SYSTEM**	**CAT I**							
					ALSTOM	FRANCE	A		
					ABB	SWITZERLAND	A		
					SIEMENS	AUSTRIA	A		
					BHEL	BANGLORE	A		
					MITSUBISHI ELECTRIC	JAPAN	A		
131	**EXCITATION TRANSFORMER**	**CAT I**							
					REFER SEPARATE LIST				
132	**EXCITATION AC/DC BUS DUCT**	**CAT I**							
					REFER SWITCHGEAR AND BUS DUCT LIST				
133	**END WINDING VIBRATION SYSTEM**	**CAT II**							
					IRIS	Canada	A		
					Vibro systems	Canada	A		
134	**Rotor slot angle (Slot cell)**	**CAT II**							
					PCT	USA	A		
					MITSUBISHI ELECTRIC	JAPAN	A		
					VON ROLLA ISOLA	FRANCE	A		
135	**CENTRING RING & INTERMEDIATE RING MACHINING (End plate & space ring)**	**CAT I**							
					MITSUBISHI ELECTRIC	JAPAN	A		
					Good luck (For forging only)	Faridabad	A		
					LMTG (For machining)	HAZIRA	A		
136	**ROTOR FLUX MONITORING SYSTEM**	**CAT II**							
					GE	USA	A		
					MITSUBISHI ELECTRIC	JAPAN	A		
					Vibro systems	Canada	A		
					IRIS	CANADA	A		
137	**FIELD LEAD CORE BAR FOR ROTOR WITH D LEAD**	**CAT II**							
					MITSUBISHI ELECTRIC	JAPAN	A		
138	**Generator Blower shroud**	**CAT I**							
					RV Casting	Faridabad	A	(M/C by LMTG)	

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
139	**Bearing Bracket Hub casting**	**CAT I**							
					VAISHNOV STEEL	MUZAFFAR NAGAR	A		
					LMTG HCU	Hazira	A		
140	**Shroud support**	**CAT I**							
					R V Casting	Faridabad	A		(M / C by LMTG)
141	**Blower hub Forging**	**CAT I**							
					Goodluck	Gaziabad	A		(M / C by LMTG)
142	**Bore ring Forging**	**CAT I**							
					CHW	Greater noida	A		(M / C by LMTG)
143	**Rotor & stator blade**	**CAT I**							
					LMTG (for machining)	Hazira	A		
					Star wire (For Rotating blade raw material)	BALLABHGARH	A		
					As per NTPC approved list (For ST blade raw material also)		A		
144	**Center wedge & end wedge machining**	**CAT I**							
					Moldpro	Vadodara	A		
NOTE	**1.CHECKS FOR STATOR CORE ASSLY, STATOR WINDING ASSEMBLY, ROTOR WINDING ASSLY.(GEN.), GENERATOR ROTOR -FINAL, BEARING ASSEMBLY/SHAFT SEAL ASSEMBLY, EXCITER ASSLY (MAIN & PILOT)/ SLIP RING SHAFT ASSEMBLY WITH BRUSH GEARS, EXCITER TEST RUN, GENERATOR ASSEMBLY AT WORKS INCLUDING TERMINAL BUSHING & GENERATOR WORKS RUN TEST SHALL BE FINALIZED DURING DETAILED ENGINEERING/MQP FINALIZATION FOR THE RESPECTIVE OEMs.** **2. For Raw Material/Components/Items of Generator which are not appearing in the above list, their OEM approved sources shall be tied up during Detailed Engineering/ MQP finalization.**								
	C- MAJOR COMPONENTS FOR GE MAKE GENERATOR (AS PER OEM SPECIFIC DESIGN):								
145	Stator Frame with manhole cover (Fabrication & Machining)	**CAT I**							
					ALSTOM Power Sp. z o.o,	Poland	A		
					Alstom Bharat Forge Power Limited	Sanand	A		
					ISGEC	YAMUNA NAGAR	A		
146	Key Bar (Fabrication & Machining)	**CAT I**							
		II			Bright Steel	UK	A		
		II			Jordan Matcon	Poland	A		
		II			ALSTOM Power Sp. z o.o	Poland	A		
		II			Somet	Poland	A		
		II			Empaz	Poland	A		Only M / c
		I			Shiv Engineering	vadodara	A		Only M / c
		I			Alstom Bharat Forge Power Limited	Sanand	A		Only M / c
		I			Shape Engg	Haridwar	A		Only M / c

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
147	Dovetail for Stator (Aluminnium key profile)	**CAT II**							
					Sapa Profiles Kft.	Hungary	A		
					ALSTOM Power Sp. z o.o,	Poland	A		
					Somet	Poland	A		
148	End Presure Plate (Laminated Press plate)	**CAT II**							
					ALSTOM Power Sp. z o.o,	Poland	A		
					Generpro	Sweden	A		
149	Stator Core Punching	**CAT II**							
					ALSTOM	France	A		
					ALSTOM Power Sp. z o.o,	Poland	A		
					Donako	Poland	A		
					Pitti Laminations	Hyderabad	A		
					BHEL	Jagdishpur	A		
150	Core Tension Bolt for Stator								
		I			Starwire	Ballabhgarh	A		
		II			Boehler Ybbstal Profil	Austria	A		
		II			Energietechnik Essen	Germany	A		
		II			Empaz	Poland	A		
		I			Kalyani carpenter	Pune	A		
151	Insulation of Core Tension Bolt for Stator	**CAT II**							
					Empaz	Poland	A		
					ALSTOM Power Sp. z o.o,	Poland	A		
152	Solid Copper Coductor for Stator Bar	**CAT I**							
					VonRoll	Switzerland	A		
					Pearl	Bangalore	A		
					Cosmos	Bangalore	A		
					Mahindra	Bangalore	A		
					Geaber & Greuller	Austria	A		
153	Hollow Stainless Steel Conductor for Stator Bar	**CAT II**							
					Fine Tubes	UK	A		
					Fischer	Austria	A		
154	Stator Bars	**CAT I**							
					ALSTOM Power Sp. z o.o,	Poland	A		
155	Tubes for Connection Bus Bar	**CAT II**							
					KME	Germany	A		
					Luvata Pori	Finland	A		
					Multimetal	Jamnagar	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	Sub-supplier Details sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
156	Connection Bus Bar (Phase Connector)	**CAT II**							
					PPU Wojtera	Poland	A		
					ALSTOM Power Sp. z o.o,	Poland	A		
157	Insulating Hoses for Stator (Water Supply Hoses)	**CAT II**							
					Dr. Schnabel	Germany	A		
					Siemens	Germany	A		
					Crane Resistoflex	USA	A		
158	Winding Head Support Ring	**CAT II**							
					Röchling Permali	Germany	A		
					Kompozyty	Poland	A		
					PCT	USA	A		
					Siemens	Germany	A		
					Texplas	Haridwar	A		
159	Spring for Winding Head Assembly (Console)								
		CAT II			Wolfensberger	Switzerland	A		
		CAT I			R V Engg	Ballabgarh	A		
160	Generator Shaft Forging	**CAT II**							
					Saarschmiede	Germany	A		
					Buderus	Germany	A		
					JSW	Japan	A		
					JCFC	Japan	A		
					SdF Terni	Italy	A		
					SUMITOMO	JAPAN	A		
					FORGEMASTER	UK	A		
					OMZ	RUSSIA	A		
161	Generator Shaft Machining	**CAT I**							
					Alstom (Switzerland) Ltd.	Switzerland	A		
					Alstom Bharat Forge Power Limited	Sanand	A		
162	Centering Ring Forging	**CAT II**							
					Bharat Forge	Pune	A		
					Schmiedewerk Stoss	Switzerland	A		
					FORGITAL SPA VELO D ASTICO LOCALITA	Italy	A		
					Bay Forge	Chennai	A		
163	Centering Ring Machining	**CAT II**							
					Alstom (Switzerland) Ltd.	Switzerland	A		
					Bharat Forge Limited	Satara	A		

एनटीपीसी NTPC		Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL			Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022
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 sub sch/** उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	**Remarks/** टिप्पणी
164	Retaining Ring FORGING (Mat.18-18Cr-Mn)	**CAT II**							
					Energietechnik Essen	Germany	A		
					Saarschmiede	Germany	A		
					JSW	Japan	A		
165	Retaining Ring Machining	**CAT II**							
					Alstom (Switzerland) Ltd.	Switzerland	A		
					Alstom Bharat Forge Power Limited	Sanand	A		
166	Rotor Copper Profile	**CAT II**							
					Swissmetall	Switzerland	A		
					Wieland	Germany	A		
					Buntmetall	Austria	A		
167	Field Lead Core Bar for Rotor	**CAT II**							
					Swissmetall	Switzerland	A		
					Buntmetall	Austria	A		
					Wieland	Germany	A		
168	Radial Bolt for Rotor	**CAT II**							
					Alstom	Switzerland	A		
					Starwire	Ballabgarh	A		
					Atals	Hydrabad			only for Machining
169	Rotor Coil Forming	**CAT I**							
		CAT II			Alstom (Switzerland) Ltd.	Switzerland	A		
		CAT I			Alstom Bharat Forge Power Limited	Sanand	A		
170	Rotor Slot Wedges & Damper wedges	**CAT II**							
					Swissmetall	Switzerland	A		
					Wieland	Germany	A		
					Luvata	Finland	A		
					Buntmetall	Austria	A		
171	Generator Rotor Final	**CAT I**							
					ALSTOM Power Sp. z o.o,	Poland	A		
					Alstom (Switzerland) Ltd.	Switzerland	A		
172	Hydrogen Blower	**CAT II**							
					FIMA	Germany	A		
172.1	Hydrogen Blower Assembly	**CAT II**							
					Alstom (Switzerland) Ltd.	Switzerland	A		
173	Terminal Bushing(Condenser type)	**CAT II**							
					Trench (Emily new name)	France	A		
					HSP	Germany	A		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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174	Terminal Box Fabrication	**CAT II**							
					ALSTOM Power Sp. z o.o,	Poland	A		
					ISGEC	Yamunanagr	A		
					Shape Engg	Haridwar	A		
174.1	Terminal Box Machining	**CAT II**							
					ALSTOM Power Sp. z o.o,	Poland	A		
					Energy machines	Ahmedabad	A		
175	End Shield Fabrication	**CAT I**							
					ALSTOM Power Sp. z o.o,	Poland	A		
					Shape Engg	Haridwar	A		
					ISGEC	Yamunanagr	A		
175.1	End Shield Machining	**CAT I**							
					ALSTOM Power Sp. z o.o,	Poland	A		
					ISGEC	Yamunanagr	A		
					Energy Machines	Ahmedabad	A		
176	Seal Assembly (Ring & Housing)	**CAT II**							
					ALSTOM Power Sp. z o.o,	Poland	A		
177	Stator water cooler	**CAT I**							
					Alpha Laval	Sweden	A		
					GEA	Germany	A		
					TRANTER	Pune	A		
					IDMC Ltd	Anand	A		
178	Stator water cooling unit	**CAT II**							
					Rockfin	Poland	A		
179	Stator water cooling pump	**CAT II**							
					ALWELLER	GERMANY	A		
					KSB	Pune	A		
					Ebera	Japan	A		
					SULZER	Navi Mumbai	A		
180	Slip Ring Shaft Forging	**CAT II**							
					See Generator Forging Suppliers				
					Bharat forge	Pune	A		
					BAY FORGE	Chennai	A		
180.1	Slip Ring Shaft Machining	**CAT II**							
					Alstom (Switzerland) Ltd.	Switzerland	A		
					Euroflex Transmission(india) pvt. Ltd.	Hydrabad	A		

एनटीपीसी NTPC		Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL			Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022
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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
181	DC-Lead Assembly for Slip Ring	**CAT II**							
					Alstom (Switzerland) Ltd.	Switzerland	A		
181.1	Slip Ring Shaft Assembly	**CAT I**							
					Alstom (Switzerland) Ltd.	Switzerland	A		
					Euroflex Transmission(india) pvt. Ltd.	Hydrabad	A	Only M/c	
182	Seal Oil Pump	**CAT I**							
					Allweiler	Germany	A		
					Allweiler	DAMAN	A		
					UT PUMP	FARIDABAD	A		
183	Seal Oil Cooler	**CAT I**							
					GEA	Germany	A		
					Alpha Level	EUROPE	A		
					Alfa level	Satara	A		
					ALPHA LAVAL	Sweden	A		
					TRANTER	Pune	A		
184	Seal Oil Unit	**CAT II**							
					Rockfin	Poland	A		
185	Hydrogen Cooler	**CAT I**							
					GEA	Germany	A		
					Kelvion	Pune	A		
					Laxmi	Bhopal	A		
186	Hydrogen dryer(Refrigrant Type)	**CAT I**							
					Jindal electrical	Roorkee	A		
					Melcon engg	G. NOIDA	A		
187	Copper connector between main rotor and slip ring shaft(radial stud)	**CAT II**							
					SWISS METAL	Switzerland	A		
					Pfisterer Sefag AG	Germany	A		
188	Carbon Brush & Holders	**CAT III**							
					Morgan	Germany	A		
					Vidhyut Carbon	Haridwar	A		
					National Carbon	Kolkata	A		
					G. Dietrich (belongs to CL)	Germany	A		
189	ETS Material	**CAT I**							
		CAT I			Thyseen Krupp	NASIK	A		
		CAT II			Mitsubishi	Japan	A		
		CAT II			Arcelor	Luxemburg	A		
		CAT II			Salzgietter	Germany	A		
		CAT II			Alloverze	Germany	A		
		CAT I			JSW	BELLARY	A		
		CAT II			JFE	Japan	A		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
190	Radial Leads (Slip Ring Shaft)	**CAT II**							ALSO FOR SL NO 71
					Schmelzmetall AG	Switzerland	A		
191	Connection Rod for main Rotor	**CAT II**							
					Weiland werke	Germany	A		
					Swiss Metal	Switzerland	A		
192	Excitation System	**CAT I**							
					Alstom Power Sp. z o.o	Poland	A		
					GE power	NOIDA	A		
193	GHM(Generator health monitoring system)	**CAT I**							
					GE Power	Noida	A		
194	Excitation AC-DC Bus duct	**CAT I**							
					Etacom	Belgium	A		for Cast Resin
					REEP	Chennai	A		
					C&S	NOIDA	A		
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	D- MAJOR COMPONENTS FOR TOSHIBA MAKE GENERATOR (AS PER OEM SPECIFIC DESIGN):								
195	**STATOR FRAME WITH MAN HOLE COVER FABRICATION & MACHINING**	**CAT I**							
					TOSHIBA	JAPAN	A		
					TJPS	CHENNAI	A		
196	**KEY BAR FABRICATION AND MACHINING**	**CAT I**							
					TOSHIBA	CHENNAI	A		
					Kalyani Carpenter (Material)	Pune	A		
					Punj Lloyd (Machining)	Gwalior	A		
197	**KEY BAR ASSEMBLY**	**CAT I**							
					TOSHIBA	JAPAN	A		
					TJPS	CHENNAI	A		
198	**DOVETAIL FOR STATOR**	**CAT I**							
					TOSHIBA	JAPAN	A		
					TJPS	CHENNAI	A		
199	**END PRESSURE PLATE - Fabrication**								
		II			TOSHIBA	JAPAN	A		
		I			TJPS	CHENNAI	A		
199.1	**End Pressure Plate - Machining**	**CAT II**							
					TJPS	CHENNAI	A		
					Sharp Engineering	Pune	A		
					N.S Engg	Hyderabad	A		

एनटीपीसी NTPC		Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL			Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022
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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
200	STATOR CORE PUNCHING								
		I			TJPS	CHENNAI	A		
		II			TOSHIBA	JAPAN	A		
201	TERMINAL BOX FABRICATION& MACHINING								
		II			TOSHIBA	JAPAN	A		
		I			TJPS	CHENNAI	A		
		I			Leo Prime	Chennai	A		
202	OVER HANG SUPPORT RING	CAT II							
					HITACHI CHEMICAL	JAPAN	A		
203	SOLID COPPER CONDUCTOR (FOR STATOR BAR)	CAT II							
					UNIMAC	JAPAN	A		
204	HOLLOW COPPER CONDUCTOR (FOR STATOR BAR)	CAT II							
					UNIMAC	JAPAN	A		HOLLOW CONDUCTOR (RAW MATERIAL FROM FURUKAWA-JAPAN)
205	TERMINAL BUSHING (CONDENSER TYPE)	CAT II							
					PASSONI & VILLA	ITALY	A		
					Trench	Switzerland	A		
					Toshiba	Japan	A		
206	CONNECTING BUS BAR (PHASE BELTS) FABRICATION	CAT II							
					SUMIKEI COPPER	JAPAN	A		
					Oriental Copper	Thailand	A		
					Hitachi Cable	JAPAN	A		
207	INSULATING HOSES FOR STATOR (WATER SUPPLY HOSES)	CAT II							
					SAKURA RUBBER	JAPAN	A		
					CRANE RESISTOFLEX	USA	A		
					MIL	Chennai	A		
208	GENARATOR SHAFT FORGING	CAT II							
					SAARSCHMIEDE	GERMANY	A		
					SDF ITALY	ITALY	A		
					JCFC	JAPAN	A		
					JSW	JAPAN	A		
					BUDERUS EDESTAHL	GERMANY	A		
					Doosan	Korea	A		
208.1	GENERATOR SHAFT MACHINING	CAT I							
					TOSHIBA	JAPAN	A		
					TJPS	CHENNAI	A		
209	ETS MATERIAL	CAT II							
					NIPPON	JAPAN	A		
					JFE	JAPAN	A		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
210	RETAININIG RING FORGING (MAT-CrMn 18-18)	CAT II							
					SAARCSHMIEDE	GERMANY	A		
					JSW	JAPAN	A		
210.1	RETAINING RING MACHINING	CAT II							
					TOSHIBA	JAPAN	A		
					TJPS	Chennai	A		
211	SILVER BEARING COPPER HOLLOW STRIPS (ROTOR COIL)	CAT II							
					ORIENTAL COPPER	THAILAND	A		
212	FIELD LEAD CORE BAR FOR ROTOR WITH D LEAD	CAT II							
					KME	GERMANY	A		
					ORIENTAL COPPER	THAILAND	A		
					BAOSHIDA SWISS METAL	GERMANY	A		
213	CURRENT CARRYING BOLTS FOR ROTOR	CAT II							
					TOYO KOGYO	JAPAN	A		
					TOSHIBA	JAPAN	A		
214	ROTOR COIL FORMING	CAT II							
					TOSHIBA	JAPAN	A		
					TJPS	Chennai	A		
215	ROTOR SLOT WEDGES & DAMPER WEDGES FABRICATION & MACHINING	CAT II							
					MURUKAMI	JAPAN	A		
					FIAV	ITALY	A		
					TOSHIBA	JAPAN	A		
216	GENERATOR ROTOR -FINAL	CAT I							
					TOSHIBA	JAPAN	A		
					TJPS	Chennai	A		
217	MOLDED INSULATION RING (FAN NOZZLE RIM)	CAT I							
		II			PCT	USA	A		
		I			PERMALI WALACE	Bhopal	A		
218	FAN BLADE ASLY ON ROTOR								
		II			TOSHIBA	JAPAN	A		
		I			TJPS	Chennai	A		
219	D LEAD (FL CORE BAR)& CONTACT BOLT FOR SLIP RING								
		I			TJPS	Chennai	A		
		II			TOSHIBA	JAPAN	A		
220	END SHIELD FABRICATION & MACHINING	CAT I							
					SHAPE	HARIDWAR	A		
					TJPS	Chennai	A		

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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221	Bearing (CE & TE)								
		II			DSE	Korea	A		
		I			Omega Renk	Bhopal	A		
		II			DYM	Korea	A		
222	CENTERING RING FORGING								
		I			BAY FORGE	CHENNAI	A		
		II			MINATO KIKO	JAPAN	A		
		II			NISHIMAKI IRON WORKS	JAPAN	A		
		I			GOODLUCK	GHAZIABAD	A		
223	SEAL ASSLY (RING & HOUSING)	CAT II							
					TOSHIBA	JAPAN	A		
224	SLIP RING SHAFT ASSLY								
		I			TJPS	Chennai	A		
		II			TOSHIBA	JAPAN	A		
225	FAN BLADE FORGING & MACHINING								
		II			MURAKAMI SEISAKUSHO	JAPAN	A		
		I			TJPS	Chennai	A		
		I			Azad	Hyderabad	A		
		II			TOSHIBA	JAPAN	A		
226	HYDROGEN COOLER	CAT II							
					ENERGYEN	KOREA	A		
					KITASHIBA ELECTIRC	JAPAN	A		
					Karnataka Gas Coolers	Bangalore	A		
227	AC/DC BUSDUCT	CAT I							
					SPACEAGE	GURGAON	A		
					REEP	CHENNAI	A		
					C&S ELETRIC	NOIDA / HARIDWAR	A		
228	EXCITATION TRANSFORMER (DRY TYPE)	CAT I							
					RITZ	GERMANY	A		UPTO 8 MVA
					BHEL	JHANSI	A		UPTO 6 MVA
229	EXCITATION SYSTEM	CAT I							
					TOSHIBA	JAPAN	A		
					ABB	Bangalore	A		
230	HYDROGEN DRIER	CAT I							
					JINDAL ELECTRONICS	ROORKEE	A		
					MELCON ENGG	GREATER NOIDA	A		
					SPAN MANUFACTURING CO PVT LTD	ROORKEE	A		

NOTE

1. CHECKS FOR STATOR CORE ASSLY, STATOR WINDING ASSEMBLY, ROTOR WINDING ASSLY.(GEN.), GENERATOR ROTOR -FINAL, BEARING ASSEMBLY/SHAFT SEAL ASSEMBLY, EXCITER ASSLY (MAIN & PILOT)/ SLIP RING SHAFT ASSEMBLY WITH BRUSH GEARS, EXCITER TEST RUN, GENERATOR ASSEMBLY AT WORKS INCLUDING TERMINAL BUSHING & GENERATOR WORKS RUN TEST SHALL BE FINALIZED DURING DETAILED ENGINEERING/MQP FINALIZATION FOR THE RESPECTIVE OEMs.

2. For Raw Material/Components/Items of Generator which are not appearing in the above list, their OEM approved sources shall be tied up during Detailed Engineering/ MQP finalization.

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी
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							
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							

एनटीपीसी NTPC		Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL				Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022
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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	
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	CAT III								
MC 38	VACUUM PUMP WITH MOTOR	CAT III								
MC 39	ON LINE MOISTURE REMOVAL SYSTEM	CAT III								
MC 40	Oil Tanker (wheel mounted),10 kL capacity	CAT III								
MC 41	POST INSULATOR	CAT II								
MC 42	DISC INSULATOR/ PIN INSULATOR	CAT II								
MC 43	FIBRE OPTIC CABLE	CAT I								
MC 44	EVENT LOGGER	CAT III								
MC 45	GPS TIME SYNCHRONISATION EQUIPMENT	CAT III								
MC 46	RELAY TEST KIT	CAT III								
MC 47	DISTURBANCE RECORDER	CAT III								
MC 48	OPERATIONAL ANALYSER WITH DCRM KIT	CAT III								
MC 49	FOTE	CAT II								
MC 50	OPGW	CAT II								
MC 51	LARGE VIDEO SCREEN (LVS)	CAT III								
MC 52	BELT WEIGHER	CAT II								
MC 53	WEIGH BRIDGE	CAT I								
MC 54	IN LINE MAGNETIC SEPARATOR / SUSPENDED MAGNET	CAT II								
MC 55	METAL DETECTOR	CAT II								
MC 56	CABLE REELING DRUMS	CAT II								
MC 57	PIANO SWITCHES	CAT III								
MC 58	PULL CORD / BELTSWAY / INDICATION SYSTEM	CAT II								
MC 59	ELECTRONIC SPEED SWITCH, ZSS, TILT SWITCH, MAGNETIC SWEITCH, PROXIMITY SWITCH	CAT II								
MC 60	HEAVY DUTY LIMIT SWITCHES	CAT II								
MC 61	UNDER BELT SWITCH	CAT II								
MC 62	GI CABLE TRAYS AND ACCESSORIES (LADDER & PERFORATED TYPE), fitting & accessories including bends	CAT II								

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MC 63	GI FLEXIBLE CABLE TRAY SUPPORT SYSTEM	CAT II							
MC 64	Cable termination kits & straight through jointing kit	CAT II							
MC 65	Lighting fixtures with accessories (Filament type)	CAT II							
MC 66	Lighting fixtures with accessories (LED type)	CAT II							
MC 67	VFD MOTOR	CAT I							
MC 68	HFTR SET (Power Plus)	CAT I							
MC 69	Insulators for ESP (Bushing, Support , Shaft)	CAT III							
MC 70	Fire sealing system - Type A Material supplier	CAT II							
MC 71	Fire sealing system - Type B Material supplier	CAT III							
MC 72	Executing Agency for Fire sealing system	CAT I							
MC 73	Porcelain Insulator	CAT III							
MC 74	Lighting & Welding Transformer	CAT III							
MC 75	Industrial / welding receptacles & boxes	CAT III							
MC 76	LT Switchgear - Wall mounted fixed type indoor / outdoor LT Switchgear non compartmentalized Panel (Lighting panels / AC / DC Fuse boards etc.)	CAT II							
	L2 LIST OF MAJOR EQUIPMENT(POWER TRANSFORMER)								SOURCES FOR THESE ITEMS SHALL BE FINALIZED DURING DETAILED ENGINEERING AND MQP FINALIZATION
1	CRGO STEEL	CAT II							
2	TANK FABRICATION	CAT II							
3	CRGO PROCESSORS	CAT II							
4	CONTINUOUSLY TRANSPOSED CONDUCTOR	CAT II							
5	PAPER INSULATED COPPER CONDUCTOR	CAT II							
6	INSULATING PAPER for PICC	CAT III							
7	MOULDED INSULATION COMPONENTS	CAT III							
8	PRE-COMPRESSED BOARDS & INSULATION COMPONENTS	CAT III							
9	OIL PUMP AND MOTOR SET	CAT II							
10	BUCHOLZ RELAY	CAT III							

एनटीपीसी NTPC		Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL				Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022
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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	
11	ON LOAD TAP CHANGER	CAT III								
12	OFAF COOLER	CAT III								
13	RADIATORS	CAT II								
14	REGNENERATIVE MAINTENANCE FREE BREATHER	CAT III								
15	CMS System	CAT I								
16	CMS PANEL	CAT II								
17	TRANSFORMER TESTING & MAINTENANCE EQUIPMENTS	CAT III								
	L2 LIST OF BUS DUCTS									
1	Air Pressurisation Equipment	CAT II								
2	Hot Air Blower	CAT II								
3	LAVT Cubicle / NG Cubicle/ Marshalling Box	CAT II								
4	CT for IPBD	CAT II								
5	Epoxy Seal off bushing / Insulators	CAT II								
NOTE	**L2 LIST OF SWITCH GEAR**								SOURCES FOR THESE ITEMS SHALL BE FINALIZED DURING DETAILED ENGINEERING AND MQP FINALIZATION	
1	Numerical Relays	CAT I							SUB-QR CLEARED VENDORS ARE ACCEPTABLE FOR NUMERICAL RELAYS	
2	Silver Plating	CAT III								
3	LV Air Circuit Breaker	CAT I								
4	LT CT/PT/CBCT/ Control Transformer	CAT II								
5	MV Vacuum Type Circuit Breaker	CAT I								
6	MV CT / PT & CBCT	CAT I								
7	MCBs	CAT III								
8	ENERGY METER	CAT III								
9	H.V. Fuse	CAT III								
10	Terminal Blocks (Control)	CAT III								
11	Surge Capacitors	CAT 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 finaly 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.

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी

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
	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	

एनटीपीसी NTPC	Project/ परियोजना : Talcher - III Package/ पैकेज : TALCHER III EPC PACKAGE 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 SUB-SYSTEM उप-प्रणाली: ELECTRICAL	Doc. No./ दस्तावेज सं.: REVISION NO : 01 DATE/ तिथि : 03.02.2022

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 sub sch/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी

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 एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :04.02.2022

Sr No	Item Description	QP Inspection Category	QP No	QP submission SCH	QP approval SCH	Proposed Sub Supplier	Country	SS Approval_Status (Note-1)	SS Detail Sub.SCH	SS Approval SCH	Remark
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										
		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

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :04.02.2022

Sr No	Item Description	QP Inspection Category	QP No	QP submission SCH	QP approval SCH	Proposed Sub Supplier	Country	SS Approval_Status (Note-1)	SS Detail Sub.SCH	SS Approval SCH	Remark
		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)
		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			

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Sr No	**Item Description**	**QP Inspection Category**	**QP No**	**QP submission SCH**	**QP approval SCH**	**Proposed Sub Supplier**	**Country**	**SS Approval_Status (Note-1)**	**SS Detail Sub.SCH**	**SS Approval SCH**	**Remark**
		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.
		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										

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Sr No	**Item Description**	**QP Inspection Category**	**QP No**	**QP submission SCH**	**QP approval SCH**	**Proposed Sub Supplier**	**Country**	**SS Approval_Status (Note-1)**	**SS Detail Sub.SCH**	**SS Approval SCH**	**Remark**
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
		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

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		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			
		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

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :						LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL				REVISION NO : 00 DATE :04.02.2022
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		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
		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			
		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			

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		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
		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

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :					LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL					REVISION NO : 00 DATE :04.02.2022
Sr No	**Item Description**	**QP Inspection Category**	**QP No**	**QP submission SCH**	**QP approval SCH**	**Proposed Sub Supplier**	**Country**	**SS Approval_Status (Note-1)**	**SS Detail Sub.SCH**	**SS Approval SCH**	**Remark**
		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
		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)										
		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
14	EQMS										

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :					LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL				REVISION NO : 00 DATE :04.02.2022
Sr No	**Item Description**	**QP Inspection Category**	**QP No**	**QP submission SCH**	**QP approval SCH**	**Proposed Sub Supplier**	**Country**	**SS Approval_Status (Note-1)**	**SS Detail Sub.SCH**	**SS Approval SCH**	**Remark**
		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)										
		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

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :					LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL				REVISION NO : 00 DATE :04.02.2022
Sr No	**Item Description**	**QP Inspection Category**	**QP No**	**QP submission SCH**	**QP approval SCH**	**Proposed Sub Supplier**	**Country**	**SS Approval_Status (Note-1)**	**SS Detail Sub.SCH**	**SS Approval SCH**	**Remark**
		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
		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)										

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :					LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL				REVISION NO : 00 DATE :04.02.2022
Sr No	**Item Description**	**QP Inspection Category**	**QP No**	**QP submission SCH**	**QP approval SCH**	**Proposed Sub Supplier**	**Country**	**SS Approval_Status (Note-1)**	**SS Detail Sub.SCH**	**SS Approval SCH**	**Remark**
		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			
		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										

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :04.02.2022

Sr No	Item Description	QP Inspection Category	QP No	QP submission SCH	QP approval SCH	Proposed Sub Supplier	Country	SS Approval_Status (Note-1)	SS Detail Sub.SCH	SS Approval SCH	Remark
		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
		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			

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :					LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL					REVISION NO : 00 DATE :04.02.2022
Sr No	**Item Description**	**QP Inspection Category**	**QP No**	**QP submission SCH**	**QP approval SCH**	**Proposed Sub Supplier**	**Country**	**SS Approval_Status (Note-1)**	**SS Detail Sub.SCH**	**SS Approval SCH**	**Remark**
		III				Durag GmbH	Germany	A			D-VTA-201
		III				Lenox	USA	A			
		III				Mirion	UK	A			
		III				Piper GmbH	Germany	A			
		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			
		II				TPS Tecnitube	Germany	A			
		II				Veluric & Manessmann	Germany	A			
		II				Trouvay and Cauvin	France	A			
		II				Sandvik	Sweden	A			For SS only
29	Instrument Cables (F,G & T/C Cables)										

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :04.02.2022

Sr No	Item Description	QP Inspection Category	QP No	QP submission SCH	QP approval SCH	Proposed Sub Supplier	Country	SS Approval_Status (Note-1)	SS Detail Sub.SCH	SS Approval SCH	Remark
		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			
31	Large Video Screen (LED Based)										
		I				Pyrotech Electronics Pvt Ltd	Udaipur	A			
		I				Delta India Electronics Pvt Ltd	Gurugram	A			
		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			

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :04.02.2022

Sr No	Item Description	QP Inspection Category	QP No	QP submission SCH	QP approval SCH	Proposed Sub Supplier	Country	SS Approval_Status (Note-1)	SS Detail Sub.SCH	SS Approval SCH	Remark
		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										
		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			
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

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :					LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL				REVISION NO : 00 DATE :04.02.2022	
Sr No	**Item Description**	**QP Inspection Category**	**QP No**	**QP submission SCH**	**QP approval SCH**	**Proposed Sub Supplier**	**Country**	**SS Approval_Status (Note-1)**	**SS Detail Sub.SCH**	**SS Approval SCH**	**Remark**
		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 approval 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
		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

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :04.02.2022

Sr No	Item Description	QP Inspection Category	QP No	QP submission SCH	QP approval SCH	Proposed Sub Supplier	Country	SS Approval_Status (Note-1)	SS Detail Sub.SCH	SS Approval SCH	Remark
		I				Adaptive Engineering Private Limited	Ahmedabad	A			For M/s Schneider make system
		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
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			
		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
		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			

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :					LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL				REVISION NO : 00 DATE :04.02.2022
Sr No	**Item Description**	**QP Inspection Category**	**QP No**	**QP submission SCH**	**QP approval SCH**	**Proposed Sub Supplier**	**Country**	**SS Approval_Status (Note-1)**	**SS Detail Sub.SCH**	**SS Approval SCH**	**Remark**
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
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)
		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
		III				Hach	USA	A			For Conductivity, pH,Concentration, Phosphate, Silica,Turbidity
		III				ABB	USA	A			For 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

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :04.02.2022

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		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										
		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	Turbine supervisiory Instruments along with vibration analysis system.										
		I				GE	Pune	A			For GE Bentlly ,USA make system
		I				Meggitt India Pvt ltd	Bengaluru	A			For Meggitt (Vibrometer) Switzerland make system
		I				Forbes Marshall	Pune	A			For Shinkawa ,Japan make system
		II				GE BENTLY	USA	A			
		II				SHINKAWA	JAPAN	A			
		II				MEGGITT	Switzerland	A			
45	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			
46	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			
47	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 160 KVA,

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :04.02.2022

Sr No	Item Description	QP Inspection Category	QP No	QP submission SCH	QP approval SCH	Proposed Sub Supplier	Country	SS Approval_Status (Note-1)	SS Detail Sub.SCH	SS Approval SCH	Remark
		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			
48	Vibration Monitoring System										
		II				Sensonics Technology India	Kundli	A			For Sensonic UK system
		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			
49	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

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :					LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL				REVISION NO : 00 DATE :04.02.2022	
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50	Field Bus Cable/ Profibus Cable- PA & DP type										
		I				LAPP India Pvt Ltd	Bangalore	A			
51	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 .
52	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
53	Perimeter Intrusion Detection System										
		III				Senstar	Canada	A			
54	Radar based Perimeter Surveillance System										
		III				Magos System Ltd	Israel	A			Third Party "Cyber Penetration report " shall be provided along with material TC/COC
55	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					
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					

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :04.02.2022

Sr No	Item Description	QP Inspection Category	QP No	QP submission SCH	QP approval SCH	Proposed Sub Supplier	Country	SS Approval_Status (Note-1)	SS Detail Sub.SCH	SS Approval SCH	Remark
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					
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					

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :04.02.2022

Sr No	Item Description	QP Inspection Category	QP No	QP submission SCH	QP approval SCH	Proposed Sub Supplier	Country	SS Approval_Status (Note-1)	SS Detail Sub.SCH	SS Approval SCH	Remark
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					
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					

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : Talcher-III (2X660MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :	LIST OF C&I ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL	REVISION NO : 00 DATE :04.02.2022

Sr No	Item Description	QP Inspection Category	QP No	QP submission SCH	QP approval SCH	Proposed Sub Supplier	Country	SS Approval_Status (Note-1)	SS Detail Sub.SCH	SS Approval SCH	Remark
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					
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					

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

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 ACCPETED IN QP. IF THE TOTAL INTEGRATED PANEL AND FAT IS CONDUCTED INDEGENEOUSLY

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

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.

एनटीपीसी NTPC	**Project/** परियोजना **: TALCHER TPP STAGE-III (2X660 MW)** **Package/** पैकेज **: EPC PACKAGE** **Supplier/** आपूर्तिकर्ता**:** **Contract No./** अनुबंध सं**.:**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** क़्वालिटी प्लान तथा सब – वेंडर के अनुमोदन सहित मदों की सूची **SUB-SYSTEM** उप-प्रणाली**: CIVIL WORKS**	**DOC. NO./** दस्तावेज सं.**:** CS-4540-001-2 **REV. NO.:** **DATE/** तिथि **: 03.02.2022** **PAGE/** पृष्ठ **: PAGE 1 OF 7**

S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यू पी. 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
1.	GALAVANISED 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
					RICHARDSON & CRUDDAS (1972) LTD	NAGPUR	A		
2.	COLOUR COATED METAL DECK & CLADDING/ROOFING SHEET (COIL)	I			TATA STEEL BSL 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 LTD	THANE	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.	HDPE LINER (GEOMEMBRANE)	I			MAIN CONTRACTOR APPROVED SOURCE	-	-		
5.	ELECTROFORGED GRATING	II			INDIANA GRATINGS PVT. LTD	PUNE	A		
					KANADE ANAND UDYOG	THANE	A		
					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		
					VINFAB ENGINEERS INDIA PVT LTD. (For Galvanising) VINFAB GRATINGS (For Fabrication)	THANE	A		

6.	PROFILERS FOR COLOUR COATED METAL DECK & CLADDING/ROOFING SHEETS	II			MAIN CONTRACTOR APPROVED SOURCE	-	-		
7.	FABRIC EXPANSION COMPENSATOR (FOR CHIMNEY)	II			MAIN CONTRACTOR APPROVED SOURCE	-	-		
8.	MINERAL WOOL FOR THERMAL INSULATION (FOR CHIMNEY)	II			MAIN CONTRACTOR APPROVED SOURCE	-	-		
9.	STOP LOG GATES, TRASH RACK AND LIFTING BEAM	II			MAIN CONTRACTOR APPROVED SOURCE	-	-		
10.	REINFORCEMENT STEEL	III			STEEL AUTHORITY OF INDIA LTD. (SAIL)		A		
					JINDAL STEEL & POWER Ltd. (JSPL)		A		
					TATA STEEL LIMITED.		A		
					RASHTRIYA ISPAT NIGAM LTD. (RINL)	VISAKHAPATNAM	A		
					JSW STEEL LTD.	RAIGAD, MAHARASHTRA; BELLARY	A		
					ESL STEEL LTD.	BOKARO	A		
					JSW ISPAT SPECIAL PRODUCTS LTD.	RAIGARH, CHHATTISGARH	A		
11.	HIGH PERFORMANCE MOISTURE COMPATIBLE CORROSION RESISTANT COATING SYSTEM	III			CECRI LICENSED SOURCES	-	-		
12.	BITUMEN	III			ALL GOVERNMENT REFIINARIES	-	-		
13.	PTFE BEARING / ELASTOMERIC BEARING	III			MORTH / RDSO APPROVED VENDORS	-	-		

14.	CEMENT	III			BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-		
15.	CI PIPES	III			BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-		
16.	RCC PIPES	III			BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-		
17.	CPVC/UPVC PIPES	III			BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-		
18.	PVC WATER STOP	III			BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-		
19.	POLYTHENE WATER STORAGE TANKS	III			BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-		
20.	CERAMIC / VITRIFIED TILES	III			BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-		
21.	PARTICLE BOARDS, PLYWOOD, MDF	III			BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	-		
22.	FIRE PROOF DOORS	III			MAIN CONTRACTOR APPROVED SOURCES WITH VALID PROTOTYPE TEST REPORT FROM CBRI/CPRI/GOV. LAB.)	-	-		
23.	CONSTRUCTION CHEMICALS/ADMIXTURE, WATER PROOFING COMPOUNDS AND GROUTS	III			MAIN CONTRACTOR APPROVED SOURCE	-	-		
24.	PAINT AND PAINTING SYSTEM	III			MAIN CONTRACTOR APPROVED SOURCE	-	-		

25.	HIGH SOLID CONTENT LIQUID APPLIED URETHANE BASED ELASTOMERIC MEMBRANE FOR WATER PROOFING	III			MAIN CONTRACTOR APPROVED SOURCE	-	-		
26.	INSTRUMENTATIONS (Porous Tube Piezometer, Surface settlement point, Water level sounder etc.) FOR ASH DYKE	III			MAIN CONTRACTOR APPROVED SOURCE	-	-		
27.	PRE-ENGINEERED BUILDINGS	III			MAIN CONTRACTOR APPROVED SOURCE	-	-		
28.	FOUNDATION BOLTS	III			MAIN CONTRACTOR APPROVED SOURCE	-	-		

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: 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.

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.

ANNEXURE-III

FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES

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 "BMCR" (Boiler Maximum Continuous Rating) appearing in the Technical Specification shall mean the maximum continuous steam output of Steam Generator (as defined Cl. No. 1.02.00 Sub-section A-01, Part-B) at super heater outlet at rated parameters.

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 mmHg (abs) condenser pressure unless used in conjunction with a different cycle make-up and/or a different condenser pressure and /or a different throttle steam pressure.

1.00.00 PERFORMANCE GUARANTEES

1.00.01 General Requirements

a) The Contractor 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 indicated in furnished by the bidder in his offer, shall be without any tolerance values whatsoever and all margins required for instrument inaccuracies and other uncertainties shall be deemed to have been included in the guaranteed figures.

c) The Contractor shall conduct performance test and demonstrate all the guarantees covered herein, during performance 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 Contractor at site in presence of Employer on each unit individually.

d) All costs associated with the tests including cost associated with the supply, calibration shall be included in the bid price.

e) It is the responsibility of the contractor to perform the Performance Guarantee/ Acceptance test as specified in this subsection. At all times during the Performance Tests the emissions and effluents from the Plant shall not exceed the Guaranteed Emission and Effluent Limits.

f) The Contractor shall make the plant ready for the performance guarantee tests before start of Initial Operation.

All CAT-1 Performance Guarantee tests shall be conducted along with initial operation except following

a) Coal Pulverisor Wear Parts Warranty
b) Particulate Emission/ESP Efficiency, FGD.
c) Auxiliary power consumption for Station Auxiliaries (PG Test for Station Auxiliary Power Consumption to be done along with unit#2 initial operation)
d) "PG test of Cooling Tower (NDCT) shall be carried out by the contractor within one year of successful completion of trial operation of the cooling tower and at a time when the atmospheric conditions are within limits of deviation from the design conditions as specified, preferably in the period from May to September. If Unit trial operation falls in these months then PG test of NDCT can be clubbed with Unit trial operation.

e) PG test of A/C System (for aux. power consumption under station auxiliaries) shall be carried out by the contractor within one year of successful completion of trial operation of the respective A/C system during summer in the months of May-August. If unit#2 trial operation falls in these months then PG test of A/C system can be clubbed with unit#2 trial operation.

g) PG test shall be performed by using process instruments envisaged for normal operation and control of unit. Any additional instrument/ item required for PG test shall also be supplied by the contractor. Instruments to be used for PG test shall be indicated in the respective P&IDs.

Control system loop tuning required to limit the variation of parameters during performance guarantee testing shall be completed prior to PG Test / initial operation.

Test result for PG test is envisaged to be computed in DDCMIS.

h) Tools and tackles, 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 contractor free of cost.

i) The Performance / Acceptance test shall be carried out as per the standard procedure included in the specification. For some of the PG tests, standard PG test procedures have not been included in the specification. PG test procedure for such PG tests shall be submitted, as per latest International codes / standard meeting the specification requirements along with sample calculations & detailed activity plan of preparation (including test instrumentation), conductance and evaluation of Guarantees, 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.

1. For Cat-I Performance / Acceptance tests to be conducted along with the initial operation: After the conductance of Performance test, the test results shall be calculated **in Contractor's PG test program/ software.** The correction curves shall be fed/inbuilt in the PG test program/ software. Provision of manual entry of offline data which cannot be captured online (such as Relative humidity, atmospheric pressure, Coal analysis, Unburnt carbon in fly ash and bottom ash, Bottom ash / fly ash collection at various hoppers, Flue gas analysis (grid result) etc.) and necessary for calculation of PG Test result shall also be provided. The contractor shall submit the detailed test evaluation report of Performance test results to Employer promptly but not later than 7 days from the date of conductance of Performance test.

2. For Performance / Acceptance tests other than those identified at 1 above: After the conductance of Performance test, the contractor shall submit the test evaluation report of Performance test results to Employer promptly but not later than 7 (seven) days from the date of conductance of Performance test. However, preliminary test reports shall be submitted to the Employer after completing each test run.

j) The contractor shall submit for Employer's approval the detailed Performance Test procedure (except for the guarantee tests for which the standard PG test procedure is identified in technical specification) containing the following:

i. Object of the test.
ii. Various guaranteed parameters & tests as per contract.
iii. Method of conductance of test and test code.
iv. Duration of test, frequency of readings & number of test runs.
v. Method of calculation.
vi. Correction curves and respective equations for graphs to be fed for the online computation.
vii. Instrument list consisting of range, accuracy, least count, and location of

instruments along with reference approved P&IDs.

viii. Scheme showing measurement points.

ix. Sample calculation.

x. Acceptance criteria.

xi. Any other information required for conducting the test.

k) In case during performance guarantee tests it is found that the equipment/system has failed to meet the guarantees, the Contractor shall carry out all necessary modifications and/or replacements to make the equipment/system comply with the guaranteed requirements at no extra cost to the Employer and re-conduct the performance guarantee test(s) with Employer's consent. However, if the specified performance guarantee(s) are still not met even after the above modifications/replacements within ninety (90) days or a reasonable period allowed by the Employer, after the tests have been completed Employer will have the right to the following:

i) For Category-I Guarantees

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 for this sub-section are on per unit basis and shall be levied separately for each unit, except for the rate indicated for auxiliary power consumption for station auxiliaries which is on station basis. The liquidated damages shall be prorated for the fractional parts of the deficiencies. The performance guarantees coming under this category shall be called 'Category - I' Guarantees.

ii) For Category-II Guarantees

In case the performance guarantee(s) are not met by the Contractor during demonstration test, the Contractor shall carry out all necessary modifications and/or replacements to comply with the guaranteed requirements at no extra cost to the Employer and re-conduct the performance guarantee test(s) with Employer's consent.

If, however, the demonstrated guarantee(s) are not met even after the above modifications / replacements within ninety (90) days, it will be concluded that, the equipment has failed to meet the guarantee(s).

In such a case, Employer shall Reject the equipment/plant/system and recover from the Contractor the 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

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 guarantee performance. These parameters/capacities shall be termed as category - III, guarantees.

1.01.00 GUARANTEES UNDER CATEGORY I

NIL

1.02.00 GUARANTEE UNDER CATEGORY –II

Noise

All the plant, equipment and systems covered under this specification shall perform continuously without exceeding the noise level over the entire range of output and operating frequency specified in General Technical Requirement, Part-C Section-VI of 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 61672-1 & 2 (latest edition) 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 micro bar 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.

1.03.00 GUARANTEE UNDER CATEGORY –III

1. PRE-TREATMENT PLANT: -

A) CLARIFICATION PLANT

1. The System shall be designed for the varying inlet total suspended solids (TSS) of 100 ppm to 2000 ppm & turbidity 100 NTU to 2000 NTU. However, the sludge handling equipment/system shall be designed for the maximum inlet total suspended solids (TSS) of 2000 ppm & turbidity of 2000 NTU .

2. Each clarifier unit of PT-CW system & PT-DM system shall be guaranteed for design effluent capacity meeting the effluent quality as mentioned below.

3. Effluent quality at the outlet of clarifiers (PT-CW system & PT-DM system) shall be guaranteed for the following:

   I. Organic Matter : Less than 0.05 mg/l (see note below)
   II. Iron Content : Less than 0.3 mg/l
   III. Turbidity : Less than 10 NTU
   IV. Total Suspended Solids : Less than 10 ppm

Note: Organic matter shall be tested as per KmnO4 method.

4. Each clarifier shall be tested to demonstrate the above mentioned Guarantees at site under P&G test. In addition, demonstration of satisfactory working of all the clarifiers, its drives, scrapper mechanism, operation of sludge blow-off etc, shall be demonstrated.

B) FILTRATION PLANT

1. Each Gravity filter for PT-DM system shall be guaranteed for design capacity meeting the effluent quality below with one backwash and air scouring in not less than 24 hours or more. Backwash water requirement not to exceed 2% of the water treated between two successive backwashes.

2. Each Gravity filter for PT-Potable system shall be guaranteed for design capacity meeting the effluent quality below with one backwash and air scouring in not less than 24 hours or more. Backwash water requirement not to exceed 2% of the water treated between two successive backwashes.

3. Turbidity at outlet of each gravity filter of PT-DM and PT-Potable system shall not exceed 2 NTU with inlet turbidity of up to 10 NTU.

4. Each filter shall be tested to demonstrate the above mentioned Guarantees at site under P&G test. In addition, demonstration of satisfactory working of all the filters, its backwashing operation, operation of various valves etc shall be demonstrated by Contractor.

2. CRANE, MONORAIL,HOIST ETC:-

The 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) **HOT Cranes**, Monorails etc.: Over load test, Travel and speed checks, functional and performance tests as per relevant Indian standards IS (latest edition).

(iii) 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.

3. Pumps (Pre-treatment Plant)

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.

Standard PG Test Procedure:

Pre-Treatment Plant

Scope: PG Test shall be conducted after successful trial run to establish the various guarantee parameters as defined in the technical specifications.

(a) Guaranteed effluent quality and capacity for each of Clarifier, Gravity Filter, Tube Settler and Coal Slurry Settling Pond.

(b) Sample collection and analysis:

Table1:

S.N.	Sample_ID	Chemical parameters	Frequency of sampling
1	Raw Water	All parameters given in feed analysis	Once/day
2	Clarifier Outlet	Flow, Organic matter, Iron content, Turbidity	Two-hourly
3	Gravity Filter Outlet	Flow, Turbidity	Two-hourly
4	Tube Settler Inlet & Outlet	Flow, Turbidity, Oil & Grease	Two-hourly
5	CSSP outlet	TSS, Particle size	Two-hourly
Note: Joint sampling to be done during PGT.			

(c) Noise and vibration levels of all rotary equipments.

(d) Current, voltage, motor input power, frequency, speed, bearing/motor winding temperature, vibration and noise level of pumps, blowers and their drives and parallel operation of pumps and blowers, if applicable are to be demonstrated.

(e) Capacity, head and power consumption of specified pumps.

General Requirements:

(a) Responsibility of conducting the test: Agency

(b) Standard analytical procedures to be followed for chemical parameter determination.

(c) All necessary tools & tackles, equipment, any additional equipments viz. piping, valves strainers etc required for PGT shall be arranged by vendor. Laboratory facilities at site shall be made available for analysis purpose. In absence of proper lab facility, same shall be arranged by the vendor/sample to be got tested at external NABL labs.

Test Methodology:

(a) After raw water supply is established in clarifier, flow to be adjusted as desired, amount of treatment chemicals is to be assessed by jar test at site.

(b) PGT shall be carried out separately for clarifier, gravity filter, tube settler, coal slurry settling pond of rated flow for a time period as defined in technical specifications.

(c) The guaranteed parameters of respective systems shall be demonstrated during performance guarantee test as per approved test procedure, test procedure is to be submitted by agency.

PT-CW Clarifier , PT-DM Clarifier & Tube Settlers

Test Objective	Test Procedure	Remarks
Effluent Capacity	Flow is to be adjusted so that the effluent quantity from clarifiers/Tube Settler is as defined in technical specifications.	i.Duration of each test shall be 8 hours and one run in one day shall be conducted. ii.Three tests shall be run for each clarifier/Tube settler and average value of three test runs shall be considered for approval.
Effluent Quality	Chemicals shall be dosed based on laboratory Jar Test results for the water available at the time of PGT.	
	20% overloading test of each clarifier is to be done exactly in line with 100% flow test procedure for 8 hours.	

PT-Potable Gravity Filter & PT-DM Gravity Filter

Test Objective	Test Procedure	Remarks
Effluent Capacity	Flow is to be adjusted so that the effluent quantity from clarifier is as defined in technical specifications.	i.Duration of each test of filter shall be 24 hours. ii.Three tests shall be run for each gravity filter and average value of three test runs shall be considered for approval.
Effluent Quality	Effluent from filter is to be sampled and analysed.	
	Backwash water requirement not to exceed 2% of water treated between two successive backwashes.	

Coal Slurry Settling Pond (CSSP)

Test Objective	Test Procedure	Remarks
Effluent Quality	Flow is to be adjusted so that the effluent quantity from CSSP is as defined in technical specifications.	i.Duration of each test shall be 8 hours for each pond. ii.Three tests shall be run for each pond and one test in one day shall be conducted. iii. Average value of three test runs shall be considered for approval. iv. Rated flow shall be provided by NTPC during PGT. If rated inlet flow is not available, PGT shall be conducted as per prevailing conditions and recording of reason for non-availability be done jointly.

Test Summary (Table 2):

S.N.	Unit	Test Objective	Parameters	Remarks
1	PT-CW clarifier, PT-DM Clarifier	Effluent Capacity	Flow	By Flow Transmitter
		Effluent Quality	Turbidity & Iron	By Offline testing
			Organic matter	KMnO4 Method
2	PT-Potable Gravity Filter, PT-DM Gravity Filter	Effluent Capacity	Flow	By Flow Transmitter
		Effluent Quality	Turbidity	By Offline testing
3	Tube Settler	Effluent Capacity	Flow	By Flow Transmitter
		Effluent Quality	Turbidity, Oil & Grease	By Offline testing
4	CSSP	Effluent Quality	Effluent TSS at the outlet of each CSSP during storm water flow condition as defined in technical specifications.	By Flow transmitter and offline testing of TSS

Note:

i. List of instruments is to be provided by vendor.
ii. Chemical consumption: As per design calculations submitted by agency.
iii. Agency should submit the detailed PG test procedure based on the above details for approval of NTPC.

PREREQUISITES TO GUARANTEE TESTS TO BE ENSURED BY CONTRACTOR

1. Deputation of team to site to associate with the Guarantee tests,
2. Calibration of belt weigher scales and accuracy of same to be demonstrated to NTPC.
3. Arrangement of wattmeters / energymeters calibrated and sealed from approved Govt. test house or NTPC site laboratory. Arrangement of any other instrument/ accessory for the test.
4. Proper adjustment of skirt boards and belt cleaners prior to the start of tests.
5. Arrangement of calibrated equipments for measurement of vibration & noise levels.
6. Protection Relays of LT/HT switchgears and all motor feeders shall be checked.
7. Belt protection switches, local push buttons, hooters, brakes/rail clamps to be in working order.
8. Free rotation of idlers and pulleys.
9. Protection relays of LT/HT switchgears and all motors/transformer feeders to be checked.
10. Sufficient illumination.

FORMAT FOR SUBMISSION OF GUARANTEE TEST PROCEDURE

Clause No. as per LOA/ Tech. Specs.	Provision of LOA / Tech. Specs.	Name and Methodology of Test proposed by Vendor	NTPC comments on the tests proposed by vendor

GUARANTEE TEST PROFORMA

POWER MEASUREMENT

Project :

Package :

Date :

1. Equipment/Stream Composition :
2. Motor Description :
3. Sr. No. of meters used :
4. Date of Calibration of instrument and name of test house :
5. Multiplying factor (M.F.) of the wattmeter :
6. Wattmeter Readings (to be taken at 1 minute intervals) :

Sl. No.	Measurement Terminal Location	Time	Voltage (Volts)	Current (amps)	kw Reading M.F.		Total (W1+W2) MF kw	Remarks
					W1	W2		

GUARANTEE TEST PROFORMA

NOISE LEVEL MEASUREMENT

Project :

Package :

Date :

Details of Sound Level Meter

1. Make
2. Model
3. Date of calibration with name of Test House

Sl.No	Equipment with location	Equipment load/capacity	Measurement* point no.	Sound level dBA.	Remarks

NTPC **Contractor**

* For each equipment location, a Projected Plan Diagram shall be made and the location of measurement points shall be identified.

ANNEXURE IV

DRAWING/ DOCUMENTS REQUIREMENT & DISTRIBUTION SCHEDULE

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.

Bidder to further note that the submitted drawings/revised drwaing, should be complete in all respects. Any incomplete drawing submitted shall be treated as non-submission with delays 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.

- The date of submission of drawing documents shall be considered as the date of submission of hard and soft copes whichever is later.

- All the drawings shall be prepared on computer auto cad and other documents (like datasheet 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 lay out of PT Plant.
  - Equipment Cable tray layout of PT Plant.
  - Civil assignment drawings.
  - Piping lay out drawing of PT Plant.

Other requirements

- Engineering for this project is to be carried out in Integrated Intelligent Engineering environment at BHEL end. The engineering platform on which BHEL is doing the project is based on Smart Plant Suite. This is being done to have automated interface checking and thereby minimising rework at site. The engineering for packages placed in TG Hall will essentially be done using Intelligent P&ID, Intelligent Electrical, Intelligent Instrumentation and 3D modelling. For other BOPs i.e. those outside TG hall, though the same level of integration is preferable but 3D modelling is necessarily to be done and review model in compatible format is to be provided to BHEL on stages to be agreed.

  Hence in line with above, bidder is required to prepare PIDs, Electrical drawings and all layout drawings using intelligent software with capability for transfer of data to and from corresponding Software being used by PEM.

- The data of models of facilities will be made available to BHEL as per the BHEL schedule for importing into BHEL model for interface checking and raising of integrated plant model. Layout and PID/electrical drawings will be extracted from the model.

- Standard write up on format compatibility of the BHEL's engineering platform for this project is attached as File formats supported by SPPID, SPI, SPEL & SP3D (Refer Section-D1).

- **e-Learning Package/Module:**

  e-learning packages shall be supplied for the equipment / system for the complete pre-treatment plant along with associated electrical and C&I system. Bidder to refer Section-D1 for detail.

- Data/Reports other than listed drawings/documents will also be made available to BHEL as and when required for import into BHEL model.

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

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

- 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. However, in case changes are necessitated due to any constraints at customer end, delay in review/ approval of such revised drawing beyond one month will be to customer's account.

	MASTER DRAWING LIST (MDL)			
S.No	**Vendor Drawing No**	**NTPC Drawing No**	**Drawing Title**	**No. Of Weeks for Document Submission After Placing LOI/LOA**
1.	PE-V0-497-158-A001*		P & I Diagram for Pre-Treatment Plant	4
2.	PE-V0-497-158-A002*		Process Sizing Calculation for PT Plant	4
3.	PE-V0-497-158-A005		G.A of Filter House, Filter Water Resrvoir & Pump House	10
4.	PE-V0-497-158-A006*		Composite Plant Layout for Pre-Treatment Plant System	4
5.	PE-V0-497-158-A007*		Hydraulic Flow Diagram for Pre-Treatment Plant	4
6.	PE-V0-497-158-A008*		Hydraulic Calculation for Pre-Treatment Plant	4
7.	PE-V0-497-158-A011		Valve schedule for PT Plant	12
8.	PE-V0-497-158-A012*		Pressure Drop calculation for PT	4
9.	PE-V0-497-158-A015		G.A of Inlet Chamber for PT- DM System (Valve Chamber, Parshall Flume, Stilling Chamber, Inlet Chamber)	10
10.	PE-V0-497-158-A016		G.A of Sludge Sump & Pump House	10
11.	PE-V0-497-158-A017		G.A of Filter Backwash Pit & Pump House	10
12.	PE-V0-497-158-A018		G.A of Chemical House including Overhead Tank (Top of Chemical House)	10
13.	PE-V0-497-158-A019		G.A of Inlet Chamber for PT- CW System (Valve Chamber, Parshall Flume, Stilling Chamber, Inlet Chamber)	10
14.	PE-V0-497-158-A020*		Basic Civil Design criteria	4
15.	PE-V0-497-158-A021		I/O LIST FOR PT PLANT AREA	10
16.	PE-V0-497-158-A022		G.A of Reactor Clarifier for PT-CW and DM System including Datasheet	10
17.	PE-V0-497-158-A023		Architectural details of filter house for PT Plant	12
18.	PE-V0-497-158-A024		Architectural details of ground floor plan, section & elevation, terrace plan etc. of Chemical house (two storied) for PTP	12
19.	PE-V0-497-158-A026		MQP for Reator Clarifier	10
20.	PE-V0-497-158-A028		Civil GA, Foundation & super structure details of Cascade Aerator, Stilling Chamber, Parshall Flume & Inlet Chamber for PT- DM System	12
21.	PE-V0-497-158-A029		Civil GA of Reactor Clarifier for PT-DM System	12
22.	PE-V0-497-158-A030		RCC details of Reactor Clarifier for PT-DM System	12
23.	PE-V0-497-158-A032		CIVIL GA & RCC DETAIL OF BYPASS CHANNEL & INTERCONNECTING CHANNEL OF HRSCC FOR PT-CW TO RGSF & INTERCONNECTING CHANNEL FOR HRSCC FOR PT-DM TO RGSF	12
24.	PE-V0-497-158-A033		Civil GA of Gravity Filter House, filtered water reservoir, sump & pump house for PTP	12
25.	PE-V0-497-158-A034		RCC details for Gravity Filter House, filtered water reservoir, sump & pump house for PTP	12
26.	PE-V0-497-158-A035		Civil GA & R/F details of foundation, columns and plinth beams of Chemical House	12
27.	PE-V0-497-158-A038		Civil GA & R/F details of first floor tie beam, roof beam, slab of Chemi,EPC DM&CWT PEM",Water Treatment Plant_sys"	12

28.	PE-V0-497-158-A040		Civil GA & R/F details of water storage tank above Chemical House	12
29.	PE-V0-497-158-A042		Civil GA of Backwash water collection tank, inlet chamber, Filter backwash Sump & Pump House	12
30.	PE-V0-497-158-A043		RCC detail of Backwash water collection tank, inlet chamber, Filter backwash Sump	12
31.	PE-V0-497-158-A046		Civil GA of Sludge pit, sump & pump house	12
32.	PE-V0-497-158-A047		RCC detail of Sludge pit, sump & pump house	12
33.	PE-V0-497-158-A050		Civil Design Calculation of Cascade Aerator, Stilling Chamber, Parshall Flume & Inlet Chamber for PT- DM System	12
34.	PE-V0-497-158-A051		Civil Design Calculation of Reactor Clarifier for PT-DM System	12
35.	PE-V0-497-158-A052		CIVIL DESIGN CALCULATION OF BYPASS CHANNEL & INTERCONNECTING CHANNEL OF HRSCC FOR PT-CW TO RGSF & INTERCONNECTING CHANNEL FOR HRSCC FOR PT-DM TO RGSF	12
36.	PE-V0-497-158-A053		Civil design calculation for Gravity Filter House, filtered water reservoir, sump & pump house of PT & DM system.	12
37.	PE-V0-497-158-A054		Civil Design Calculation of Chemical house (two storied) for PT-CW system.	12
38.	PE-V0-497-158-A056		Civil Design Calculation of Backwash water collection tank, inlet chamber, Filter backwash Sump & Pump House	12
39.	PE-V0-497-158-A057		Civil Design Calculation of Sludge pit, sump & pump house	12
40.	PE-V0-497-158-A058		TYPE TEST REPORT OF FLOW ELEMENT (CALIBRATION)	10
41.	PE-V0-497-158-A059		INSTRUMENT SCHEDULE FOR PT PLANT AREA(INDICATING RANGE, SET POINT, ENGG UNIT ETC)	12
42.	PE-V0-497-158-A060		Painting Schedule	12
43.	PE-V0-497-158-A062		Pipe Schedule for PT Plant	10
44.	PE-V0-497-158-A063		Civil GA, Foundation & Super structure details of Cascade Aerator, Stilling Chamber, Parshall Flume & Inlet Chamber for PT- CW System	12
45.	PE-V0-497-158-A065		Civil GA of Reactor Clarifier for PT-CW System Connecting chanel for clarifiers	12
46.	PE-V0-497-158-A066		RCC details of Reactor Clarifier for PT-CW System Connecting chanel for clarifiers	12
47.	PE-V0-497-158-A069		Civil Design Calculation of Cascade Aerator, Stilling Chamber, Parshall Flume & Inlet Chamber for PT- CW System	12
48.	PE-V0-497-158-A070		Civil Design Calculation of Reactor Clarifier for PT-CW System Connecting chanel for clarifiers	12
49.	PE-V0-497-158-A072		LIST OF ALARM FOR PT PLANT AREA	10
50.	PE-V0-497-158-A073*		System Description & Control Write up	4
51.	PE-V0-497-158-A074		GA OF FLASH MIXER, FLOCCULATION TANK AND TUBE PLATE SETTLER	10
52.	PE-V0-497-158-A075		General Arrangement & Civil Block out details of Sluice Gate	10
53.	PE-V0-497-158-A076		MQP for Sluice Gate	10
54.	PE-V0-497-158-A077		Datasheet for Platform type weighing scale	10
55.	PE-V0-497-158-A078		Datasheet and GA of Ball Valves for PTP	10
56.	PE-V0-497-158-A079		Datasheet and G.A of Air Blower	10
57.	PE-V0-497-158-A080		MQP for Dual Plate Check Valves	10

58.	PE-V0-497-158-A081		MQP for Ball Valves	10
59.	PE-V0-497-158-A082		MQP for Butterfly Valves	10
60.	PE-V0-497-158-A083		MQP for Gate/ Globe/ Check Valves	10
61.	PE-V0-497-158-A084		MQP for Diaphragm Valve	10
62.	PE-V0-497-158-A085		MQP for Air Blower (Lobe Type)	10
63.	PE-V0-497-158-A086		MQP for NRV Flap Type	10
64.	PE-V0-497-158-A088		DATASHEET & WIRING DIAGRAM OF ELECTRICAL ACTUATOR	10
65.	PE-V0-497-158-A089		INSTRUMENTS HOOK UP DRAWINGS (PT PLANT AREA)	10
66.	PE-V0-497-158-A090		G.A and datasheet of Tank Agitator Assembly	10
67.	PE-V0-497-158-A091		Datasheet for Strainers	10
68.	PE-V0-497-158-A092		GA AND DATASHEET OF HORIZONTAL CENTRIFUGAL PUMPS WITH MOTOR	10
69.	PE-V0-497-158-A093		Datasheet for header isolation valve (PT)	10
70.	PE-V0-497-158-A094		Datasheet for Safety shower and Emergency KIT B	10
71.	PE-V0-497-158-A097		MQP for MS Pipes	10
72.	PE-V0-497-158-A098		MQP for SS Pipes	10
73.	PE-V0-497-158-A099		MQP for CI/ DI Pipes & Fittings	10
74.	PE-V0-497-158-A100		MQP for Tube Settler Media	10
75.	PE-V0-497-158-A101		MQP for Pressure Vessel/ Atmospheric Storage Tanks	10
76.	PE-V0-497-158-A102		MQP for Metering Pump (Diaphragm Type)	10
77.	PE-V0-497-158-A103		MQP for Strainer Y Type	10
78.	PE-V0-497-158-A104		MQP for Agitator/ Mixer	10
79.	PE-V0-497-158-A107		MQP for Control Valve (Butterfly Type)	10
80.	PE-V0-497-158-A108		MQP for Electrical Actuator	10
81.	PE-V0-497-158-A116		MQP for Centrifugal Pumps (Horizontal & Vertical)	10
82.	PE-V0-497-158-A117		MQP for Vertical Wet Pit Turbine Pump	10
83.	PE-V0-497-158-A118		MQP for Drainage Pump (Submersible type)	10
84.	PE-V0-497-158-A119		LCP OF REACTOR CLARIFIER FOR PT-CW	10
85.	PE-V0-497-158-A120		LCP OF REACTOR CLARIFIER FOR PT-DM	10
86.	PE-V0-497-158-A121		INTERCONNECTION DIAGRAM AND CABLE SCHEDULE FOR PT PLANT AREA	10
87.	PE-V0-497-158-A122		GA Drawing & Calculation of Electrical Hoist	10
88.	PE-V0-497-158-A123		Piping Layout for PT	10
89.	PE-V0-497-158-A124		Operation & Maintenance Manual	24
90.	PE-V0-497-158-A125		MQP for Electrical Hoist	10

91.	PE-V0-497-158-A127		Electrical Load List	10
92.	PE-V0-497-158-A128		DATA SHEET FOR LOCAL GAUGES	10
93.	PE-V0-497-158-A130		DATA SHEET FOR FLOW ELEMENT ALONG WITH ORIFICE CALC.	10
94.	PE-V0-497-158-A131		TECHNICAL DATA SHEET FOR FLOW TRANSMITTER	10
95.	PE-V0-497-158-A132		DATA SHEET FOR HAND HELD CALIBRATOR	10
96.	PE-V0-497-158-A133		DATA SHEET FOR JUNCTION BOX	10
97.	PE-V0-497-158-A134		DATA SHEET FOR PRESSURE TRANSMITTER	10
98.	PE-V0-497-158-A136		DATA SHEET FOR LEVEL TRANSMITTER FOR PT PLANT	10
99.	PE-V0-497-158-A138		TYPE TEST REPORT OF ELECTRONIC TRANSMITTER	10
100.	PE-V0-497-158-A142		TYPE TEST REPORT OF JUNCTION BOX (DEGREE OF PROTECTION)	10
101.	PE-V0-497-158-A143		Layout and details of interconnecting pathways and paving for all facilities	10
102.	PE-V0-497-158-A144		CABLE TRAY LAYOUT OF WATER PRETREATMENT PLANT	10
103.	PE-V0-497-158-A145		DRIVE LIST FOR PTP (DRIVES CONTROLLED FROM DDCMIS)	10
104.	PE-V0-497-158-A147		PG TEST PROCEDURE FOR PT PLANT	20
105.	PE-V0-497-158-A148		CONTROL SCHEMS FOR PT PLANT	12
106.	PE-V0-497-158-A149		STEP LIST FOR PT PLANT	10
107.	PE-V0-497-158-A150		DATASHEET FOR INSTRUMENT CABLE	10
108.	PE-V0-497-158-A151		GA OF SLUDGE THICKNER	10
109.	PE-V0-497-158-A152		GA OF SUPERNATENT COLLECTION SUMP	10
110.	PE-V0-497-158-A153		GA OF THICKENED WASTE SUMP	10
111.	PE-V0-497-158-A154		CIVIL GA OF THICKENED SUMP & PUMP HOUSE.	12
112.	PE-V0-497-158-A155		CIVIL DESIGN CALCULATIONS OF THICKENED WASTE SUMP.	12
113.	PE-V0-497-158-A156		CIVIL GA & RCC DETAIL OF THICKENER SUERNATANT COLLECTION SUMP & PUMP HOUSE	12
114.	PE-V0-497-158-A158		CIVIL DESIGN CALCULATIONS OF SUERNATANT COLLECTION SUMP & PUMP HOUSE	12
115.	PE-V0-497-158-A159		CIVIL GA OF THICKENER	12
116.	PE-V0-497-158-A160		REINF. DETAIL OF THICKENER	12
117.	PE-V0-497-158-A161		CIVIL DESIGN CALCULATIONS OF THICKENER	12
118.	PE-V0-497-158-A162		GA OF BYPASS CHANNEL & INTERCONNECTING CHANNEL OF HRSCC FOR PT-CW TO RGSF & INTERCONNECTING CHANNEL FOR HRSCC FOR PT-DM TO RGSF	10
119.	PE-V0-497-158-A163		QUALITY PLAN FOR SLUDGE THICKENER WITH DRIVE HEAD	10
120.	PE-V0-497-158-A164		GA AND DATASHEET OF VERTICAL CENTRIFUGAL PUMPS WITH MOTOR	10
121.	PE-V0-497-158-A165		GA AND DATASHEET OF VERTICAL SCREW PUMPS WITH MOTOR	10

122.	PE-V0-497-158-A166		GA, CROSS SECTION, PERFORMANCE CURVE AND DATASHEET OF DOSING PUMPS WITH MOTOR FOR PRE-TREATMENT PLANT	10
123.	PE-V0-497-158-A167		DATASHEET AND GA DRAWING OF DIAPHRAGM VALVES FOR PTP	10
124.	PE-V0-497-158-A168		DATASHEET AND GA DRAWING OF BUTTERFLY VALVES FOR PTP	10
125.	PE-V0-497-158-A169		DATASHEET AND GA DRAWING OF NRV/CHECK VALVES FOR PTP	10
126.	PE-V0-497-158-A170		DATASHEET AND GA DRAWING OF GATE VALVES FOR PTP	10
127.	PE-V0-497-158-A171		DATASHEET AND GA DRAWING OF PLUG VALVES FOR PTP	10
128.	PE-V0-497-158-A172		DATA SHEET AND GA DRAWING FOR NON METTALIC VALVE (CPVC) FOR PTP	10
129.	PE-V0-497-158-A173		GA AND DATASHEET OF PP FILTER NOZZLES (GRAVITY FILTER)	10
130.	PE-V0-497-158-A174		CABLE SCHEDULE	10

Note- The drawing/ document marked as (*) shall be considered as basic drawings/ documents. In addition to above bidder to refer other Sections for documents related to Electrical & Control & instrumentation respectively.

DRAWING/DOCUMENTS DISTRIBUTION SCHEDULE

S.No	Description of Drgs/Docs	No of Prints	No of CD ROMs/DVDs/Portable Hard Disk
1	Drawings, Data sheets, Design calculations, Purchase specifications and other documents		
	First submission and submission with major changes		
	▪ Layout (A0&A1 sizes)	4	-
	▪ Other Drawings/Documents (A0&A1 sizes)	2	-
	▪ P&ID (All sizes)	4	-
	a) Final drawings/documents (Directly to site)	6	2
	b) "As Built" Drawing/Documents (Directly to site)	6	2
	c) Analysis reports of Equipments / piping /structures components/system employing software packages as detailed in the specifications.	2	2
2	Erection Manual (Directly to site)	4 sets	2
3	Operation & Maintenance manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2
4	Plant Hand Book i) First Submission	1	1
5	Commissioning and Performance Test Procedure manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2

S.No	Description of Drgs/Docs	No of Prints	No of CD ROMs/DVDs/Portable Hard Disk
6	Performance and Functional Guarantee Test Report i) First Submission	2 sets	--
	ii) Approved Copies (Direct to Site)	4 sets	2
7	Project Completion Report (Directly to site)	6 sets	2
8	QA programme including Organisation for implementation and QA system manual(with revisions)	1	--
9	Vendor details in respect of proposed vendors including contractor's evaluation report.	2	--
10	Manufacturing QPs, Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc i) For review/comment	1	--
	ii) Approved final copies of Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc (Direct to Site)	4	2
11	Welding Manual, Heat Treatment Manuals, Storage & preservation manuals i) For review/comment	1 set	--
	ii) Approved copies (Direct to Site)	4 sets	2
12	QA Documentation Package for items / equipment manufactured and despatched to site	2 sets	2
13	QA Documentation Package for field activities on equipment/systems at site	2 sets	2

Note:

- Quantity of prints may change during detailed engineering stage based on BHEL / Customer requirement. However the same will be adhered by the bidder without any delivery/commercial implication to BHEL.
- 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.
- The date of submission of drawing documents shall be considered as the date of submission of hard and soft copes whichever is later.
- All the drawings shall be prepared on computer auto cad and other documents (like datasheet 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.
- Bidder has 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-word (as applicable)/MS-Excel (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 / customer will also be submitted by the bidder without any delivery/commercial implication to BHEL.

    - P&IDs.
    - Equipment lay out of the PT Plant area.
    - Equipment Cable tray layout for PT Plant area
    - Equipment earthing layout PT Plant area
    - Civil scope drawings.
    - Piping lay out drawing for PT Plant area and yard piping layout.
    - Valve schedule.
    - Instrument schedule.
    - Any Other Dwg/Docs as required.

ANNEXURE-V

MANDATORY SPARES

SI. NO.	PARTICULARS	QUANTITY
1)	**CLARIFIERS : PT CW & DM System**	
a)	Rake (Scrapper) drive	1 Set
b)	Turbine drive shaft assembly	1 Set
c)	Rake (Scrapper) drive shaft assembly	1 Set
d)	Worm wheel	1 Set
e)	Worm shaft	1 Set
f)	All Bearings required for motors, Turbine drive, and Rack drive	1 Set
	Note: One set consists of quantity required for complete replacement for one clarifier or motor as the case may be	
2)	**Lime Slurry Transfer Pumps, Lime Dosing Pumps**	
a)	Lime Dosing Pump Unit	1 No
b)	Lime Slurry Transfer Pump Unit	1 No
	Note : One set consists of quantity required for complete replacement for one pump	
3)	**Alum Dosing Pumps : PT – CW , PT – DM System**	
a)	Alum Dosing Pump Unit (for each system)	1 No
	Note : One set consists of quantity required for complete replacement for one pump	
4)	**Vertical Sump Pumps (For Each Type & Size)**	
a)	Complete Casing including suction (if applicable) bell	1 Set
b)	Impeller	1 Set
c)	Wearing rings – Impeller (if applicable)	1 Set
d)	Wearing rings – Casing (if applicable)	1 Set
e)	Impeller Shaft, line shaft and head shaft	1 Set
f)	Shaft Sleeves	1 Set
g)	Stuffing box	1 Set
h)	Line Shaft Couplings (if applicable)	1 Set
i)	Impeller, Line and Head shaft bearings (as applicable)	1 Set
	Note : One set consists of quantity required for complete replacement for one pump	
5)	**Agitators**	
a)	Agitator Assembly with Gear Box – Lime Slaking Tank	1 Set
b)	Agitator Assembly with Gear Box – Lime Preparation Tank – PT System	1 Set
c)	Agitator Assembly with Gear Box – Alum Preparation Tank	1 Set
d)	Agitator Assembly with Gear Box – Flash Mixer	1 Set
e)	Agitator Assembly with Gear Box – Flocculation Tank	1 Set
6)	**Valves**	
a)	Manual Plug Valve	Min 1 no of each type, rating & size (Set)
b)	Motor operated Plug Valve (without motor actuator)	-do-
c)	Check Valves /Non-return Valve	-do-

d)	Manual Ball Valve	-do-
e)	Motor operated Ball Valve (without motor actuator)	-do-
f)	Manual Globe Valve	-do-
g)	Manual Diaphragm Valve	-do-
h)	Motor operated Diaphragm Valve (without motor actuator)	-do-
i)	Diaphragm for the above Diaphragm Valves	-do-
j)	Manual Butterfly Valve	-do-
k)	Motor operated Butterfly Valve (without motor actuator)	-do-
l)	Manual Gate Valve	-do-
m)	Motor operated Gate Valve (without motor actuator)	-do-
7)	**Gravity Filters for PT-Potable**	
a)	Sand and gravel	1.1 times of One full charge for one filter (LOT)
b)	Filter flow rate indicator	1 no of each type /rating
c)	Rate of flow controller	1 no of each type /rating
d)	Back wash filter flow rate indicator	1 no of each type /rating
e)	Differential head indicator	1 no of each type /rating
8)	**Gravity Filters for PT-DM**	
a)	Sand and gravel	1.1 times of One full charge for one filter (LOT)
b)	Filter flow rate indicator	1 no of each type /rating
c)	Rate of flow controller	1 no of each type /rating
d)	Back wash filter flow rate indicator	1 no of each type /rating
e)	Differential head indicator	1 no of each type /rating
9)	**Air Blowers for Pressure Filters , Sludge pit, Gravity filters**	
a)	Impeller with shaft	1 Set
b)	All Bearings (Blower & Motor)	1 Set
c)	Gears	1 Set
d)	Filters	1 Nos
	Note : One set consists of quantity required for complete replacement for one blower	
10)	**Electrically Operated Hoists (For each type & capacity)**	
a)	Bearings	1 Set
b)	Rope guide	1 Set
c)	Brake lining	1 Set
	Note : One set consists of quantity required for complete replacement for one hoist of each type & capacity	
11)	**Vertical (wet pit) Pumps- (for Each Type & Size)**	
a)	Impeller with nuts & washers	1 set of each type
b)	Bearings for Line, Head and Impeller shafts	-do-
c)	Thrust Bearings of pump & drive	-do-
d)	Wearing rings – Impeller (if applicable)	-do-
e)	Wearing rings – Casing (if applicable)	-do-
f)	Impeller Shaft, line shaft and head shaft	-do-
g)	Shaft Sleeves	-do-
h)	Stuffing box	-do-
i)	Motor Bearings	-do-

j)	Line Shaft Couplings (if applicable)	-do-
	Note : One set consists of quantity required for complete replacement for one pump	
12)	**Horizontal Centrifugal Pumps –For Each Type & Size**	
a)	Impeller for each type	1 Set
b)	Wearing rings – Impeller for each type (if applicable)	1 Set
c)	Wearing rings – Casing for each type (if applicable)	1 Set
d)	Shaft for each type	1 Set
e)	Shaft Sleeves for each type	1 Set
f)	Stuffing box for each type	1 Set
g)	Pump bearings for each type	1 Set
	Note : One set consists of quantity required for complete replacement for one pump	
	CONTROL & INSTRUMENTATION-PT PLANT	
	MEASURING INSTRUMENTS	
1)	**Electronic Transmitters**	
(i)	Transmitters of all types and model. (for the measurement of Pressure, differential pressure, flow, level, etc.) including local indication (if applicable)	2 Nos. of each type and model
2)	**Temperature elements**	
(i)	Temperature Transmitter	2 Nos. of each type and model
(ii)	RTD's*	1 no. of each type
(iii)	Thermo well	1 no. of each type
	* (With head assembly, terminal block and nipple)	** (to be divided into various insertion lengths in proportion to main population)
3)	**Local Indicators (Non-Electrical type) -As applicable for the package as per the following items**	
(i)	Temperature gauges	1 no. of each range and type
(ii)	Pressure gauges	1 no. of each range and type
(iii)	Differential Pressure Gauges,	1 no. of each range and type
(iv)	Level gauges	1 no. of each range and type
(v)	Flow gauges excluding Rota meters	1 no. of each range and type
(vi)	All types of Rota meters	1 no. of each range and type.
4)	**Process Actuated Switch Devices -As applicable for this package, as per the following items**	
(i)	Temperature switches	1 no. of each range and type
(ii)	Pressure switches	1 no. of each range and type
(iii)	Differential Pressure switches	1 no. of each range and type
(iv)	level switches	1 no. of each range and type
(v)	Flow switches	1 no. of each range and type
5)	**Solenoid Valves**	**2 Nos. of each type and model**
6)	**Limit Switches (for Pneumatic Valves and Manual valves)**	**2 no. of each type**
7)	**ANALYSERS**	
1)	Complete PH Analyzer (including Flow Through type cell and Electrode, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type

2)	Complete Conductivity Analyzer (including Flow Through type cell and Electrode, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type
3)	Complete Turbidity Analyzer (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type
4)	Complete Residual Chlorine Analyzer (including sensing unit, Electronic Transmitter unit, Pre-fabricated cable with connector as minimum)	1 Set of each type

SI. NO.	PARTICULARS	QUANTITY
I	**CLARIFIERS : PT-CW System**	1 no.
1	Turbine drive motor	
II	**CLARIFIER: PT-DM System**	1 no.
1	Turbine drive motor	1 no.
2	Lime Slurry Transfer Pump motor	1 no.
3	Lime Dosing Pumps motor– PT System	1 no.
4	Alum Dosing Pump motor : PT – CW System	1 no.
5	Alum Dosing Pump motor : PT – DM System	1 no.
6	Vertical Sump Pumps – Filter Back wash water pump motor	1 no.
7	Vertical Sump Pumps – Sludge pump motor	1 no.
8	Agitator Assembly with Motor & Gear Box – Lime Slaking Tank	1 no.
9	Agitator Assembly with Motor & Gear Box – Lime Preparation Tank – PT System	1 no.
10	Agitator Assembly with Motor & Gear Box – Alum Preparation Tank	1 no.
11	Air Blowers motor for Gravity Filters	1 no.
12	Vertical (wet pit) Pumps- Potable water pump motor	1 no.

Notes:

1) 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.
2) Mandatory spares listed above is bare minimum requirement. In case any additional mandatory spares requirement is covered elsewhere in the tender specification apart from specified above, same shall be deemed to have been covered in bidder's scope of supply.
3) Unless stated otherwise, a "set" or "Lot" means items required for complete replacement in one equipment of each type/ size/ range.
4) In case of Bought Out items, itemized spares list may be vendor specific and may differ from the list of spares mentioned above. In such cases, the quoted price shall be considered for applicable items only without any change in the contract price.
5) 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 above list.
6) 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.

(DRAWINGS)

COMPUTER FILE NAME : C:\ZZZ.dwg

FROM RAW WATER PUMP HEADER

BHEL ◁ ▷ BIDDER

TERMINAL POINT : 20M FROM AERATOR ℄

LIME SLAKING TANK (2 NOS.)

LIME SLURRY TANSFER PUMP (2X100%)

LIME SOLUTION PREPARTION TANK (3 NOS.)

LIME SOLUTION DOSING PUMPS (2X100%)

ALUM SOLUTION PREPARATION TANK (4 NOS.)

ALUM DOSING PUMPS (PT CWI-4 NOS.

COAGULANT AID PREPARATION TANK (2 NOS.)

COAGULANT AID DOSING PUMPS (2X100%)

PAC PREPARATION /DOSING TANK (2 NOS.)

PAC DOSING PUMPS (2X100%)

STORAGE TANK (PAC) CAP-15 cum.(Min)

Fume Absorber (TYP)

PAC UNLOADING / TRANSFER PUMPS (2X100%)

2 NOS. 80MM DIA FLEXIBLE HOSES OF 20 M LENGTH

PUMP DISCHARGE FROM POTABLE WATER

FILTERED WATER OVER HEAD TANK

TO LUBRICATION & FLUSHING PUMP

BLANKED CONNECTION

TO CLO2 GEN PLANT

TO SLUDGE PIT

TO FILTER BACK WASH PT–DM

TO FILTER BACK WASH PT–POTABLE

FILTERED WATER FLUSHING LINE

LIME RECIRCULATION RING HEADER

FROM FILTER BACKWASH PUMP DISCHARGE

FROM CLO2 DOSING GENERATOR (BHEL'S SCOPE)

CONTROL VALVE SYSTEM

AERATOR

BAFFELE WALL (TYP.)

STILLING CHAMBER

TO FILTER BACKWASH SUMP

BYPASS CHANNEL

PARSHALL FLUME(TYP.)

INLET CHAMBER

TELESCOPIC DEVICE

TO SLUDGE SUMP

COAGULANT AID

LIME

ALUM

PAC

VFD

FOR SAMPLING

PT - CW CLARIFIER-1

PT - CW CLARIFIER-2

PT - CW CLARIFIER-3

PT - DM CLARIFIER-1

(INST. BY BIDDER) INTERLOCK TO BE PROVIDED WITH INLET CONTROL VALVE (TYP)

CLARIFIED WATER DISTRIBUTION CHAMBER (BHEL'S SCOPE)

FILTER BACKWASH LINE

BACK UP LINE

GRAVITY FILTER

TO FILTER BACKWASH PIT

FROM CLO2 DOSING GENERATOR (BHEL'S SCOPE)

SUCTION FILTER (TYP)

AIR BLOWER (2X100%)

FILTERED WATER RESERVOIR

POTABLE WATER PUMPS

POTABLE WATER FOR COLONY DIST. (TP - 5M FROM PUMP DISCHARGE) Pressure-6 kg/cm2 (g)

POTABLE WATER FOR PLANT DIST. (TP - 5M FROM PUMP DISCHARGE) Pressure-6 kg/cm2 (g)

DM WATER FOR DM PLANT (REF. P&ID FOR DM PLANT) (PE-DG-405-163-A001)

DM PLANT FEED PUMPS (BHEL's SCOPE)

BIDDER

BHEL

FROM BACKWASH WATER PUMP DISCHARGE

SUCTION FILTER

AIR BLOWER (2X100%)

FROM PT-DM GRAVITY FILTERS

FROM PT-POTABLE GRAVITY FILTERS

INLET CHAMBER

NOZZLE

FILTER BACKWASH PIT-I

FILTER BACKWASH PIT-II

FILTER BACKWASH TRANSFER PUMPS (2X100%)

TO SITTLING CHAMBER

TO AGITATION OF PITS & PUMP

OTHER DRAIN FROM STILLING CHAMBER, INLET CHAMBER ETC.

SLUDGE FROM ALL THE CLARIFIERS

OVERFLOW & DRAIN FROM CHEMICAL TANKS

SLUDGE FROM TUBE SETTLER / LAMELLA CLARIFIER (BHEL's SCOPE)

INLET CHAMBER FOR SLUDGE PIT

SLUDGE PIT COMP-1

SLUDGE PIT COMP-2

SLUDGE TRANSFER PUMPS (3X50%)

(2W+1S)

FOR SLUDGE RECIRCULATION

TO ASH SLURRY SUMP

LEGEND

	PLUG VALVE
	GATE VALVE
	GLOBE VALVE
	BALL VALVE
	BUTTERFLY VALVE
	PRESSURE RELIEF VALVE
	NON RETURN VALVE
	BUTTERFLY VALVE ELECTRICALLY OPERATED
	DIAPHRAGM VALVE NORMALLY OPEN / NORMALLY CLOSED
	PNEUMATICALLY OPERATED
	'Y' TYPE STRAINER
	FUNNEL
	ORIFICE PLATE
LS	LEVEL SWITCH
PS	PRESSURE SWITCH
LI	LEVEL GAUGE
LGF	LEVEL GAUGE (FLOAT TYPE)
LGR	LEVEL GAUGE (REFLEX TYPE)
PI	PRESSURE INDICATOR
FI	FLOW INDICATOR
FT	FLOW TRANSMITTER
	MOTOR OPERATED
LT	LEVEL TRANSMITTER
	DISTRIBUTED DIGITAL CONTROL MONITORING AND INFORMATION SYSTEM (OWNER'S)
	PUMP
	NIDDLE VALVE
	GATE VALVE (MOTORIZED–INCHING TYPE)
	BUTTERFLY VALVE (MOTORIZED–INCHING TYPE)

	FLOAT VALVE
	AIR BLOWER
	DIAPHRAGM SEAL
OC–LS	OPEN CLOSE LEVEL SWITCH
	ISOLATION GATE
ZT	POSITION TRANSMITTER
	PARSHALL FLUME
AE–TDS	CONDUCTIVITY ANALYSER (INDICATING CORRESPONDING TDS VALUES)

NOTES

1. PIPE LINE SIZE INDICATED ARE IN mm (NB).
   1.1. CARBON STEEL PIPING UP TO AND INCLUDING 150NB SHALL BE ERW, IS: 1239 (HEAVY GRADE)
   1.2. CARBON STEEL PIPING 200NB AND ABOVE SHALL BE IS: 2062. ROLLED & WELDED CONFIRMING TO IS 3589.
2. THE P&I DIAGRAM INDICATES ONLY MINIMUM REQUIREMENT OF VALVES, INSTRUMENTATION ETC.BIDDER SHOULD 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.
3. LIME SOLUTION HEADER SHALL COVER ALL THE CLARIFIERS BEFORE RETURNING TO THE PREPARATION/DOSING TANK .TAPPING FROM THIS HEADER SHALL BE TAKEN NEAR THE INDIVIDUAL CLARIFIER.
4. ALL VARIABLE FREQUENCY DRIVES (VFD) SHALL BE CONTROLLED FROM DDCMIS.
5. SUITABLE PERMANENT FLUSHING CONNECTION SHALL BE PROVIDED FOR ALL PIPIELINES CARRYING SLUDGE AND CHEMICAL LINES. IN CASE, ADEQUATE PRESSURE IS NOT AVAILALBLE, SEPARATE BOOSTER PUMPS (2X100%) SHALL BE PROVIDED FOR THE SAME.
6. ALL RECIRCULATION LINES SHALL BE PROVIDED WITH SUITABLE ORIFICE PLATE & SHALL BE DESIGNED BASED ON 50% OF EACH PUMP CAPACITY.
7. WIDTH OF GATES SHALL BE SAME AS THAT OF CHANNEL. CHANNEL WIDTH SHALL BE INCREASED LOCALLY, IF REQUIRED.
8. ALL THE PIPE AND VALVE SIZES AND ANY OTHER SIZES INDICATED IN THE DRAWING ARE MINIMUM REQUIREMENT. PIPE & VALVES SIZES SHELL BE INCREASED WHERE EVER REQUIRED TO MEET THE SYSTEM REQUIREMENT.
9. OVER FLOW & DRAINS FROM VARIOUS CHEMICAL TANKS & FLOOR WASH DRAINS OF CHEMICAL HOUSE BUILDING (EXCEPT OVER FLOW O/H FILTERED WATER STORAGE TANK) SHALL BE LED TO THE PT PLANT CLARIFIER SLUDGE SUMP.
10. OVER FLOW & DRAINS FROM STRUCTURES AND PIPING HANDLING CLEAR RAW WATER, CLARIFIED WATER AND FILTERED WATER IN PTP SUCH AS AERATOR, STILLING CHAMBER, INLET CHAMBER ETC. SHALL BE LED TO BE TO FILTER BACK WASH SUMP.
11. OVER FLOW & DRAINS FROM FILTERED WATER RESERVOIR , FILTER WATER SUMP ETC. SHALL BE LED TO THE BACK WATER SUMP.
12. THE INSTRUMENTS, VALVES, PIPING, FITTINGS, ETC SHOWN IN P & ID ARE MINIMUM. THE ADDITIONAL VALVES, INSTRUMENTS, PIPING, FITTINGS ETC. SHALL ALSO BE INCLUDED AS INDICATED ELSEWHERE IN THE SPECIFICATION & BASED ON SYSTEM REQUIREMENT. THE P&ID TO BE READ IN CONJUNCTION WITH THE TECHNICAL DETAILS SPECIFIED IN OTHER PART OF TECHNICAL SPECIFICATION.

REV	DATE	ALTD	CHD	APPD	REV	DATE	ALTD	CHD	APPD

JOB No. 497

STATUS CONTRACT

DISTRIBUTION

TO

No.OFF

OWNER: NTPC

NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT: TALCHER THERMAL POWER PROJECT STAGE–III (2X660 MW)

ENGG / SUB CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
A	DRN	VK		
	DESN	VK		
	CHD	SB		
	APPD	SB		

TITLE: P&I DIAGRAM FOR PRE–TREATMENT PLANT

MPL	C	MSE	I	MAX	E	DEPT.	SCALE
						SIGN	
						DATE	

DRAWING No. PE–DG–497–158–A001

SHEET 01 OF 01 REV 00

SIZE-A1

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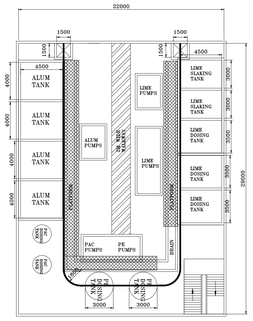
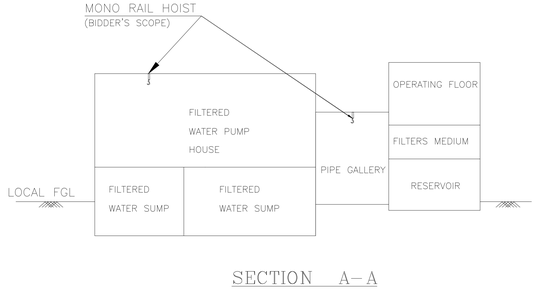
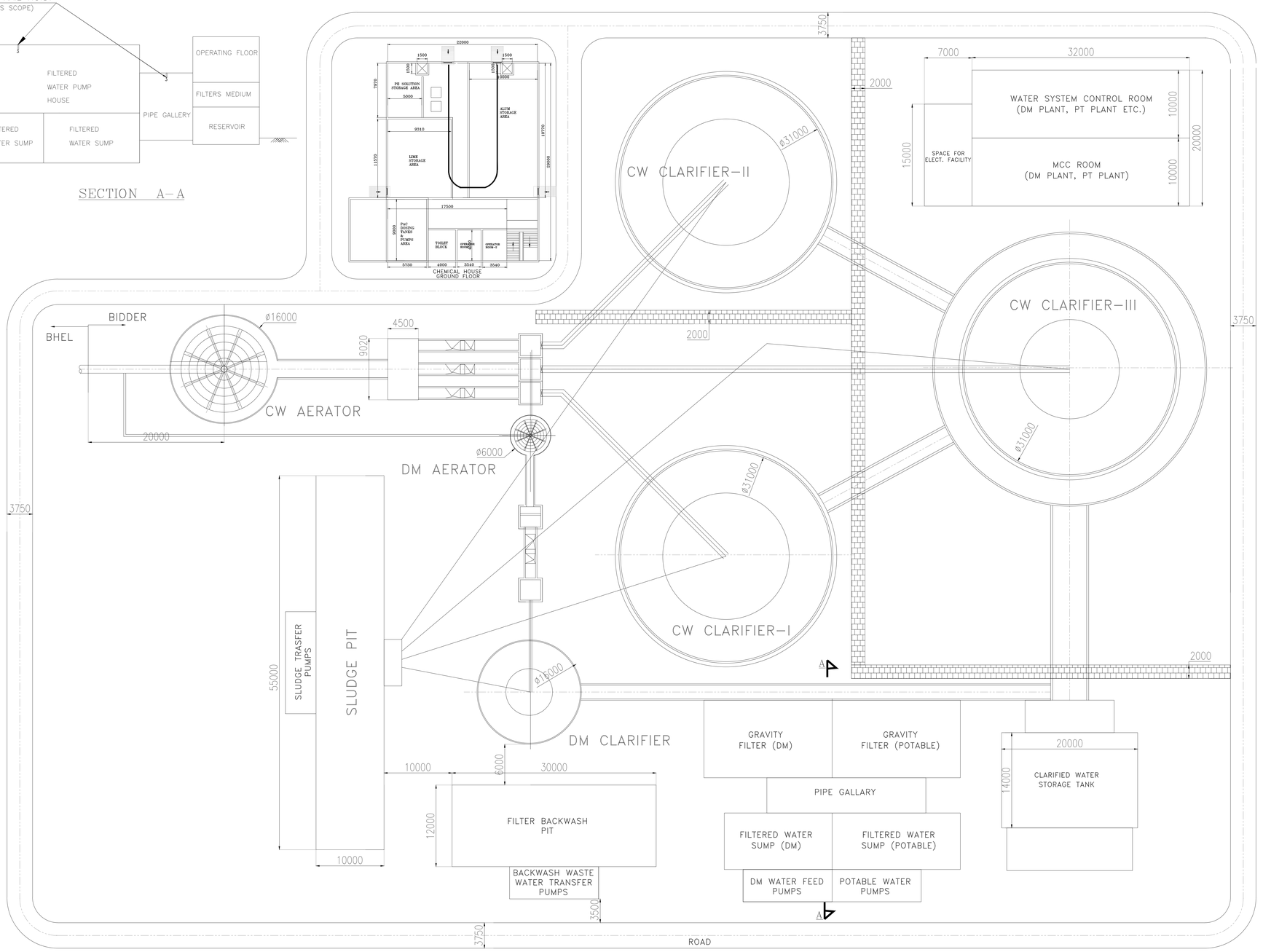


FIRST FLOOR
CHEMICAL HOUSE



SECTION A–A



NOTES:

1. ALL DIMENSIONS AND ELEVATIONS ARE IN MM.
2. ORIENTATON/LOCATION OF FACILITIES WITHIN PT PLANT IS TENTATIVE.
3. ALL CHEMICAL DRAIN CHANNELS WILL BE PROVIDED WITH ACID/ALKALI RESISTANT TILING.
4. CHEMICAL DYKE AREA FLOOR, WALLS & SADDLE SUPPORT TO BE PROVIDED WITH CHEMICAL RESISTANT TILING.
5. THE DIMENSIONS SHOWN HERE ARE INDICATIVE AND FINAL DIMENSIONS SHALL BE AS PER THE CONTRACT REQUIREMENT.

REV	DATE	ALTD	CHD	APPD	REV	DATE	ALTD	CHD	APPD

JOB No. 497
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

OWNER
NTPC
NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT
TALCHER THERMAL POWER PROJECT STAGE–III (2X660 MW)

ENGG / SUB CONTRACTOR
BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
A	DRN	VK		
	DESN	VK		
	CHD	SB		
	APPD	SB		

TITLE
LAYOUT FOR
PRE–TREATMENT PLANT

MPL	C	MSE	I	MAX	E	DEPT.	SCALE
						SIGN	
						DATE	

DRAWING No.
PE–DG–497–158–A002
01 OF 01 REV 00

SIZE–A1

फर्स्ट एंगल प्रोजेक्शन/FIRST ANGLE PROJECTION

सभी माप मि॰ मी॰ मे है/ALL DIMENSIONS ARE IN MM

LEGEND:-

1. ROADS (DOUBLE LANE)
   ROADS (SINGLE LANE)
2. EXISTING BOUNDARY WALL
3. EXISTING FENCING
4. RAILWAY LINE
5. FACILITES/ BUILDINGS (NTPC)
6. WATCH TOWER
7. FORMATION LEVEL — RL(+) 71M/69M
8. NEW BOUNDARY WALL TO BE CONSTRUCTED
9. BOUNDARY WALL TO BE DISMANTLED
10. NEW CHAIN LINK FENCING TO BE CONSTRUCTED
11. TEMPORARY FENCING LINE (NOT IN EPC PKG)
12. ROADS BHEL/ISG

ANNOTATION:-
1. LM - LIGHTING MAST
2. WT - WATCH TOWER

NOTES:-
1. ALL DIMENSIONS AND LEVELS ARE IN METRES.
2. ±0.00 OF MAIN PLANT AREA CORRESPONDS TO RL(+)71.50M
3. ROUTING OF VARIOUS PIPES AS SHOWN ARE TENTATIVE. BIDDER MAY OPTIMISE TO SUIT SITE CONDITIONS.
4. THE LAYOUT SHOWN IS SUGGESTIVE AND SAME MAY BE FURTHER DEVELOPED/OPTIMISED BY THE BIDDER AT DETAILED ENGINEERING STAGE.
5. BUILDINGS/FACILITES OTHER THAN BIDDERS SCOPE ARE SHOWN AS INDICATIVE ONLY.

LIST OF BUILDINGS/FACILITES:-

S.NO	ZONE	DESCRIPTION	SCOPE
1	F-8	TG BUILDING	BHEL
2	F-8	BOILER	BHEL
3	F-7	ESP	BHEL
4	F-6	CHIMNEY	BHEL
5	F-7	ESP/FGD CONTROL ROOM	BHEL
6	F-8	TRANSFORMER YARD	BHEL
7	F-9	SWITCHYARD	BHEL
8	F-9	33 KV SWGR ROOM	BHEL
9	E-9	CANTEEN BUILDING	BHEL
10	G-9	COOLING TOWER	BHEL
11	G-10	CW PUMP HOUSE	BHEL
12	H-10	CW TREATMENT PLANT	BHEL
13	H-10	CW CLO2 PLANT	BHEL
14	H-9	AUX. BOILER	BHEL
15	G-9	F/O TANKER UNLOADING	BHEL
16	G-9	F/O UNLOADING CUM. PRESSURISING PUMP HOUSE	BHEL
17	G-8	F/O TANK	BHEL
18	G-9	FIRE WATER TANKS & PUMP HOUSE	BHEL
19	G-8	FOAM PUMP HOUSE	BHEL
20	G-8	FIRE WATER BOOSTER PUMP HOUSE	BHEL
21	G-8	CPU REGEN	BHEL
22	I-9	PT PLANT	BHEL
23		*RESERVED*	BHEL
24	I-9	CLARIFIED WATER TANK & PUMP SHED	BHEL
25	I-10	DM PLANT	BHEL
26	I-10	DM TANK & PUMP	BHEL
27	I-10	CHEMICAL LAB	BHEL
28		*RESERVED*	BHEL
29	I-11	EFFELUENT TREATMENT PLANT	BHEL
30	F-8	SEWAGE TREATMENT PLANT	BHEL
31	H-13	O&M WORKSHOP	BHEL
32	H-13	CONSTRUCTION OFFICE	BHEL
33	F-11	FIRE STATION/DRILL TOWER	NTPC
34	F-12	SAFETY PARK	BHEL
35	F-11	ADMIN BUILDING	BHEL
36	F-11	GATE COMPLEX	BHEL
37	G-9	COMPRESSOR HOUSE	BHEL
38		*RESERVED*	BHEL
39	K-3	RAW WATER RESERVIOUR	BHEL
40	K-3	RAW WATER PUMP HOUSE	BHEL
41		*RESERVED*	BHEL
42	H-5	COAL STOCKPILE	BHEL
43	H-5	DOSER SHED	BHEL
44	H-5	CHP WORKSHOP CUM OFFICE	BHEL
45	H-4	RAW WATER BOOSTER PUMO HOUSE	BHEL
46	H-5	CHP/LHP/GHP PUMP HOUSE	BHEL
47	H-5	CHP CRUSHER HOUSE	BHEL
48	H-5	CHP CONTROL ROOM CUM CHP MCC	BHEL
49	G-5	LHP-TIPPLER/CONVAYER	BHEL
50	G-5	LHP-CRUSHER HOUSE	BHEL
51	G-6	BALL MILL BLDG.	BHEL
52	F-5	GHP-GYSPUM DEWATERING BUILDING	BHEL
53	F-5	GHP-GYPSUM STORAGE SHED	BHEL
54		*RESERVED*	BHEL
55	F-5	TRACK HOPPER	BHEL
56	D-7	FLY ASH SILO	BHEL
57		*RESERVED*	BHEL
58	D-7	ASH CLASSIFIER	BHEL
59	F-6	ABSORBER	BHEL
60	F-6	ASH SLURRY PUMP HOUSE	BHEL
61	F-6	ASH WATER PUMP HOUSE	BHEL
62		*RESERVED*	BHEL
63	H-4	CSSP	BHEL
64	H-4	CSSP CLARIFIER	BHEL
65	G-8	SERVICE BUILDING	BHEL
66	F-8	ACW PUMP SHED U#1 & CST PUMP SHED	BHEL
67	F-8	ACW PUMP SHED U#2 & CENTRAL LUBE OIL BUILDING	BHEL
68	I-11	GAS CYLINDER STORAGE SHED	BHEL
69	I-11	O&M WORKERS ACCOMODATION/WORKERS REST ROOM	BHEL
70	G-7	CHP BUNKER MCC	BHEL
71	G-7	AHP COMPRESSOR HOUSE #1	BHEL

पुनरीक्षण REV.	दिनांक DATE	परिवर्तितकर्ता ALTD	जाँचकर्ता CHD	अनुमोदनकर्ता APPD

ELECTRONIC FILE NAME : 497_100_M001_R0.dwg

ग्राहक ड्राइंग संख्या CUSTOMER DRAWING NO.	4540-001-301-POC-F-001
ग्राहक/CUSTOMER	एन टी पी सी लिमिटेड N T P C LIMITED
कार्य संख्या- JOB NO.	497
स्थिति STATUS	CONTRACT
मुद्रण स्केल मीटर में PRINT SCALE IN METRE	0 2 4 6 8 10 20 30 40 50
परियोजना PROJECT	2X660 मेगावाट तालचर थर्मल पावर परियोजना लिमिटेड चरण-III 2X660MW TALCHER THERMAL POWER PROJECT LTD. STAGE-III

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: M

	नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
तैयारकर्ता/DRN	DK		17.10.2022
डिजाइनकर्ता/DESN	DK		17.10.2022
जाँचकर्ता/CHD	KK		17.10.2022
अनुमोदनकर्ता/APPD	BKA		17.10.2022

शीर्षक/TITLE

PLOT PLAN

एमपीएल MPL	सिविल CIVIL	इलेक्ट्रिकल ELEC	सीएण्डआई C&I	एमएसई MSE	मैक्स MAX	विभाग DEPT.	स्केल - SCALE- 1:2500
						हस्ताक्षर SIGN / दिनांक DATE	

ड्राइंग संख्या / DRAWING NO. PE-DG-497-100-M001

शीट SHEET 1 OF 1 — पुनरीक्षण REV. 00

फार्मेट साइज A0 FORMAT SIZE A0

DATASHEET-A

(PRE TREATMENT PLANT)

DATA SHEET – A

1.	**INLET VALVES**	
1.1	Inlet valves for PT-CW clarifiers & PT-DM clarifier.(Each)	One (1) number motorized butterfly flow control valve, located at inlet to each aerator, with manual upstream and downstream isolation valves along with by-pass motorized butterfly flow valve. Control valve shall have "auto manual" selection option, position indicator with "open-close" push buttons. Inching operation of valve shall be possible from DDCMIS.
1.2	Inlet control valve size	Suitable to cater to total flow
1.3	Code	AWWA – C 504/EN 593/Equivalent Std. of required class/rating.
1.4	Control	Under " Auto" mode of flow control valve, valve shall automatically maintain the level of water in the clarified water reservoir, i.e valve shall automatically close when reservoir level becomes high.
2.	**AERATOR**	
2.1	Type	Cascade Type
2.2	Nos.	Two (2) [One (1) for PT-CW Clarifier and One (1) for PT-DM Clarifier]
2.3	Capacity(Design flow) Each.(Min.)	PT-CW -4950 CuM/Hr + water loss through desludging or min 3% whichever is maximum. PT-DM - 300 CuM/Hr + water loss through desludging or min 3% whichever is maximum.
2.4	Material of construction	RCC
2.5	Retention time	1 min
2.6	Surface flow rate	0.03 m^3/ hr/ m^2
3.	**STILLING CHAMBER**	
3.1	No.	Two (2) Numbers [One for PT-CW and one for PT-DM]
3.2	Purpose	To dampen out any turbulence of the incoming water.
3.3	Retention time	1 min minimum.
3.4	Velocity of water rise	0.05 m/sec
3.5	Capacity(Design flow)	PT-CW -4950 CuM/Hr + water loss through desludging or min 3% whichever is maximum . PT-DM - 300 CuM/Hr + water loss through desludging or min 3% whichever is maximum.
3.6	Material of construction	RCC
3.7	Drain arrangement	Suitable draining arrangement shall be provided for the stilling chamber and drain lines shall be connected to sludge sump.
4.	**PARSHALL FLUME**	
4.1	No.	Four (4) numbers [Three (3) for PT-CW and one (1) number PT-DM].
4.2	Purpose	To measure flow.
4.3	Material of construction	RCC
5.	**INLET CHANNEL & CHAMBER**	
5.1	Nos.	Four (4) numbers [Three (3) for PT-CW and One (1) for PT-DM].
5.2	Capacity (Design flow).each	PT-CW -1650 CuM/Hr + water loss through desludging or min 3% whichever is maximum (each). PT-DM - 300 CuM/Hr + water loss through desludging or min 3% whichever is maximum (each).
5.3	MOC	RCC

6.	**HRSCC (HIGH RECOVERY SOLID CONTACT CLARIFIER)**	
6.1	Number	Four (4) [Three (3) numbers for PT-CW Clarifier and one (1) number PT-DM Clarifier]
6.2	Design Flow of each clarifier (Net output) (minimum)	PT-CW Clarifier -1650 Cum/Hr (each). PT-DM Clarifier -300 Cum/Hr
6.3	Type	High Rate Solids Contact Type Clarifier (HRSCC).Circular Reactor Type
6.4	MOC	RCC
6.5	MOC of pipe from inlet channel to clarifier	Carbon Steel pipe encased with concrete for buried portion and externally epoxy painted inside the clarifier.
6.6	Sludge Blow Off	By gravity through telescopic stand-pipe for continuous discharge and through manual operated blow-off valve for intermittent.
6.7	Sludge Blow Off- Pipe Material	CI class A as per IS: 1536)
6.8	Platform with hand railing	Shall be provided (1 meter wide all along Clariflocculator)
6.9	Rake bridge	Shall be provided.
6.10	Reaction Turbine (For Each Clarifier)	With variable frequency drive as per Manufacturer's Standard.
7.	**CLARIFIER SCRAPPERS**	
7.1	Number required	One(1) assembly per clarifier.
7.2	Material	Mild steel (MS) with rubber inserts (With bitumastic paint protective coating)
7.3	Traction drive	Slow speed motor driven through reduction gear unit or VFD as per manufacturer's std.
8.	**SUITABLE ACCESSORIES**	
8.1	Access ladder, platform, staircase, hand railings etc.	Shall be provided of structural steel.
8.2	Walkway	Shall be provided with hand railings around launder periphery of width 1000 mm.
8.3	Electrical requirements	For each HRSCC, one (1) Distribution Board to be located on HRSCC bridge for all drives of HRSCC bridge assembly.
9.	**SLUDGE PIT**	
9.1	Number	One (1) with two compartments.(Under Ground)
9.2	Capacity (effective) Each section	Not Less than 200 cum.
9.3	Dimension	Suitable
9.4	Material	RCC with epoxy paint.
9.5	Location	Shall be finalized during Detailed Engineering (DDE).
9.6	Special arrangement	Agitation/ recirculation line shall be provided in pit.
10.	**AIR BLOWER FOR SLUDGE PIT & BACKWASH PIT**	
10.1	Number	Two (1W+1S)
10.2	Type	Centrifugal /Twin Lobe Type
10.3	Duty	Intermittent
10.4	Capacity & Head	As required
10.5	MOC of casing, cover, stator and Impeller/lobes	CI as per IS 210 FG 260
10.6	MOC of shaft	Carbon steel BS-970 En-8/ANSI-I045
10.7	Accessories Required	Acoustic Enclosures. Suction Filter, Silencer, relief Valve etc
10.8	Location	Outdoor

11.	**GRAVITY FILTER**	
11.1	Number	Four (4) [Two (2X100 %) for PT-PW System and Two (2X100 %) for DM System]
11.2	Type	Twin Section
11.3	Design Capacity (each) Net Output	100 Cum/hr for PW System & 150 Cum/hr for DM System
11.4	Maximum Flow (each)	100 Cum/hr + 2% for PW System & 150 Cum/hr + 2% for DM System
11.5	Media type	Sand/Anthracite coal.
11.6	Supporting Material	Graded Gravel
11.7	MOC	RCC
11.8	Back wash interval	24 hrs.
11.9	Free board	50%
11.10	Filter Flow Rate at max. flow rate	Not more than 5 m3/m2/hr
12.	**AIR BLOWER FOR FILTER**	
12.1	Number	Four (4) [Two (2X100 %) for PT-Potable Water System and Two (2X100 %) for DM System]
12.2	Type	Centrifugal /Rotary Twin Lobe Type
12.3	Duty	Intermittent
12.4	Capacity & Head	As required
12.5	MOC of casing ,cover ,stator & Impeller/Lobes	CI as per IS 210 FG 260
12.6	MOC of shaft	Carbon steel BS-970 En-8/ANSI-I045
12.7	Accessories Required	Acoustic Enclosures, Suction Filter, Silencer, relief Valve etc
12.8	Location	Outdoor
13.	**FILTER BACKWASH WASTE COLLECTION PIT**	
13.1	Number	One (1) with two Sections.
13.2	Capacity (effective) Each section	Not Less than 200 cum.
13.3	Dimension	Suitable
13.4	Material	RCC with Acid/Alkali Proof Lining.
14.	**FILTERED WATER RESERVOIR & PUMP HOUSE**	
14.1	Number	Two (2) numbers. [One (1) for PW System and One (1) for DM System]
14.2	Type	Twin Section
14.3	Effective capacity of each Section (minimum)	100 Cum for PW System & 150 Cum for DM System
14.4	Material	RCC.
14.5	Electric Monorail hoist in Filtered Water Pump house	One (1) No. of 2 ton Capacity (Minimum).
15.	**CHEMICAL HOUSE**	
15.1	Number	One (1).
15.2	Type	Two storied building of civil construction.
15.3	Building dimensions	DDE

15.4	Ground floor	Storage of chemical required for Alum, Lime and Poly Electrolyte,PAC, dosing for 30 days storage capacity.
15.5	First floor	Location of all chemical dosing tanks and pumps for entire PT & ET Plant.
16.	**WEIGHING SCALE FOR CHEMICAL**	
16.1	Type	Platform & dial type./electronic type
16.2	Number	Two (2) [One of 0-500 Kg & One Of 0-2000 Kg]
17.	**MONORAIL HOIST**	
17.1	Type	Electric operated
17.2	Number	Two (2).
17.3	Capacity (each)	1 T
17.4	Design Standard	IS:3938 Class 2
18.	**CHEMICAL DOSING**	
18.1	**ALUM SOLUTION PREPARATION & DOSING SYSTEM**	
	a) Tank –	Number-Four (4) numbers Capacity (each)- To store alum solution (of about 10% W/V concentration) for 8 hrs req. of all clarifier operating at its design capacity and a dosing rate of 70 ppm min, Whichever is maximum. Material- RCC with acid/alkali resistant tiles. Dissolving basket (each tank)-SS 316 Motorized Stirrer (MOC (impeller & Shaft)-SS316)- One (1) number per tank
	b) Pump -	Number-(4x100%) (3W+1S),For PT-CW clarifier, (2x100%) (1W+1S) for PT-DM Clarifier. Type – Simplex hydraulically operated diaphragm type. Capacity- As per System Requirement. Capacity Controlled-10-100% of capacity manually by micrometer dial. Pump Stroke speed per minute.-100 (Max) Material of construction- Liquid end (pump head valve, valve housing, etc.), valve spring- AISI 316 Diaphragm-PTFE Packing-PTFE Shaft-Hardened steel (EN8-BS-970)/AISI-316
18.2	**LIME PREPARATION & DOSING SYSTEM**	
	a) Lime Slaking Tank –	Number-Two (2) numbers lime slaking tanks Capacity (each) - To hold lime slurry (of about 10% W/V concentration from Quick lime of purity of 75% CaO) for 12 hours requirement of all the clarifiers operating at design capacity and a design dosage rate of 30 ppm minimum, Whichever is maximum. Material- RCC. with two (2) coats of bitumastic paint over two (2) coats of primer. Dissolving basket (each tank)-SS 316 Motorized Stirrer (MOC (impeller & Shaft)-SS316)- One (1) number per tank
	b) Lime Dosing Tank –	Number-Three (3) numbers lime solution dosing tanks. Capacity (Each)- To hold lime solution (of about 6% W/V concentration) for 8 hours requirement of all the clarifiers operating at its design capacity and a design dosage rate of 30 ppm minimum, Whichever is maximum. Material- RCC. with two (2) coats of bitumastic paint over two (2) coats of primer. Dissolving basket (each tank)-SS 316 Motorized Stirrer (MOC (impeller & Shaft)-SS316)- One (1) number per tank

	b) Pump-	Number-Two (2) numbers (1W+1S) lime slurry transfer pump & Two (2) numbers (1W+1S) lime solution dosing pump. Type – Horizontal Centrifugal non clogging type. Capacity- As per system requirement.
18.3	**COAGULANT AID DOSING SYSTEM. (CLARIFIERS)**	
	a) Tank –	Number- Two (2) numbers. Type-Vertical cylindrical with dished end bottom & with cover at the top. Capacity (each)- To hold coagulant for 12 hours requirement of all the clarifiers operating at design capacity and a design dosage rate of 2 ppm minimum, Whichever is maximum. Material- MSRL Motorized Stirrer (MOC (impeller & Shaft)-SS316)- One (1) number per tank
	b) Pump-	Number-Two (2) numbers (1W+1S). Type – Simplex hydraulically operated diaphragm type. Capacity- As per system requirements.
18.4	**PAC UNLOADING & DOSING SYSTEM.**	
	a) Storage Tank –	Number- Two (2) numbers. Horizontal tank Type-Horizontal cylindrical with dished ends, atmospheric, above ground. Capacity (each)- 15 cum. Material- MSRL(Dished End)
	b) Unloading Pumps-	Number-Two (2) numbers (1W+1S) Type – Horizontal Centrifugal non clogging type. Capacity- 10 cum/hr, Head.-10 mlc.
	a) Tank –	Number- Two (2) numbers. Type-Vertical cylindrical with dished end bottom & with cover at the top. Capacity (each)- To hold coagulant for 12 hours requirement of all the clarifiers operating at design capacity and a design dosage rate of 2 ppm minimum, Whichever is maximum. Material- MSRL (Dished End) Motorized Stirrer (MOC (impeller & Shaft)-SS316)- One (1) number per tank
	b) Dosing Pump -	Number-(2x100%) Type – Simplex hydraulically operated diaphragm type. Capacity- As per System Requirement. Material of construction- Liquid end (pump head valve, valve housing, etc) ,valve spring- AISI 316 Diaphragm-PTFE Packing-PTFE Shaft-Hardened steel (EN8-BS-970)/AISI-316
19.	**MOC and type of the pumps shall be as per the following details.**	

	Pump Description	**Quantity**	**Pump Type**	**Capacity (min)**	**Material of Construction**
19.1	Sludge disposal pumps	Three (3X50%)	Vertical sump pump	160 cum/hr (min) each	Shaft, Coupling & sleeves- SS 410 Impeller – ASTM A 351 CF8M Suction bell/Casing – 2.5% Ni CI IS 210 Gr. FG 260, S-0.1% max. P-0.15 % max. Column & discharge pipe-IS 2062 (Min. Thickness 8 mm) With 2 coats of epoxy coating inside and outside. Shaft enclosing tube (if applicable)- IS 2062 (Min. Thickness 8 mm) With 2 coats of epoxy coating inside and outside. Bolts & nuts- SS Base plate and Soleplate- CS (Min. 10 mm thick)
19.2	Gravity Filter Back wash water pumps	Two (2X100%)	Vertical sump pump (Suitable to	Each pump shall be capable of	Shaft, Coupling & sleeves- SS 410 Impeller – ASTM A 351 CF8M Suction bell/Casing – 2.5% Ni CI IS 210

			handle Drains with particle size up to 40 mm)	evacuating the capacity of complete pit within 2 hours.	Gr. FG 260, S-0.1% max. P-0.15 % max. Column & discharge pipe-IS 2062 (Min. Thickness 8 mm) With 2 coats of epoxy coating inside and outside. Shaft enclosing tube (if applicable)- IS 2062 (Min. Thickness 8 mm) With 2 coats of epoxy coating inside and outside. Bolts & nuts- SS Base plate and Soleplate- CS (Min. 10 mm thick)
19.3	Potable Water Pumps (Plant)	Two (2X100%)	Vertical Turbine (Wet pit) Type	20 m3/hr (min.).each	Shaft, Coupling & sleeves- SS 410 Impeller – ASTM A 351 CF8M Suction bell/Casing – 2.5% Ni CI IS 210 Gr. FG 260, S-0.1% max. P-0.15 % max. Column & discharge pipe-Fabricated steel as per IS: 2062 (minimum thickness shall not be less than 8 mm) with 2 coats of epoxy coating inside & outside.
19.4	Potable Water Pumps (Colony)	Two (2X100%)	Vertical Turbine (Wet pit) Type	80 m3/hr (min.) each	Shaft, Coupling & sleeves- SS 410 Impeller – ASTM A 351 CF8M Suction bell/Casing – 2.5% Ni CI IS 210 Gr. FG 260, S-0.1% max. P-0.15 % max. Column & discharge pipe-Fabricated steel as per IS: 2062 (minimum thickness shall not be less than 8 mm) with 2 coats of epoxy coating inside & outside.
20.	**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:			
20.1	Coagulant (Alum) and Coagulant aid Services	**i. Type of Valves** <u>For Isolation</u> a) Saunder's Patented Diaphragm Valves b) Ball Valves in CPVC pipes <u>For non-return / Check</u> Swing Check type /Dual Plate type			
		ii. Material of Construction Valves <u>Diaphragm Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40 ; BS: 1452 Gr.220/Equivalent. OR Cast Steel to ASTM. A 216GR. WCB and Body shall be internally lined with Soft Natural rubber, Ebonite or Polypropylene b) Diaphragm shall be shall be of reinforced rubber /Hypalon/ approved equivalent c) Stem, Compressor & Bush shall be Stainless steel Construction <u>Ball Valves in CPVC Pipe lines</u> a) Body , Ball & stem shall be of CPVC b) Seat ring & Packing shall be EPDM / or equivalent <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and <u>shall be lined with natural Rubber, PTFE or Viton</u> or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and <u>shall be coated with PVDF, or suitable elastomer</u> or Stainless Steel – 316 c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS – 316 e) Material of construction of spring in dual type valve shall be of INCONEL or better		
20.2	Lime slurry/Solution/ Suspensions	**i. Type of Valves** <u>For Isolation</u> Non-lubricated Plug Valves <u>For non-return / Check</u> Swing Check type /Dual Plate type			

		ii. Material of Construction Valves Plug Valves a) Body shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt b) Plug shall be Stainless steel to AISI 316 c) Body Sleeve & Seat shall be PTFE d) Gland & Gland nut shall be SS 304/316 e) Cover shall be of Cast Steel to ASTM A 216 Gr WCB Check Valves a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and shall be lined with natural Rubber, PTFE or Viton or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and shall be coated with PVDF, or suitable elastomer or Stainless Steel – 316 c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS-316 e) Material of construction of spring in dual type valve shall be of INCONEL or better
20.3	Sludge	**i. Type of Valves** For Isolation Gate or Sluice or Knife edge type Slide Valves For non-return / Check Swing Check type /Dual Plate type
		ii. Material of Construction Gate / Sluice / Knife Edge Slide Valve a) Body,Disc : Cast Iron b) Stem : Stainless Steel AISI 420 d) Packing : PTFE e) Gland & Gland nut : AISI 420 f) Hand wheel : Cast Iron Check Valves a) Body & Cover, Hinge Disk/Door shall be Cast Iron BS:1452 Gr.220 or Eqvt b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB / High tensile Brass or BS: 2872 equivalent. c) Disc facing ring and Body Seat rings shall be Stainless Steel. d) Bearing bushes shall be Leaded tin Bronze. e) Material of construction of spring in dual type valve shall be of INCONEL or better
20.4	**Other Requirements:** 1) Butterfly valves shall conform to design standard latest revision of AWWA C-504/EN 593/equivalent standard of required class/rating. 2) Plug valves shall be designed as per BS: 5353 Cl.150 or equivalent. 3) Valves for alum solution shall be Saunders's patented Diaphragm type designed as per BS: 5156 or approved equivalent standard. 4) Sluice/Gate Valves shall conform to BS: 5150 (BS: 5163 PN 16) PN16, IS:14846 of rating PN 1.6 (min.). Stem, seat ring and wedge facing ring shall be of stainless steel construction. Other parts shall be as per IS: 14846 /BS:5163). Flanges shall be designed as per ANSI B 16.5 Cl. 150 (min.) to meet with the piping flanges. Valves shall be of outside screw and rising stem type. Gate valves for sizes below 50 NB and below shall conforms to IS:778 Class-2/ANSI B16.34 straight, rising stem; without side screw. 5) Sluice/Gate valves shall be provided with the following accessories in addition to the standard items: a. Hand wheel b. Manual Gear reduction unit operator for valves 200 NB and above c. Bypass valve for valve of sizes 350 NB and above. d. Draining arrangement wherever required. e. Arrow indicating flow direction. f. Position indicator. g. Sluice/Gate Valves shall be provided with back seating bush to	

	h. facilitate gland renewal during full open condition. 6) Design standard for Gates shall be IS: 3042 or Equivalent. Material of Construction a. Frame and Door : Cast Iron IS:210 Gr.260 b. Spindles, bolts & nuts: M.S. to IS:2062 c. Face & seat rings : Gun metal (as per IS: 3042). 7) All the parts of gates shall be applied with the coats of heavy duty bitumastic paint. Each of the gates shall be provided with hand wheel and a position indicator. 8) Sluice valve/knife edge type slide valves shall design by IS 14846. Plug valves shall be used for the application of lime slurry/lime solutions conforming to BS: 5353 Class 150 or Equivalent. 9) Valves will be used to start/stop or control flow. Gates will be primarily used for isolation of flow in open channels although these should be capable of throttling the flow too. However, contractor can provide either isolation gates or butterfly valves in various RCC tanks/pits/sumps such as sludge pit, distribution chamber etc. Sample valves will be used in sample collection lines. Unless otherwise specified all the valves shall be supplied with counter flanges by the Contractor. 10) All valves shall be suitable for service conditions i.e. flow, temperature and pressure under which they are required to operate. All the valves shall be of standard pressure rating of the relevant design standard. Nonstandard pressure rating shall not be accepted. The pressure and temperature rating of the valve shall not be less than the maximum expected pressure and temperature plus 5% additional margin of the system in which valves are proposed to be installed. The pressure rating of individual piping system component such as valves, flanges etc. shall however be not less than that specified.	
21.	**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:
21.1	Raw water & Clarified water	Carbon Steel: IS: 1239 Part-I (Heavy grade-Black), ASTM-A-53 Type-E Grade B / ASTM A 36 /IS: 3589 - Grade 410; / IS-2062 Gr.-B (for fabricated from plates) / Equivalent
21.2	Coagulant (Alum) PAC Solution	Rubber lined Steel/CPVC Schedule 80 CPVC Schedule 80
21.3	Lime slurry/Solution/ Suspensions	CPVC as per ASTM F441 CPVC 4120 Sch. 80
21.4	Coagulant aid Solution	Rubber lined Steel (as refereed above)/CPVC as per ASTM F441 CPVC 4120, Schedule80/equivalent.
21.5	Sludge	1) GRP as per ASTM D3517/ AWWA C950-88/AWWA M45 2) HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS:4984 or Equivalent for buried portion
21.6	Chemical Waste from vessels and tanks	1) Rubber lined Steel (as referred above) 2) HDPE as per ASTM D3350 CL 34543C, FM Class 150/ IS: 4984 or Equivalent for buried portion.

SECTION-C2
(SPECIFIC TECHNICAL REQUIRMENT-ELECTRICAL)

SPECIFIC TECHNICAL REQUIREMENTS:

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

The equipment and services to be provided by bidder under this specification shall be as detailed here below but shall not be limited to the following:

a) Services and Equipment as per "Electrical Scope between BHEL and Vendor".

b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The bidder without any extra charge shall provide the same.

c) Supply of mandatory spares as specified in the specifications of mechanical equipments.

d) Electrical load requirement for DM/ PT PLANT package.

e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.

f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer / BHEL approval without any commercial and delivery implications to BHEL.

g) Various drawings including GA drg, data sheet as per required format, quality plans, calculations, test reports, test certificates, operation and maintenance manuals, characteristic curves, wiring diagrams/schemes etc. shall be furnished as specified at contract stage. All documents shall be subject to customer / BHEL approval without any commercial implications to BHEL.

h) The sub-vendor list for various electrical items is subject to BHEL/Customer approval without any commercial implications.

i) Motors shall meet minimum requirement of Electric motor specification.

j) Purchaser will furnish data sheets to the vendor after award of contract. Vendor shall furnish filled in data sheets meeting the specification requirements.

k) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.

l) Cable BOQ worked out based on routing of cable listing provided by the vendor for "both end equipment in vendor's scope" shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

m) All Structural steel required for electrical equipment supplied by Vendor- as per scope split, shall be in Vendor's scope.

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

Refer "Electrical Scope between BHEL and Vendor".

3.0 **DOCUMENTS TO BE SUBMITTED ALONG WITH BID**

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

a) A copy of this sheet "Electrical Equipment Specification for DM/ PT PLANT package and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
b) Electrical load requirement.

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

4.0 **LIST OF ENCLOSURES**

4.1 Electrical scope between BHEL & vendor
4.2 Customer (NTPC) specification for Motors & Cabling (for vendor scope as per scope split)
4.3 Quality plan for motors & NTPC quality assurance
4.5 Datasheet A & C (ANNEX-I)
4.6 ~~List of Mandatory Spares (ANNEX-II)~~
4.7 Electrical Load data format (ANNEX-III)
4.9 BHEL cable listing format (ANNEX-IV)

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGES : DM/ PT PLANT
SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT
PROJECT: 2 X 660MW TALCHER TPP (EPC)

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	240 V AC (supply feeder)/415 V AC (3 PHASE 4 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 Vendor 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. Termination at BHEL equipment terminals by BHEL. 3. Termination at Vendor equipment terminals 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, optical fibre etc.	Vendor	Vendor	Refer C&I portion of specification for scope of fibre Optical cables if used between PLC/ microprocessor & DCS.
6	Cable trays, accessories & cable trays supporting system 100/ 50 mm cable trays/ Conduits/ Galvanised steel cable troughs for local cabling	BHEL Vendor	BHEL Vendor	Local cabling from nearby main route cable tray (BHEL scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs, as per approved layout drawing during contract stage.
7	Cable glands ,lugs and bimetallic strip for equipment supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and 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	BHEL	BHEL	
10	Equipment grounding (including electronic earthing) &	BHEL	BHEL	Refer note no. 4 for electronic earthing

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGES : DM/ PT PLANT
SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT
PROJECT: 2 X 660MW TALCHER TPP (EPC)

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
	lightning protection			
11	Below grade grounding	BHEL	BHEL	
12	LT Motors with base plate and foundation hardware	Vendor	Vendor	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	Vendor	
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 and electronic earthing cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Electrical Equipment & cable tray layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish Electrical equipment layout & cable tray 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, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Cabling arrangement of the same (wherever overhead cable trays, trenches, cable ducts, conduits etc.) shall be decided during contract stage. Electrical equipment layout & cable tray layout drawing shall be subjected to BHEL/ customer approval without any commercial implications to BHEL.
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.

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGES : DM/ PT PLANT

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 2 X 660MW TALCHER TPP (EPC)

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. Vendor shall indicate location of Electronic Earth pit in their Civil assignment drawing.

SUB-SECTION-B – 02

MOTORS

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, IEC:60034
4)	DC motors/generators	:	IS:4722, 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) Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be **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

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.

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

Type	:	Electrolytic grade Copper conductor, Non-hygroscopic, oil resistant, flame resistant Insulation.
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
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.

	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). 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.
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 three 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 Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.
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. Contractor shall provide termination kit for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. 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
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 IR, HV and no load run test.

(b) Terminal box-fault level withstand test for each type of terminal box 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.

	v)	11 kV busduct	- 1 second
	vi)	Switchgears	- 1 second
	vii)	Cables to the feeders protected by breakers	Main protection fault clearing time with 0.12 second minimum
	viii)	Cables of all other feeders	As per MCCB operating time
	ix)	11KV & 3.3KV cable screen	- 2 seconds for the adopted ground fault current - 1 second for the adopted ground fault current, for cables connected to miscellaneous switchgear/ transformer.
	x)	EHV systems	- 1 second

(** Note) Thermal withstand design time duration. The indicated values of time durations are used in transformer design for ensuring thermal stability of the transformers and are to be proven through calculations.

10.00.00 **MOTORS**

The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance):

(a) From 50KW & upto 110KW : 11.0
(b) From 110 KW & upto 200 KW : 9.0
(c) Above 200 KW & upto 1000KW : 10.0
(d) From 1001KW & upto 4000KW : 9.0
(e) Above 4000KW : 6 to 6.5

Starting voltage requirement :permissible starting voltage for motor shall be as follows:

(a) Up to 85% of rated voltage for ratings below 110 KW
(b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW
(c) Up to 85% of rated voltage for ratings from 201 KW to 1000 KW
(d) Up to 80% of rated voltage for ratings from 1001 KW to 4000 KW
(e) Up to 75 % of rated voltage for ratings above 4000KW

11.00.00 **All the plant and equipments/systems supplied under the contract shall be designed following "Fail Safe" concept in case of failure of Power Supply like Electric Power, Hydraulic pressure, Pneumatic pressure, Vacuum etc the system shall be designed in such a way that the equipment shall always move/remains (as applicable) to safest position as per system requirement to ensure safety of Man and Machinery.**

12.00.00 **Latest Cybersecurity guidelines laid down by CEA/Government of India shall be followed.**

SUB-SECTION-B – 10

CABLING EARTHING AND LIGHTNING PROTECTION

1.00.00 CODES AND STANDARDS

1.01.00 All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS codes, standards, etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards/ codes as applicable .

IS:513	Cold rolled low carbon steel sheets and strips.
IS:802	Code of practice for the use of Structural Steel in Overhead Transmission Line Towers.
IS:1079	Hot Rolled carbon steel sheet & strips
IS:1239	Mild steel tubes, tubulars and other wrought steel fIttings
IS:1255	Code of practice for installation and maintenance of power cables upto and including 33 KV rating
IS:1367 Part-13	Technical supply conditions for threaded Steel fasteners. (Hot dip galvanized coatings on threaded fasteners).
IS:2147	Degree of protection provided by enclosures for low voltage switchgear and control gear
IS:2309	Code of Practice for the protection of building and allied structures against lightning.
IS:2629	Recommended practice for hot dip galvanising of iron & steel
IS:2633	Method for testing uniformity of coating on zinc coated articles.
IS:3043	Code of practice for Earthing
IS:3063	Fasteners single coil rectangular section spring washers.
IS:6745	Methods for determination of mass of zinc coating on zinc coated iron & steel articles.
IS:8308	Compression type tubular in- line connectors for aluminium conductors of insulated cables
IS:8309	Compression type tubular terminal ends for aluminium conductors of insulated cables.
IS:9537	Conduits for electrical installation.
IS:9595	Metal - arc welding of carbon and carbon manganese steels - recommendations.
IS:13573	Joints and terminations for polymeric cables.
BS:476	Fire tests on building materials and structures
IEEE:80	IEEE guide for safety in AC substation grounding
IEEE:142	Grounding of Industrial & commercial power systems
DIN 46267 (Part-II)	Non tension proof compression joints for Aluminium conductors.
DIN 46329	Cable lugs for compression connections, ring type ,for Aluminium conductors
BS:6121	Specification for mechanical Cable glands for elastomers and plastic insulated cables.
	Indian Electricity Act.
	Indian Electricity Rules.

1.02.00 Equipment complying with other internationally accepted standards such as IEC, BS, DIN, USA, VDE, NEMA etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the Bidder shall clearly indicate the standard(s) adopted, furnish a copy in English of the latest revision of the standards alongwith copies of all official amendments and revisions in force as on date of opening of bid and shall clearly bring out the salient features for comparison.

2.00.00 DESIGN AND CONSTRUCTIONAL FEATURE

2.01.00 **Inter Plant Cabling**

2.01.01 Interplant cabling for main routes shall be laid along overhead trestles/duct banks. Cables from main plant to switchyard control room shall be laid in overhead trestles or duct bank. In case of Duct banks, pull-pits shall be filled with sand and provided with a PCC covering. Directly buried cables, if essential, shall not have concentration of more than 4 cables in one route. Cables crossing Railway line (if applicable) shall be laid underground through nearest culvert. Necessary statutory clearance if required shall be taken by Bidder. All HT, LT and control cable shall be armoured.

2.01.02 **Transformer yard**
In transformer yard cables shall be laid in overhead trestle. The main cable routes coming out from Main plant building and crossing the Transformer yard shall be laid in overhead trestles. In transformer yard, trestle height for rail/road crossing shall be suitable for movement of Generator Transformer with bushing.

2.01.03 **Trenches**
PCC flooring of built up trenches shall be sloped for effective drainage with sump pits and sump pumps.

2.01.04 No sub zero level cable vault/trenches shall be provided below control building/switchgear rooms in main plant.

2.01.05 **Cable Vault**
The cable vault/ / cable spreader room space below the HT / LT switchgear room, Control Rooms, unit control equipment room, Programmer room, UPS, Charger & Battery Rooms, shall have **800 mm wide** and 2.1 m high movement passage all around the cable trays in the cable vault/ cable spreader room for easy laying/maintenance of cables

Cable vaults shall be provided with adequate drainage facilities for drainage of fire water.
Each cable vault should have at least two doors.
Exit signs shall be provided near doors for personnel escape in case of emergency

2.01.06 **Boiler Area**
Cable trays in boiler & ESP area shall be supported from the boiler and ESP structures. The same shall be coordinated with SG/ESP contractor.
Cable trays in these areas shall be in vertical formation to avoid dust accumulation. No cable trenches shall be provided in boiler/ESP area.

2.01.07 Two separate cable routes shall be provided for cable routing of working and standby drives or different set/group (say 50% capacity) of auxiliaries.

2.01.08 **OffSite Area**
For feeder in bidder's scope for offsite areas, overhead cable tray arrangement shall be followed. However cable trenches/slit may also be acceptable, for some areas, if found to be required during detailed engineering.
Cable trenches provided shall be separated from fuel oil area to avoid oil accumulation.

2.01.09 The cable slits to be used for motor/equipment power/control supply shall be sand filled & covered with PCC after cabling.

2.01.10 Sizing criteria, derating factors for the cables shall be met as per respective chapters. However for the power cables, the minimum conductor size shall be 6 sq.mm. for aluminium conductor and 2.5 sq.mm. for copper conductor cable.

2.01.11 Conscious exceptions to the above guidelines may be accepted under special conditions but suitable measures should be taken at such location to:

- Meet all safety requirements
- Safeguard against fire hazards, mechanical damage, flooding of water, oil accumulation, electrical faults/interferences, etc

3.00.00 EQUIPMENT DESCRIPTION

3.01.00 **Cable trays, Fittings & Accessories**

3.01.01 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 Clause No. 3.13.00 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 Clause No. 3.13.00 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 galvanised.

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 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

3.02.05 FOR COAL HANDLING PLANT/**FGD PLANT/ ESP AREA** THE FOLLOWING SHALL ALSO BE APPLICABLE**:**

a) All overhead cable routes shall be along the route of the conveyor gallery on separate supporting structures and cables shall be laid in vertical trays. The bottom of the steel shall be such that the existing facilities, movement of trucks/human beings etc. does not get affected. The cable trestle shall have a minimum 600mm clear walk way and shall have maintenance platforms as required. The bottom of the steel supporting structure shall be generally at 3.0M above the grade level except for rail/road crossings where it shall be at 8.0M above grade level. Tap offs from the overhead cable trestle can be through shallow trenches with prior approval of the Employer. Directly buried cable, if essential, shall not have concentration of more than 4 cables on one route.

b) Cable trenches shall be provided only in Switchgear/MCC rooms.

c) Cables shall not be routed through the conveyor galleries except for the equipment located in the conveyor galleries for a particular conveyor i.e. protection switches, receptacles etc.

d) Cables for PCS and BSS shall be routed along the conveyors through GI conduits.

3.03.00 **Pipes, Fittings & Accessories**

3.03.01 Pipes offered shall be complete with fittings and accessories (like tees, elbows, bends, check nuts, bushings, reducers, enlargers, coupling caps, nipples etc.) The size of the pipe shall be selected on the basis of maximum 40% fill criteria

3.03.02 GI Pipes shall be of medium duty as per IS: 1239

3.03.03 Duct banks shall be High Density PE pipes encased in PCC (10% spare of each size, subject to minimum one) with suitable water-proof manholes.

3.03.04 Hume pipes shall be NP3 type as per IS 458.

3.03.05 TERNE Coated Flexible Steel Conduits shall be water proof and rust proof made of heat resistant lead coated steel. 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

3.03.06 HDPE pipes and conduits shall be PE-80, PN-10 type as per IS 4984/IS 8008 part-I.

3.04.00 **Junction Boxes**

3.04.01 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.

3.04.02 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.

3.05.00 **Terminations & Straight Through Joints**

3.05.01 Termination and jointing kits for 33kV, 11 kV, 6.6 KV and 3.3 kV grade XLPE insulated cables shall be of proven design and make which have already been extensively used and type tested. Termination kits and jointing kits shall be Pre-moulded type or heat shrinkable type. Further Cold shrinkable type termination and jointing kits are also acceptable. The Cold shrinkable type kits shall be type tested as per relevant standards. Calculation to withstand the required fault level shall also be furnished in case of cold shrinkable type kits. 33 kV, 11 kV, 6.6 KV and 3.3kV grade joints and terminations shall be type tested and Type test reports as per IS:13573 Part-II and IEC60502 shall be furnished. Also, heat shrink material shall comply with requirements of ESI 09-13 (external tests). Critical components used in cable accessories shall be of tested and proven quality as per relevant product specification/ESI specification. Cable joints and terminations should be with FRLS properties as per IEC 60754-1&2. Kit contents shall be supplied from the same source as were used for type testing. The kit shall be complete with the tinned copper solderless

crimping type cable lugs & ferrule or mechanical connectors (wherein bolts are tightened that shear off at an appropriate torque) as per DIN standard suitable for aluminium compacted conductor cables.

3.05.02 Straight through joint and termination shall be capable of withstanding the fault level of 21 KA for 0.12 Sec. with dynamic peak of 52 KA for 33 KV system & of 40 kA for 0.12 sec with a dynamic peak of 100 kA for 11 kV, 6.6 KV & 3.3 KV system. Straight through joints shall have provisions for shield connection and earthing wherever required and complete with all accessories and consumables suitable for storage without deterioration at a temperature of 50 deg. C with shelf life of more than five years. 1.1 kV grade straight through joints shall also be of proven design

3.05.03 1.1 KV grade Straight Through Joint shall be of proven design.

3.06.00 **Cable glands**

3.06.01 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.

3.07.00 **Cable lugs/ferrules**

3.07.01

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.

Crimping tool for crimping (from 1.5sqmm cable to 630sqmm cables) above mentioned lugs shall be of Hexagonal Type crimp profile, with suitable die of crimp match code.
Characteristics of crimping tool:

1) To should generate enough pressure to pass pull out test as per IEC 61238-1. Relevant type test to be produced for the sizes specified in the tender.
2) Tool die shall be replaceable for assorted sizes and crimp code to be mentioned on both part the die.
3) Tool should be compliant of testing according to IEC, UL and GS standards.

Tool shall have features such as:

- Auto retraction system
- Manual retraction stop.
- Feedback signals for improper pressure
- Better battery capacity and with status display
- Flexible and rotating head for easy crimping.

3.08.00 **Trefoil clamps**

3.08.01 Trefoil clamps for single core cables shall be pressure die cast aluminum or fibre glass or nylon and shall include necessary fixing accessories like G.I. nuts, bolts, washers, etc. Trefoil clamps shall have adequate mechanical strength, when installed at 1 mtr intervals, to withstand the forces generated by the peak value of maximum system short circuit current.

3.09.00 **Cable Clamps & Ties**

3.09.01 The cable clamps/ties required to clamp multicore cables shall be of SS-316 material, 12mm wide, polyster coated ladder lock type. The clamps/ties shall have self locking arrangement

& shall have sufficient strength. The cable clamps/ties shall be supplied in finished individual pieces of suitable length to meet the site requirements.

3.10.00 **Receptacles**

3.10.01 Receptacles boxes shall be fabricated out of MS sheet of 2mm thickness and hot dipped gavanised or of die-cast aluminium alloy of thickness not less than 2.5 mm. The boxes shall be provided with two nos. earthing terminals, gasket to achieve IP55 degree of protection, terminal blocks for loop-in loop-out for cable of specified sizes, mounting brackets suitable for surface mounting on wall/column/structure, gland plate etc. The ON-OFF switch shall be rotary type heavy duty, double break,AC23 category, suitable for AC supply. Plug and Socket shall be shrouded Die-cast aluminium. Socket shall be provided with lid safety cover. Robust mechanical interlock shall be provided such that the switch can be put ON only when the plug is fully engaged and plug can be withdrawn only when the switch is in OFF position. Also cover can be opened only when the switch is in OFF position. Wiring shall be carried out with 1100 V grade PVC insulated stranded aluminium/copper wire of adequate size. The Terminal blocks shall be of 1100 V grade. The Terminal blocks shall be of 1100 V grade made up of unbreakable polymide 6.6 grade with adequate current rating and size. The welding receptacles shall be provided with RCCB/RCD of 30mA sensitivity having facility for manual testing/checking of operation of RCCB/RCD. Location and Minimum no of RC type receptacle TG and SG area shall be provided as per Annex-I attached.

3.11.00 **Cable Drum Lifting Jack**

The jack for cable drum lifting shall be of screw type with 10 ton capacity. The cable drum jacks shall be manufactured from fabricated steel. The spindles supplied with the cable drum jack shall be manufactured using BSEN-24 grade steel bar with locking collars. Jack nests shall be of SG cast steel. Cable drum jack supplied shall have undergone load testing and reports for the same shall be submitted. At least Two Nos. of jacks shall be supplied for NTPC use. Contractor has to make arrangements for his own jacks for cable reeling/unreeling under his scope of installation.

3.12.00 **Galvanising**

3.12.01 Galvanising of steel components and accessories shall conform to IS:2629 , IS4759 & IS:2633. Additionally galvanising shall be uniform, clean smooth, continuous and free from acid spots.

3.12.02 The amount of zinc deposit over threaded portion of bolts, nuts, screws and washers shall be as per IS:1367 . The removal of extra zinc on threaded portion of components shall be carefully done to ensure that the threads shall have the required zinc coating on them as specified

3.13.00 **Welding**

3.13.01 The welding shall be carried out in accordance with IS:9595. All welding procedures and welders qualification shall also be followed strictly in line with IS:9595

4.00.00 INSTALLATION

4.01.00 **Cable tray and Support System Installation**

4.01.01 Cables shall run in cable trays mounted horizontally or vertically on cable tray support system which in turn shall be supported from floor, ceiling, overhead structures, trestles, pipe racks, trenches or other building structures.

4.01.02 Horizontally running cable trays shall be clamped by bolting to cantilever arms and vertically running cable trays shall be bolted to main support channel by suitable bracket/clamps on both top and bottom side rails at an interval of 2000 mm in general. For vertical cable risers/shafts cable trays shall be supported at an interval of 1000mm in general. Fixing of cable trays to cantilever arms or main support channel by welding shall not be accepted.

Cable tray installation shall generally be carried out as per the approved guidelines/ drawings. Vendor shall design the support system along with tray, spacing etc in line with tray loadings/drawings.

4.01.03 The cantilever arms shall be positioned on the main support channel with a minimum vertical spacing of 300 mm unless otherwise indicated.

4.01.04 The contractor shall fix the brackets/ clamps/ insert plates using anchor fasteners. Minimum size of anchor fasteners shall be M 8 X 50 and material shall be stainless steel grade 316 or better. Anchor fastener shall be fixed as recommended by manufacturer and as approved by site engineer. For brick wall suitable anchor fasteners shall be used as per the recommendations of manufacturer. Make of anchor fasteners subject to QA approval and the same shall be finalized at pre-award stage.

4.01.05 All cable way sections shall have identification, designations as per cable way layout drawings and painted/stenciled at each end of cable way and where there is a branch connection to another cable way. Minimum height of letter shall be not less than 75 mm. For long lengths of trays, the identification shall be painted at every 10 meter. Risers shall additionally be painted/stenciled with identification numbers at every floor.

4.01.06 In certain cases it may be necessary to site fabricate portions of trays, supports and other non standard bends where the normal prefabricated trays, supports and accessories may not be suitable. Fabricated sections of trays, supports and accessories to make the installation complete at site shall be neat in appearance and shall match with the prefabricated sections in the dimensions. They shall be applied with one coat of red lead primer, one coat of oil primer followed by two finishing coats of aluminium paint.

4.01.07 In fire prone areas, like Boiler, TG, fuel oil area and any other strategic location etc, fire retardant paint to be applied after installation cables.

4.02.00 **Conduits/Pipes/Ducts Installation**

4.02.01 The Contractor shall ensure for properly embedding conduit pipe sleeves wherever necessary for cabling work. All openings in the floor/roof/wall / cable tunnel/cable trenches made for conduit installation shall be sealed and made water proof by the Contractor.

4.02.02 GI pull wire of adequate size shall be laid in all conduits before installation. Metallic conduit runs at termination shall have two lock nuts wherever required for junction boxes etc.

4.02.03 Conduit runs/sleeves shall be provided with PVC bushings having round edge at each end. All conduits/pipes shall have their ends closed by caps until cables are pulled. After cables are pulled, the ends of conduits/pipes shall be sealed with Glass wool/Cement Mortar/Putty to prevent entrance of moisture and foreign material

4.02.04 Exposed conduit/pipe shall be adequately supported by racks, clamps, straps or by other approved means. Conduits /pipe support shall be installed square and true to line and grade with an average spacing between the supports as given below, unless specified otherwise

Conduit /pipe size (dia).	**Spacing**
Upto 40 mm	1 M
50 mm	2.0 M
65-85 mm	2.5 M
100 mm and above	3.0 M

4.02.05 For bending of conduits, bending machine shall be arranged at site by the contractor to facilitate cold bending. The bends formed shall be smooth.

4.03.00 **Junction Boxes Installation**

4.03.01 Junction boxes shall be mounted at a height of 1200mm above floor level or as specified in the drawings and shall be adequately supported/mounted on masonry wall by means of anchor fasteners/ expandable bolts or shall be mounted on an angle, plate or other structural supports fixed to floor, wall, ceiling or equipment foundations.

4.04.00 **Cable Installation**

4.04.01 Cable installation shall be carried out as per IS:1255 and other applicable standards.

4.04.02 For Cable unloading, pulling etc following guidelines shall be followed in general:

a) Cable drums shall be unloaded, handled and stored in an approved manner on hard and well drained surface so that they may not sink. In no case shall be drum be stored flat i.e. with flange horizontal. Rolling of drums shall be avoided as far as possible. For short distances, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum. In absence of any indication, the drums may be rolled in the same direction as it was rolled during taking up the cables. For unreeling the cable, the drum shall be mounted on suitable jacks or on cable wheels and shall be rolled slowly so that cable comes out over the drum and not from below. All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends. Cable ends shall be provided with sealed plastic caps to prevent damage and ingress of moisture.

b) While laying cable, ground rollers shall be used at every 2 meter interval to avoid cable touching ground. The cables shall be pushed over the rollers by a gang of people positioned in between the rollers. Cables shall not be pulled from the end without having intermediate pushing arrangements. Pulling tension shall not exceed the values recommended by cable manufacturer. Selection of cable drums for each run shall be so planned so as to avoid using straight through joints. Care should be taken while laying the cables so as to avoid damage to cables. If any particular cable is damaged, the same shall be repaired or changed to the satisfaction of Project Manager.

4.04.03 Cables shall be laid on cable trays strictly in line with cable schedule

4.04.04 Power and control cables shall be laid on separate tiers inline with the approved guidelines/drawings. The laying of different voltage grade cables shall be on different tiers according to the voltage grade of the cables. In horizontal tray stacks, H.T. cables shall be laid on top most tier and cables of subsequent lower voltage grades on lower tiers of trays. Single core cable in trefoil formation shall be laid with a distance of four times the diameter of cable between trefoil center lines and clamped at every one metre. All multicore cables shall be laid in touching formation. Power and control cables shall be secured fixed to trays/support with cable clamps/ties with self locking arrangement. For horizontal trays arrangements, multicore power cables and control cables shall be secured at every five meter interval. For vertical tray arrangement, individual multicore power cables and control cables shall be secured at every one meter. After completion of cable laying work in the particular vertical tray, all the control cables shall be binded to trays/supports by cable clamps/ties with self locking arrangement at every five meter interval and at every bend.
Fibre Optical cable shall be laid in trenches/trays or as decided by Employer.

4.04.05 Bending radii for cables shall be as per manufacturer's recommendations and IS:1255.

4.04.06 Where cables cross roads/rail tracks, the cables shall be laid in hume pipe/ HDPE pipe.

4.04.07 No joints shall be allowed in trip circuits, protection circuits and CT/PT circuits. Also joints in critical equipment in main plant area shall not be permitted. Vendor shall identify and accordingly procure the cable drum length.

4.04.08 In each cable run some extra length shall be kept at suitable point to enable one LT/two HT straight through joints to made, should the cable develop fault at a later stage. Control cable termination inside equipment enclosure shall have sufficient lengths so that shifting of termination in terminal blocks can be done without requiring any splicing.

4.04.09 Wherever few cables are branching out from main trunk route troughs shall be used.

4.04.10 Wind loading shall be considered for designing support as well Cable trays wherever required.

4.04.11 Where there is a considerable risk of steam, hot oil or mechanical damage cable routes shall be protected by barriers or enclosures.

4.04.12 The installation work shall be carried out in a neat workman like manner & areas of work shall be cleaned of all scraps, water, etc. after the completion of work in each area every day. Contractor shall replace RCC/Steel trench covers after the Installation work in that particular area is completed or when further work is not likely to be taken up for some time.

4.04.13 **Separation**

At least 300mm clearance shall be provided between:

- HT power & LT power cables,
- LT power & LT control/instrumentation cables,

4.04.14 **Segregation**

1) Segregation means physical isolation to prevent fire jumping.
2) All cables associated with the unit shall be segregated from cables of other units.
3) Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire. Power and control cables for AC drives and corresponding emergency AC or DC drives shall be laid in segregated routes. Cable routes for one set of auxiliaries of same unit shall be segregated from the other set.
4) In switchyard, control cables of each bay shall be laid on separate racks/trays.

4.04.15 Minimum number of spare cores required to be left for interconnection in control cables shall be as follows:

Minimum number of spare cores required to be left for interconnection in control cables shall be as follows:

No. of cores in cable	No. of spare cores
2C,3C	NIL
5C	1
7C-10C	2
14C and above	3

4.04.16 **Directly Buried Cables**

a) Cable trenches shall be constructed for directly buried cables. Construction of cable trench for cables shall include excavation, preparation of sieved sand bedding, riddled soil cover, supply and installation of brick or concrete protective covers, back filling and compacting, supply and installation of route markers and joint markers. Laying of cables and providing protective covering shall be as per IS:1255 and the enclosed drawings showing cabling details.

b) RCC cable route and RCC joint markers shall be provided wherever required. The voltage grade of the higher voltage cables in route shall be engraved on the marker. Location of underground cable joints shall be indicated with cable marker with an additional inscription "Cable Joint". The marker shall project 150 mm above ground

and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road crossings and drain crossings. Top of cable marker/joint marker shall be sloped to avoid accumulation of water/dust on marker.

4.04.17 Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry, and at every 20 meters in cable tray/trench runs. Cable tags shall also be provided inside the switchgear, motor control centers, control and relay panels etc. where a number of cables enter together through a gland plate. Cable tag shall be of rectangular shape for power cables and control cables. Cable tag shall be of 2 mm thick aluminum with number punched on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280. Alternatively, the Contractor may also provide cable tags made of nylon, cable marking ties with cable number heat stamped on the cable tags. The cable tag requirements mentioned above shall prevail over Tag requirements mentioned elsewhere in this document for HT power, LT power & control cables.

4.04.18 While crossing the floors, unarmoured cables shall be protected in conduits upto a height of 500 mm from floor level if not laid in tray.

4.05.00 **Cable Terminations & Connections**

4.05.01 The termination and connection of cables shall be done strictly in accordance with cable termination kit manufacturer" instructions, drawings and/or as directed by Project Manager. Cable jointer shall be qualified to carryout satisfactory cable jointing/termination. Contractor shall furnish for review documentary evidence/experience reports of the jointers to be deployed at site.

4.05.02 Work shall include all clamps, fittings etc. and clamping, fitting, fixing, plumbing, soldering, drilling, cutting, taping, preparation of cable end, crimping of lug, insulated sleeving over control cable lugs, heat shrinking (where applicable), connecting to cable terminal, shorting and grounding as required to complete the job to the satisfaction of the Project Manager.

4.05.03 The equipment will be generally provided with undrilled gland plates for cables/conduit entry. The Contractor shall be responsible for punching of gland plates, painting and touching up. Holes shall not be made by gas cutting. The holes shall be true in shape. All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively sealed by 2mm thick aluminium sheets.

4.05.04 Control cable cores entering control panel/switchgear/MCC/miscellaneous panels shall be neatly bunched, clamped and tied with self locking type nylon cable ties with de interlocking facility to keep them in position.

4.05.05 All the cores of the control cable to be terminated shall have identification by providing ferrules at either end of the core, each ferrule shall be indelible, printed single tube ferrule and shall include the complete wire number and TB number as per the drawings. The ferrule shall fit tightly on the core. Spare cores shall have similar ferrules with suffix sp1, sp2, ---etc along with cable numbers and coiled up after end sealing.

4.05.06 All cable terminations shall be appropriately tightened to ensure secure and reliable connections.

5.00.00 EARTHING SYSTEM

5.01.00 Earthing system shall be in strict accordance with IS:3043 and Indian Electricity Rules/Acts

The earthing system shall be designed for a life expectancy of at least forty (40) years, for a system fault current of 63 kA for 1.0 sec. The minimum rate of corrosion of steel for selection of earthing conductor shall be 0.12mm per year.

Earthing system network/earthmat shall be interconnected mesh of mild steel rods buried in ground in the plant. All areas under contractor scope of supply shall be interconnected together by minimum two parallel conductors. The Contractor shall furnish the detailed design and calculations for Employer's approval. Contractor shall obtain all necessary statutory approvals for the system. All the columns shall be earthed by nearby risers and earthmat grid spacing shall be maximum 10 mts. Minimum two nos of risers shall be provided for each equipment in SG area. Separate dedicated riser shall be provided for C&I earthing purpose and also for Lightning down conductor connection purpose. Sufficient nos of risers near the equipment shall be provided as per the system requirement. Ring type earthing around the offsite building shall be provided with interconnection of with main grid at minimum two points.

5.02.00 The earth conductors shall be free from pitting, laminations, rust, scale and other electrical, mechanical defects

5.03.00 The material of the earthing conductors shall be as follows:

1)	Conductors above ground level and in built up trenches.	-	Galvanized steel
2)	Conductors buried in earth	-	Mild steel
3)	Earth electrodes	-	Mild steel rod

5.04.00 The sizes of earthing conductors for various electrical equipments shall be as below:

	Equipment	Earth conductor buried in earth	Earth conductor above ground level & in built-up trenches
a)	Main earth grid	Min 40 mm dia. MS rod or as per actual calculation whichever is more	65 x 8mm GS flat
b)	33kV/11kV/6.6kV/3.3 kV/ switchgear equipment and 415V switchgear	---	65 x 8mm GS flat
c)	415 V MCC/ Distribution boards / Transformers	---	50 x 6mm GS flat
d)	LT Motors above 125 KW	---	50 x 6mm GS flat
	25 KW to 125 KW	---	25 x 6mm GS flat
	1KW to 25 KW	---	25 x 3mm GS flat
	Fractional House power motor	---	8 SWG GS wire
e)	Control panel & control desk	---	25 x 3 mm GS flat
f)	Push button station / Junction Box	---	8 SWG GI wire
g)	Columns, structures, cable trays and bus ducts enclosures	---	50 x 6mm GS flat
h)	Crane, rails, rail tracks & other non-current carrying metal parts		25 x 6mm GS flat

5.05.00 Metallic frame of all electrical equipment shall be earthed by two separate and distinct connections to earthing system, each of 100% capacity, Crane rails, tracks, metal pipes and conduits shall also be effectively earthed at two points. Steel RCC columns, metallic stairs,

and rails etc. of the building housing electrical equipment shall be connected to the nearby earthing grid conductor by one earthing ensured by bonding the different sections of hand rails and metallic stairs. Metallic sheaths/screens, and armour of multi-core cables shall be earthed at both ends. Metallic Sheaths and armour of single core cables shall be earthed at switchgear end only unless otherwise approved. Every alternate post of the switchyard fence shall be connected to earthing grid by one GS flat and gates by flexible lead to the earthed post. Railway tracks within the plant area shall be bonded across fish plates and connected to earthing grid at several locations. Portable tools, appliances and welding equipment shall be earthed by flexible insulated cable.

5.06.00 Each continuous laid lengths of cable tray shall be earthed at minimum two places by G.S. flats to earthing system, the distance between earthing points shall not exceed 30 meter. Wherever earth mat is not available, necessary connections shall be done by driving an earth electrode in the ground

5.07.00 Neutral points of HT transformer shall be earthed through NG resistors. The Contractor shall connect the NGR earthing point to earth electrodes by suitable earth conductors.

5.08.00 Neutral connections and metallic conduits/pipes shall not be used for the equipment earthing. Lightning protection system down conductors shall not be connected to other earthing conductors above the ground level.

5.09.00 Connections between earth leads and equipment shall normally be of bolted type. Contact surfaces shall be thoroughly cleaned before connections. Equipment bolted connections after being tested and checked shall be painted with anti corrosive paint/compound.

5.10.00 Suitable earth risers as approved shall be provided above finished floor/ground level, if the equipment is not available at the time of laying of main earth conductor.

5.11.00 Connections between equipment earthing leads and between main earthing conductors shall be of welded type. For rust protection the welds should be treated with red lead compound and afterwards thickly coated with bitumen compound. All welded connections shall be made by electric arc welding.

5.12.00 Resistance of the joint shall not be more than the resistance of the equivalent length of conductors.

5.13.00 Earthing conductors buried in ground shall be laid minimum 600 mm below grade level unless otherwise indicated in the drawing. Back filling material to be placed over buried conductors shall be free from stones and harmful mixtures. Back filling shall be placed in layers of 150 mm.

5.14.00 Earthing conductors embedded in the concrete floor of the building shall have approximately 50 mm concrete cover.

5.15.00 A minimum earth coverage of 300 mm shall be provided between earth conductor and the bottom of trench/foundation/underground pipes at crossings. Earthing conductors crossings the road can be installed in pipes. Wherever earthing conductor crosses or runs at less than 300 mm distance along metallic structures such as gas, water, steam pipe lines, steel reinforcement in concrete, it shall be bonded to the same.

5.16.00 Earthing conductors along their run on columns, walls, etc. shall be supported by suitable welding / cleating at interval of 1000mm and 750mm respectively.

5.17.00 Earth pit shall be of treated type & shall be constructed as per IS:3043. Electrodes shall be embedded below permanent moisture level. Minimum spacing between electrodes shall be 600mm. Earth pits shall be treated with salt and charcoal as per IS:3043. Test links shall be

provided with bolted arrangement alongwith each earth pit, in order to facilitate measurement of earth resistance as & when required.

5.18.00 On completion of installation continuity of earth conductors and efficiency of all bonds and joints shall be checked. Earth resistance at earth terminations shall be measured and recorded. All equipment required for testing shall be furnished by contractor.

5.19.00 Earthing conductor shall be buried at least 2000mm outside the fence of electrical installations. Every alternate post of the fences and all gates shall be connected to earthing grid by one lead.

5.20.00 Other Requirements of Earthing System:

Standard/Code	IEEE 80, IS 3043
Earthing System	
Life expectancy	40 Years
System Fault Level	System Fault Level 63 KA for 1 sec
Soil resistivity	Actual as per site conditions.
Min. Steel corrosion	0.12mm/year
Depth of burial of main earth conductor	600mm below grade level; where it crosses trenches, pipes, ducts, tunnels, rail tracks, etc., it shall be at least 300mm below them.
Conductor joints	By electric arc welding, with resistance of joint not more than that of the conductor.

Welds to be treated with red lead for rust protection and then coated with bitumen compound for corrosion protection.

Surface resistivity	- Gravel	3000 ohm-meter
	- Concrete	500 ohm-meter

6.00.00 LIGHTNING PROTECTION SYSTEM

6.01.01 Lightning protection system shall be in strict accordance with IEC : 62305 and latest IS standards.

6.01.02 Lightning conductor shall be of 25x6mm GS strip when used above ground level and shall be connected through test link with earth electrode/earthing system

6.01.03 Lightning system shall comprise of air terminations, down conductors, test links, earth electrode etc. as per approved drawings.

6.02.00 **Down Conductors**

1. Down conductors shall be as short and straight as practicable and shall follow a direct path to earth electrode.
2. Each down conductor shall be provided with a test link at 1000 mm above ground level for testing but it shall be in accessible to interference. No connections other than the one direct to an earth electrode shall be made below a test point.
3. All joints in the down conductors shall be welded type.
4. Down conductors shall be cleated on outer side of building wall, at 750 mm interval or welded to outside building columns at 1000 mm interval.
5. Lightning conductor on roof shall not be directly cleated on surface of roof. Supporting blocks of PCC/insulating compound shall be used for conductor fixing at an interval of 1500 mm.
6. All metallic structures within a vicinity of two meters of the conductors shall be bonded to conductors of lightning protection system.
7. Lightning conductors shall not pass through or run inside GI Conduits.
8. Testing link shall be made of galvanized steel of size 25x 6mm.
9. Pulser system for lightning shall not be accepted.
10. Hazardous areas handling inflammable/explosive materials and associated storage areas shall be protected by a system of aerial earths.

7.00.00 **TESTS**

7.02.00 **Type Test reports shall be furnished for the following**

7.02.01 Type tests on Cable Trays support system

a) **Test 1A:**

On main support channel type-C2 for cantilever arms fixed on one side only. A 3.5 meter length of main support channel shall be fixed vertically at each end to a rigid structure as per the fixing arrangement as shown in the enclosed drawing. Eight (8) nos. 750 mm cantilever arms shall be fixed to the main channel and each arm shall be loaded over the outboard 600 mm with a uniform working load of 100 kg. Subsequently a point load of 100 kg shall be applied on arm 2. A uniform proof load on all the arms equal to twice the working load shall be then be applied. Deflections shall be measured at the points shown in the enclosed drawings and at the following load intervals:

i) Working load
ii) Working load + point load
iii) Off load
iv) Proof load + point load
v) Off load

The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied.

B) **Test 1B:**

Test 1A shall be repeated with Eight Cantilever arms uniformly loaded and with the same point load on arm 2

Test 2: **On Main support channel type -C2 for cantilever arms fixed on both sides**

a) Test 2A: A 3.5 m length of main support channel C2 for cantilever arms fixing on both sides shall be fixed at each end to rigid structure as per the fixing arrangement as shown in the enclosed drawing. Six (6), 750 mm cantilever arms shall be attached to each sides and each arm uniformly loaded to a working load of 100 kg over the out board 600 mm. A point load of 100 kg shall than be applied to arm 2, followed by a uniform proof load of twice the working load on all the arms; deflection shall be measured at points shown in the enclosed drawings at the following load intervals.

i) Working load
ii) Working load + Point load
iii) Off load
iv) Proof load + Point load
v) Off load

The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied

b) Test 2 B: The test 2 A shall be repeated with the assembly but with an asymmetrical load on the C2 column and point load applied to arm 8. The 100 kg and 200 kg uniformly distributed loads shall be applied to the upper three arms on one side and the lower three arms on the opposite side.

Test 3 : **Tests on Channel Fixed on Beam/Floor**

A length of main support channel section shall be fixed to steel structure/floor and have loads applied as shown in the drawing enclosed and as detailed below

a) Test 3A : A length of steel structure shall be rigidly supported. It should be fitted on a meter length of channel section using beam clamps welded/bolted. A point load of 1200 kg shall be applied to the centre point via two brackets. No distortion or pulling of the components shall take place.

b) Test 3B: With the components assembled as in Test 3A, two perpendicular point loads of 600 kg shall be simultaneously applied at positions 150 mm either side of the centre line, no distortion or pulling of the components shall take place.

c) Test 3C: With the components assembled as in Test 3A, a perpendicular point load shall be applied at a point 150 mm on one side of the centre line.

The load shall be gradually increased to the maximum value that can be applied without causing distortion or pulling of the components. This value shall be recorded.

Test 4 : Channel Insert Test

A 2.5 m length of C1 channel fixed to the concrete wall/ steel structure as per actual site installation conditions. 6 nos. of 750 mm cantilever arms shall be attached to C1 channel as shown in enclosed drawing. Each arm uniformly loaded to a working load of 100 kg over the out board 600 mm. A point load of 100 kg shall than be applied to arm 2, followed by a uniform proof load of twice the working load on all the arms; deflection shall be measured at points shown in the enclosed drawings at the following load intervals.

i) Working Load

ii) Working Load + Point Load

iii) Off Load

iv) Proof Load + Point Load

v) Off load

The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied

Test 5 : Channel nut slip characteristics (what ever applicable)

Tests 5A1,5A2,5A3 : A length of channel C1 section 200mm long shall have fitted bracket with the two bolt fixing as shown in drawing enclosed.
With loads applied at the position shown in drawing enclosed nut slip shall be determined with bolt torque of 30NM, 50 NM and 65 NM No fewer than three measurements shall be made for each torque setting.

A minimum loading of 720 kg shall be obtained before nut slip with bolt torque of 65 NM.

Tests 5B1,5B2,5B3: The length of channel C1 section 200 mm long shall have fitted bracket with the one bolt fixing as shown in drawing enclosed. With loads applied at the position shown in drawing, nut slip shall be determined with bolt torques of 30 NM, 50 NM and 65 NM. No fewer than three measurements shall be made for each torque setting.

A minimum loading of 350 kg shall be obtained before nut slip with a bolt torque of 65 NM.

Test 6 Weld Integrity Test

After deflection test as per test 1A, 1B, 2, 3 & 4 weld integrity shall be checked by magnetic particle inspection to detect sub-surface cracks developed, if any.

7.02.02 Cable termination kit and straight through joints should have been tested as per IS:13573 for 3.3kV grade & above.

7.03.00 **Routine/ Acceptance Tests**

7.03.01 Routine Tests

a) Routine tests as per specification and applicable standards shall be carried out on all requirements/items covered in the specification.
b) Physical & dimensional check on all equipments as per approved drawings/standards
. c) HV/IR as applicable.
d) Check/measurement of thickness of paint/zinc coating/nickel-chrome plating as per specification & applicable standard.

7.03.02 Acceptance Test

a) Galvanising Tests as per applicable standards
b) Welding checks
c) Deflection tests on cable trays:

One piece each of 2.5m length of cable tray of 300mm & above shall be taken as sample from each offered lot. It shall be supported at both end & loaded with uniform load of 76 kg/meter along the length of cable tray. The maximum deflection at the mid-span of each size shall not exceed 7mm.

d) Proof load tests on cable tray support system

i) Tests on Main Support Channel shall be done if only C1 Channel are in scope of supply and cantilever arms shall be fitted on one side. This test shall be same as test 4 of type test.
ii) Test on Main Support Channel shall be done with C2 channel and cantilever arms fitted on both sides, if C2 channels are in scope of supply. This test shall be same as test 2A of type test. Then test (i) above shall not be done.
iii) Nut slip characteristic test (it shall support minimum load of 350kg before nut slips with a bolt torque of 65 NM). This test shall be same as test 5B3 of type test.

The procedure for carrying out tests at “d” above shall be as per details given in Type Tests in specification thereafter Die-Penetration test shall be carried out to check weld integrity.

e) The above acceptance tests shall be done only on one sample from each offered lot.

8.00.00 COMMISSIONING

8.01.01 The Contractor shall carry out the following commissioning tests and checks after installation at site. In addition the Contractor shall carry out all other checks and tests as recommended by the Manufacturers or else required for satisfactory performance..

8.01.02 **Cables**

a) Check for physical damage
b) Check for insulation resistance before and after termination/jointing.

c) HT cables shall be pressure tested (test voltage as per IS:7098) before commissioning.
d) Check of continuity of all cores of the cables.
e) Check for correctness of all connections as per relevant wiring diagrams. Any minor modification to the panel wiring like removing/inserting, shorting, change in terminal connections, etc., shall be carried out by the Contractor.
f) Check for correct polarity and phasing of cable connections.
g) Check for proper earth connections for cable glands, cable boxes, cable armour, screens, etc.
h) Check for provision of correct cable tags, core ferrules, tightness of connections.

8.02.00 **Cable trays / supports and accessories**

1) Check for proper galvanizing/painting and identification number of the cable trays/supports and accessories.
2) Check for continuity of cable trays over the entire route.
3) Check that all sharp corners, burrs, and waste materials have been removed from the trays supports.
4) Check for earth continuity and earth connection of cable trays.

8.03.00 **Earthing and Lightning protection system**

1) Earth continuity checks.
2) Earth resistance of the complete system as well as sub-system.

9.00.00 ELECTRICAL LAYOUT PHILOSOPHY:

While developing the layout the bidder must give due consideration to the following requirements:

a) Adequate distance shall be maintained between the transformers. As basic guidelines following norms will be adhered to:

1) Transformers shall be separated from the adjacent building/structures and from each other by a minimum distance as defined below or by a fire wall of two hours of fire resisting of height at least 600 mm above bushing / pressure relief vent whichever is higher.

Oil capacity of individual transformer (in liters)	Clear separating distance (in meters)
5,000 to 10,000	8.0
10,001 to 20,000	10.0
20,001 to 30,000	12.5
Over 30,001	15.0

2) In case of auxiliary transformers having an aggregate oil capacity in excess of 2300 liters but individual oil capacity of less than 5000 liters, the maximum separating distance between transformers and surrounding building shall be at least 6M unless they are separated by fire separating walls or are protected by high velocity spray system.

3.) Rail track shall be provided in Transformer yard for movement of each transformer. The rail track in Transformer yard shall be connected with TG area rail track The Foundation top of transformer & rail top shall be at EL +/- 0.0M. Bus duct support or Transformer body shall be at least 8.0M from A-Row of TG building to clear the movement of GT/ Stator/UT/ST/UAT on rail line. Jacking pads shall be provided where the rail track changes the direction. Mooring post shall be provided on rail track for handling the transformers.

4) For each transformer a pit shall be provided all around at a distance of 1.5 m (minimum) from transformer outer edge. A sump pit shall be provided for each pit. A common oil retention pit per unit shall be provided to hold oil quantity of the largest transformer (by volume) & 10 minutes of water quantity of HVW spray system for the largest transformer. Sump pit of individual transformer shall be connected to common oil retention pit of that unit.

5) Rail track shall be provided for all outdoor transformers up to road for movement of each transformer of size more than or equal to 7.5MVA Transformer. Jacking pads shall be provided where the rail track changes the direction. Jacking pad shall also be provided at the location of installation of transformer and mooring post shall be provided on rail track for handling the transformers.

6.) The Transformer fencing shall be at 1.0 M (minimum) distance from the pit wall. The Height of fencing shall be 2.5 M (minimum) and fencing shall have personal entry gate and removable type fencing/gate for transformer withdrawal.

7) The transformer firewall, pit sizing and clearances from adjacent building/structures etc. shall be as per IS 1646/CBIP manual on Transformer

8) However, for all outdoor transformers of oil capacity less than 2000 litre, a trench of suitable size shall be provided all around at a distance of 1.0 m (minimum) from transformer outer edge. A sump pit shall be provided for each trench.

b) Layout requirements for Electrical MCC/switchgear rooms

1. Separate Switchgear Rooms shall be provided for each unit. For TG building, all HT boards shall be provided in HT switchgear room at only one floor and all LT boards shall be provided in LT switchgear room at only one floor

2. The following clearances shall be maintained for HT Switchboard.

a.) Front Clearance

i) For one Row of Swgr. - 2.0 M (Min)

ii) For two Rows of Swgr. - 2.5 M (Min)

b.) Back Clearance - 1.5 M (Min.)

c.) Side Clearance

Min. 800 mm, however provision to be made for any additional panel in future at both ends. Therefore end clearance shall be 800+width of panel (including spare panels/dummy panels etc.)

3. The following clearances shall be maintained for LT Switchboard.

a.) Front Clearance

i) For one Row of Swgr - 1.5M (Min)
ii) For two Rows of Swgr - 1.5/1.75M depending upon the depth of panels etc

b.) Back Clearance
i) For single front - 1.0M (Min)
ii) For double front - 1.5M (Min)

c.) Side Clearance:Min. 800 mm, however provision to be made for any additional panel in future at both ends. Therefore end clearance shall be 800 mm + width of panel.

For offsite areas, HT Switchboard clearances shall be followed wherever both LT & HT switch boards are in the same MCC room.

4. Height of HT/LT Switchgear Room and Boiler MCC room

i) With Bus Duct – 4.5 m (min)
ii) Without Bus Duct – 4.0 m (min)

Further no vertical bracings shall be envisaged in HT/LT switchgear room and associated cable vault area.

5. Cable trench/Cable vault

For LT switchgear/MCC room at EL 0.0M, 1400 wide x 1400 deep cable trench shall be provided to route the cables. Horizontal cable trays shall be routed in cable trenches.

c) Minimum clear working space around the equipment 1200mm

d) In buildings having MCC, minimum 2 fire door along with one rolling shutter of adequate size/capacity shall be provided.

e) The cable entry and exit from switchgear room shall be from 1.5 mtr (minimum) above FGL.

f) Wash basin with mirror shall be provided in battery room.

Annexure-I

1.0 **LOCATION OF LP3 :-**

One number LP3 to be located in boiler MCC room at 28.0m in BC bay to supply RC receptacles in TG area.

Location of RC Receptacles in Turbine hall

Sl. No.	Name	Location of RC	No. of RC
1	Hot Well	0m (Near CEP)	2
2	Main Oil Tank	8.5m (AB Bay)	1
3	NGT Cubicle/ Gen Bushing	8.5m (AB Bay)	2
4	LAVT	7.5m (AB Bay)	2
5	HP-IP Turbine	17.0m (AB Bay)	2
6	LP Turbine	17.0m (AB Bay)	1
7	TD BFP	17.0m (AB Bay)	1
8	HP Heater - 5	17.0m (BC Bay)	2
9	Deaerator	38.0m (BC Bay)	2
10	LP Heater- 2	8.5m (BC Bay)	1
11	Valve Room	8.5m (AB Bay)	2

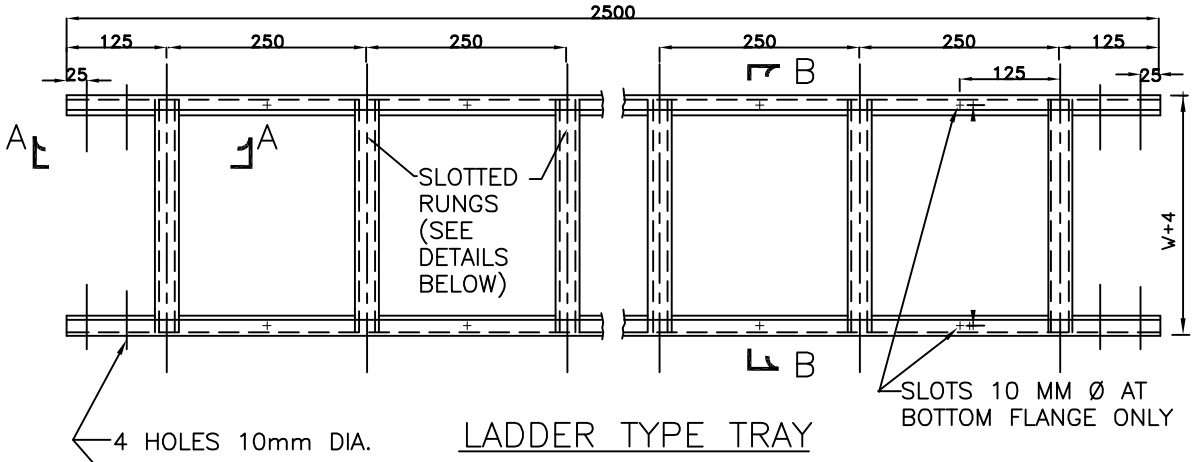
Total - 18 nos. RC Receptacles in Turbine Hall.

2.0 **LOCATION OF RC RECEPTACLES**

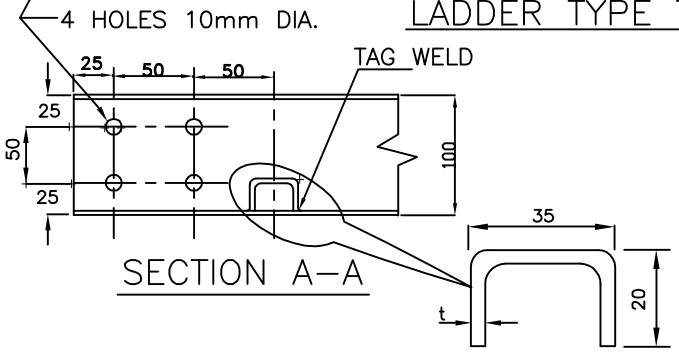
Location of Receptacles and Socket in Boiler area

FLOOR	63A WELDING RECEPTACLES		20A, 240V AC INDUSTRIAL SOCKET RA		20A, 24V AC INDUSTRIAL SOCKET RC	
	PROPOSED		PROPOSED		PROPOSED	
	QTY	LOCATION	QTY	LOCATION	QTY	LOCATION
GL-200	10	S7L,R MILL-B,E,G S17 P3L,R ID-A,B	7	S8L,R S21L, P3L,R ID-A,B	4	P2L,R ID-A,B
4710	3	MILL-A,D,J	3	MILL-A,D, MILL-J	8	MILL-A,B,C,D,F,G,H,J
8900	1	S18	1	S18, S14R	1	S12L
9700	2	S7L,R	2	S9L,R	2	S8L,R
11450	2	S8L,R	3	S9L,R S21	4	S10L,R S22L,R
17600					1	P1L
20500(APH BOTTOM), 21850	4	S18(2) S19L,R	7	S9L,R S17, S19L,R S6L,R	7	S9L,R S12L,R S18, S20L,R
21700(FEEDER FLOOR)	2	FEEDER A,J	4	FEEDER-A,C,F,J	4	FEEDER-A,C,F,J
23000	1	S17	2	S13L, S19		
25000(BURNNER BOTTOM, SPRAY STATION)	4	S8L,R S11L,R	5	S1L,R S11L,R S17	5	S1L,R S11L,R S17
28000(APH)	2	S19L,R	2	S19L,R	2	S19L,R
29200(APH, WIND BOX's	4	S20L,R S9L,R	4	S9L,R S20L,R	4	S8L,R S10L,R
32200	2	S9L,R	2	S9L,R		
33400	2	S12L,R	2	S8L,R S19L,R	2	S19L,R
38500	2	S9R, S10L				
42500	2	S10L,R	3	S9L,R S17	3	S9L,R S17
45300	2	S10L,R	4	S9L,R S11L,R	4	S8L,R S10L,R
48000	1	S1R	2	S14R S15L	2	S9L,R
48900	4	S18(2) S12L,R	4	S11L,R S12L,R	2	S11L,R
53600	2	S5L,R	3	S14R S10L,R	2	S5L,R
58000	4	S11L,R S14L S15R	4	S14R S15L S11L,R	2	S11L,R
59200(TRIPPER FLOOR)	2	LEFT, RIGHT	2	L,R		
61400	4	S11L,R S14L S15R	3	S14R S11L,R	2	S11L,R
68100	2	S11L,R	2	S9L,R		
77300	2	S10L,R	4	S9L,R S11L,R	2	S4L,R
83500	2	S10L,R	2	S12L,R		
86700	2	S3L,R	2	S11L,R	2	S11L,R
88600	1	S11L	2	S6L,R	2	S8L,R
95900	1	S1R	1	S1L		
ESP/FG I/L DUCT	4		2		4	
ESP/FG O/L DUCT	2		1		2	
ESP AT MANHOLE DOOR FLOOR	4	IN BETWEEN TWO PASS	4		4	
ESP AT TOP	2		1			
ESP AT -200	2	AT FRONT SIDE BOTH L&R	2			
TOTAL	86		92		77	

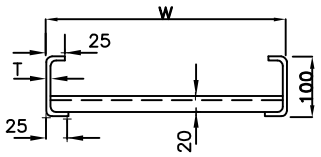
TYPICAL DETAILS FOR CABLE TRAYS & ACCESSORIES



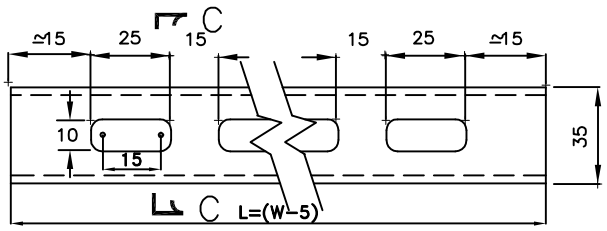
LADDER TYPE TRAY



SECTION A–A

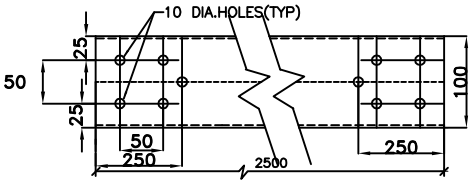


SECTION B–B



SLOTTED RUNGS

(TO SUIT TRAY WIDTH)



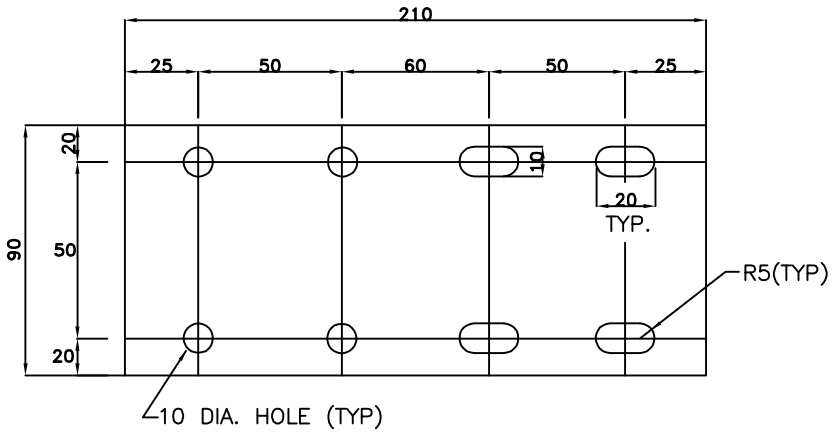
SIDE RUNNER

1

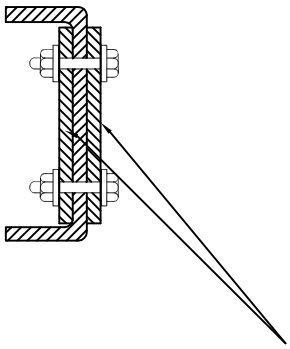
W	150	300	450	600
L	145	295	445	595
T	2	2	2	2
t	2	2	2	2

FOR GENERAL NOTES REFER SHEET 14 OF 14

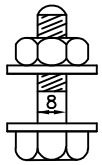
	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO.
		SHT. 02 OF 14 REV. 01



SIDE COUPLER PLATE FOR
LADDER/PERFORATED TYPE TRAYS
1 (600/~~450~~/300/150W TRAYS)
QTY. REQUIRED/TRAY SECTION : 4 NOS.

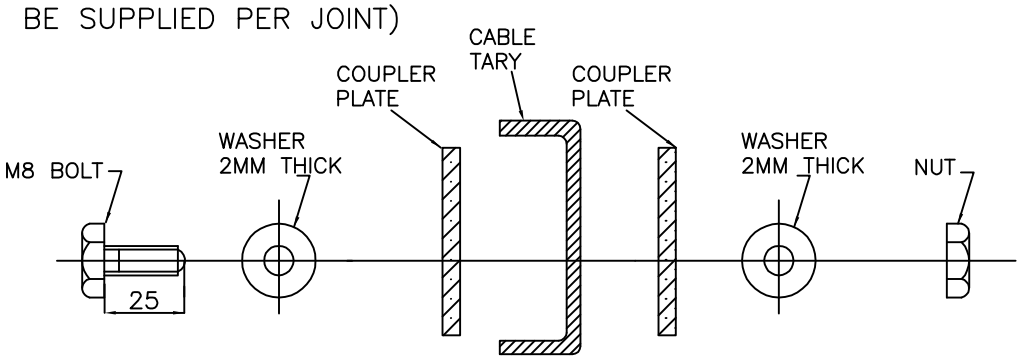


(2 NOS. COUPLER PLATES
OF 3 MM THICKNESS TO
BE SUPPLIED PER JOINT)



QTY. REQD/TRAY SECTION

A) 16 NOS. M8 BOLTS
B) 16 NOS. NUTS
C) 32 NOS. WASHERS

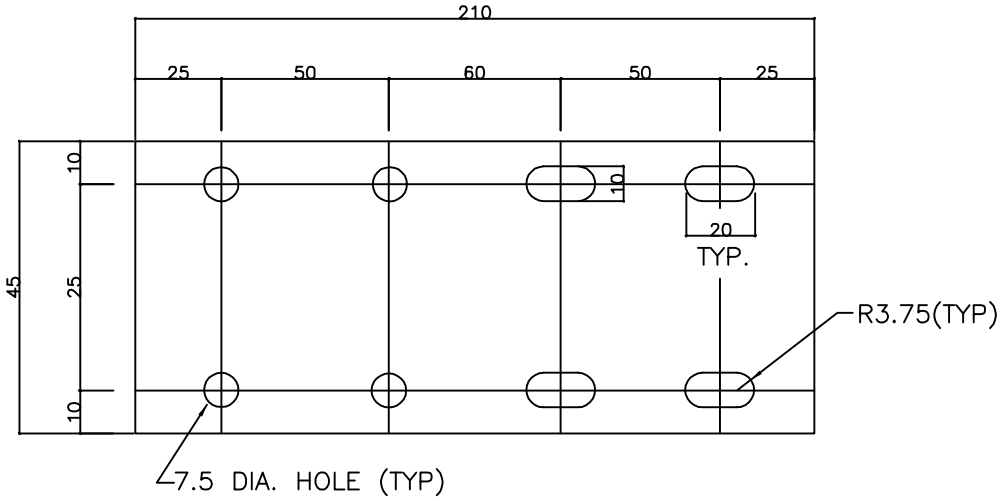


SEQUENCE OF M8 BOLT, WASHER, NUT, COUPLER PLATE & CABLE TRAY

FOR TYPICAL CABLE TRAY JOINT

FOR GENERAL NOTES REFER SHEET 14 OF 14

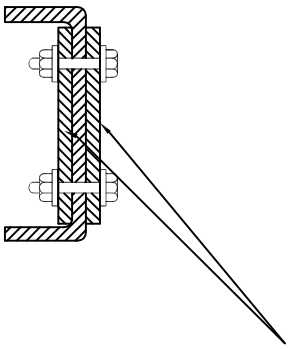
BHEL	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO.
		SHT. 03 OF 14 REV. 01



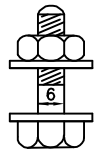
SIDE COUPLER PLATE FOR PERFORATED TYPE TRAYS

(100/50W TRAYS)

QTY. REQUIRED/TRAY SECTION : 4 NOS.

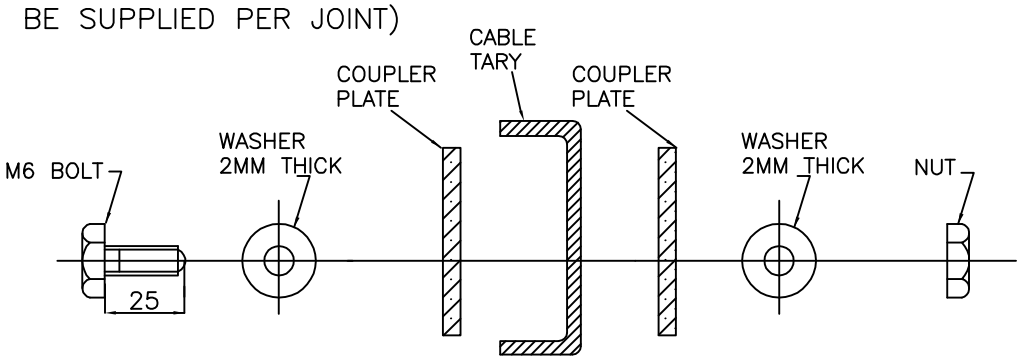


(2 NOS. COUPLER PLATES OF 3 MM THICKNESS TO BE SUPPLIED PER JOINT)



QTY. REQD/TRAY SECTION

A) 16 NOS. M6 BOLTS
B) 16 NOS. NUTS
C) 32 NOS. WASHERS

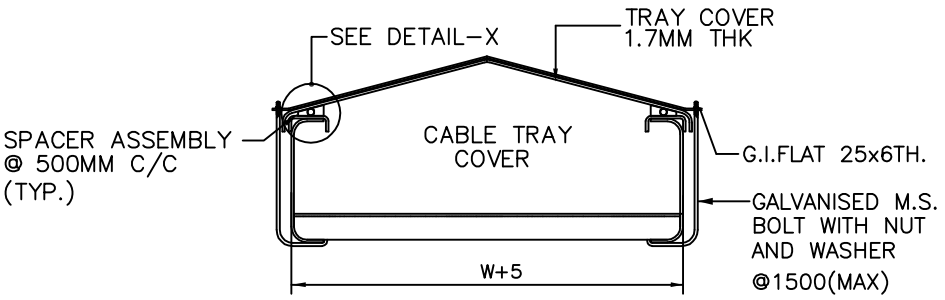


SEQUENCE OF M6 BOLT, WASHER, NUT, COUPLER PLATE & CABLE TRAY

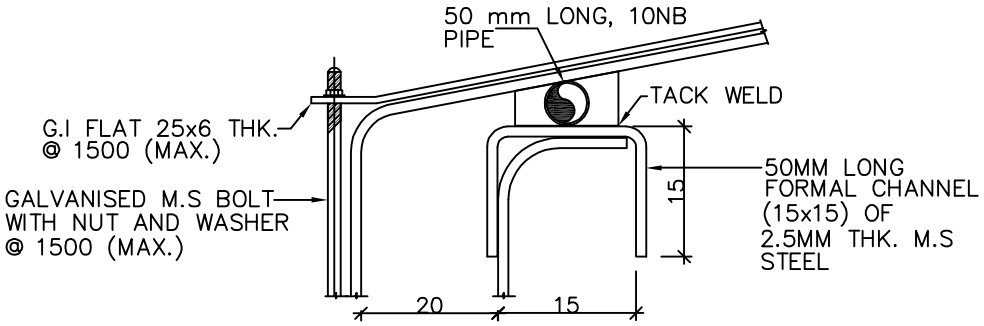
FOR TYPICAL CABLE TRAY JOINT

FOR GENERAL NOTES REFER SHEET 14 OF 14

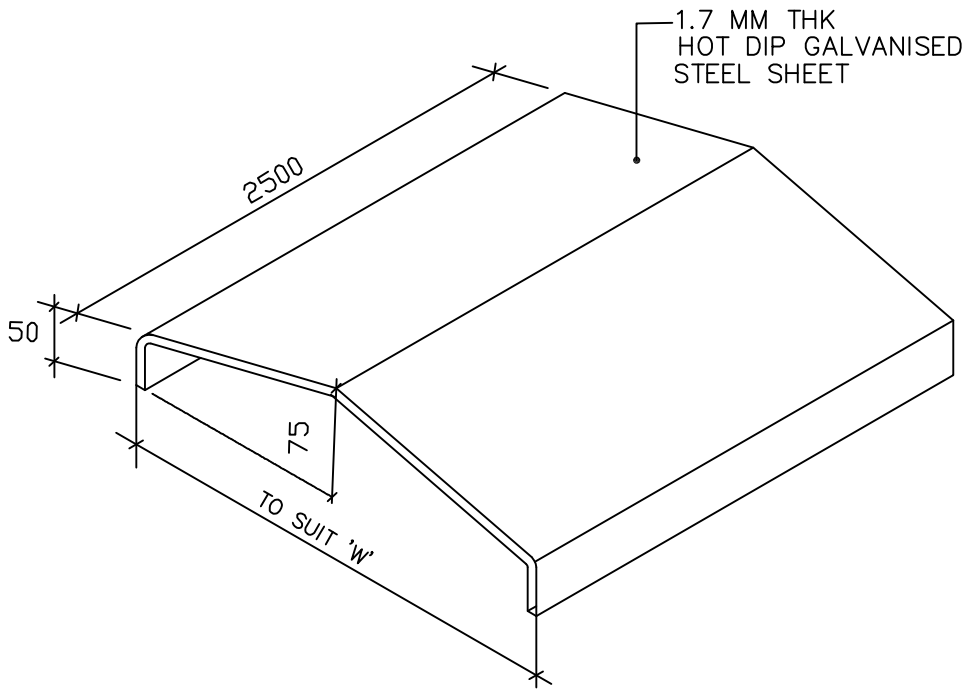
	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO.
		SHT. 04 OF 14 REV. 01



COVER FIXING (TYP.)



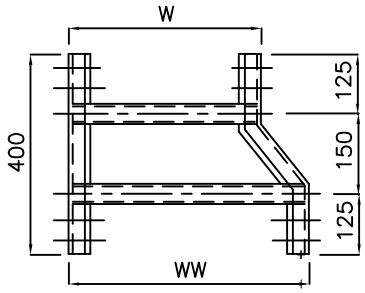
DETAIL–X



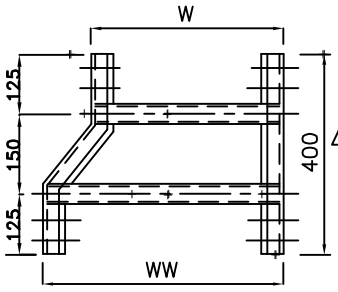
CABLE TRAY COVER

FOR GENERAL NOTES REFER SHEET 14 OF 14

	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO.
		SHT. 05 OF 14 REV. 01



LEFT HAND REDUCER

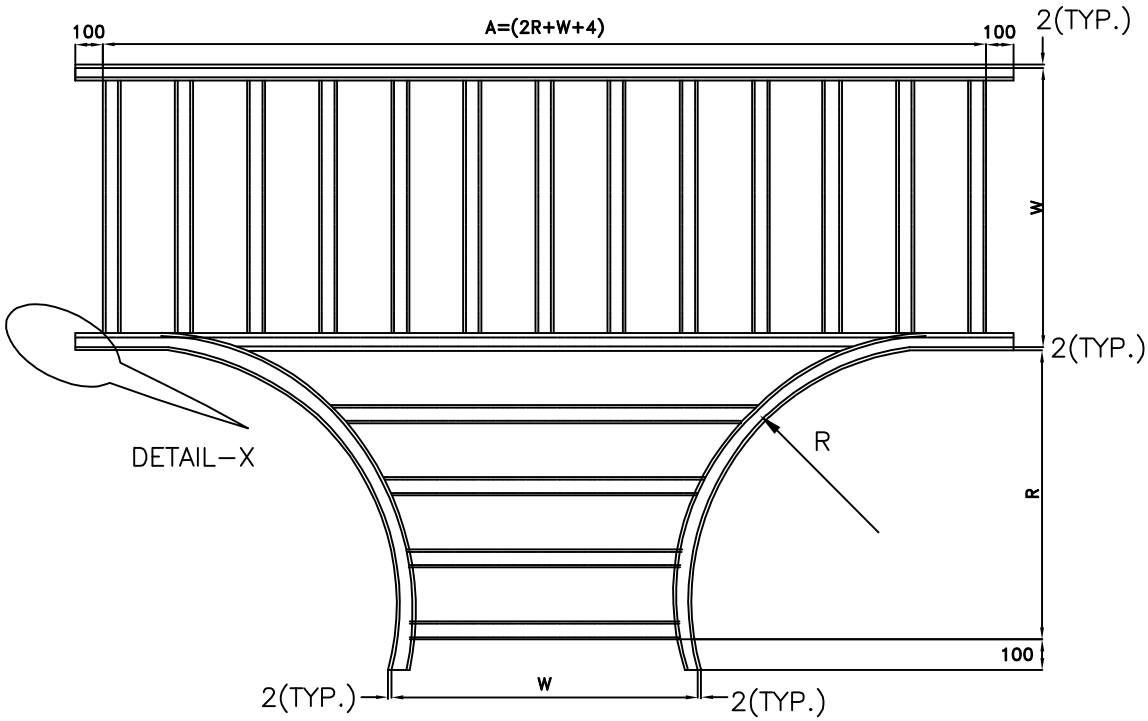


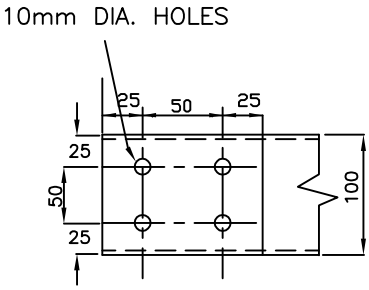
RIGHT HAND REDUCER

1

WW	W	DEPTH
~~600~~	~~450~~	~~100~~
600	300	100
600	150	100
450	300	100
300	150	100

LADDER TYPE





1

WIDTH W	BENDING RADIUS R	DEPTH	A			
			W			
			150	300	450	600
150, 300, ~~450~~ & 600	600	100	1354	1504	1654	1804

1

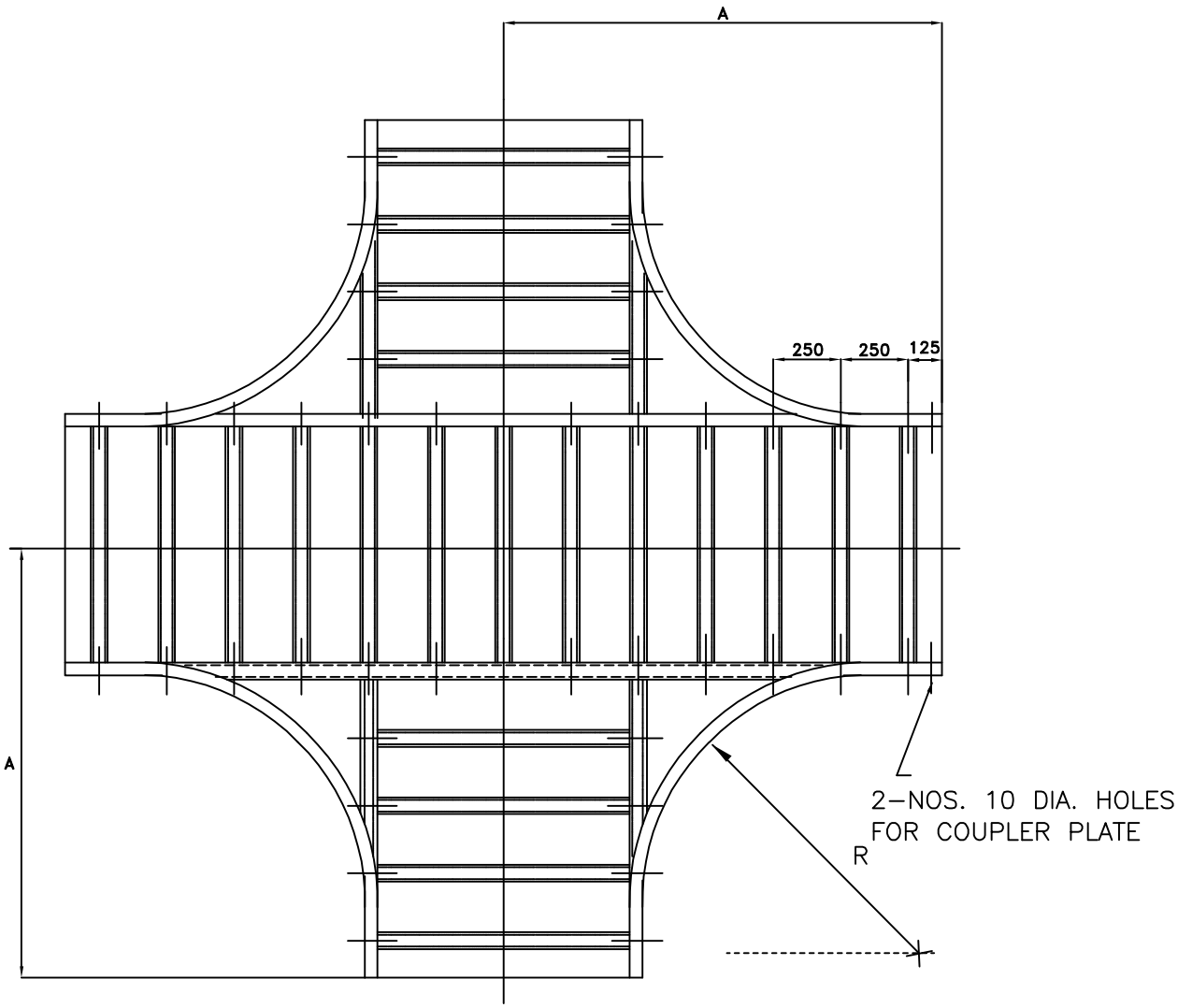
LADDER TYPE

FOR GENERAL NOTES REFER SHEET 14 OF 14

TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.

SHT. 06 OF 14 REV. 01



HORIZONTAL CROSS–PLAN

WIDTH W	BENDING RADIUS R	A=R+W/2+100
600	600	1000
450	600	925
300	600	850

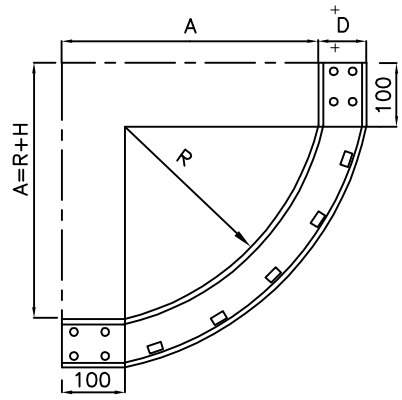
1

FOR GENERAL NOTES REFER SHEET 14 OF 14

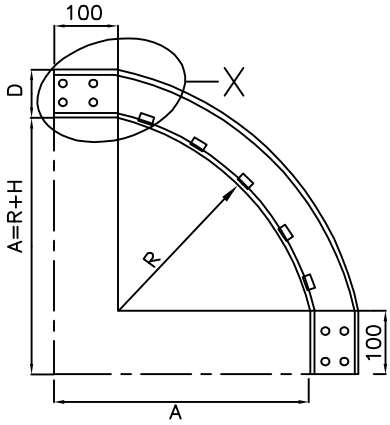
TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.

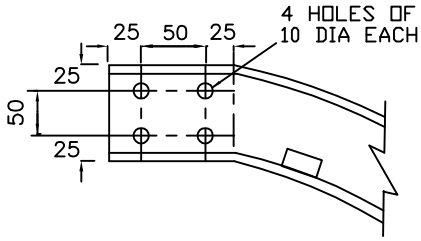
SHT. 07 OF 14 REV. 01



INSIDE TYPE



OUTSIDE TYPE



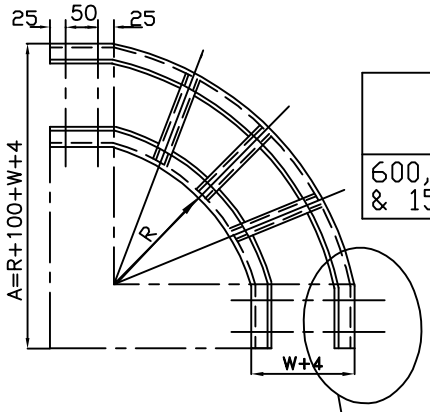
ENLARGED VIEW OF "X"

VERTICAL ELBOW 90 DEG UP/DOWN

INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A
600, ~~450~~, 300 & 150	600	100	700

1

90° VERTICAL BEND - LADDER TYPE



LADDER TYPE

X (AS ABOVE)

HORIZONTAL ELBOW 90 DEG

INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A			
			W			
			150	300	450	600
600, ~~450~~, 300 & 150	600	100	854	1004	1154	1304

1

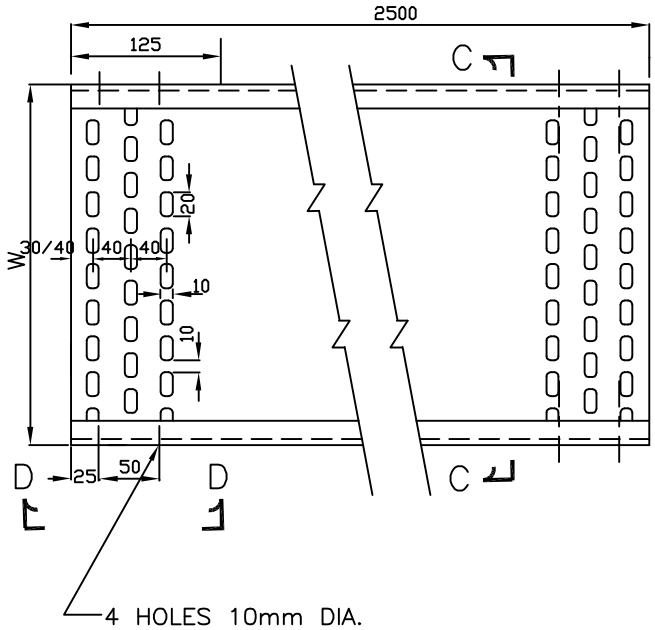
1

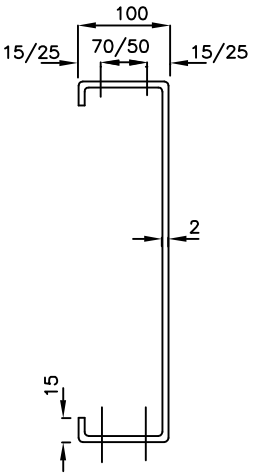
90° HORIZONTAL BEND - LADDER TYPE

LADDER TYPE ACCESSORIES

FOR GENERAL NOTES REFER SHEET 14 OF 14

BHEL	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO.
		SHT. 08 OF 14 REV. 01

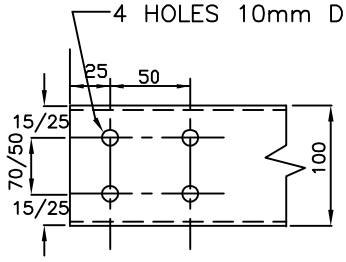




SECTION–CC

600/~~450~~/300/150 TRAYS

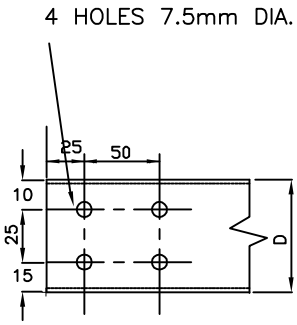
1



SECTION–DD

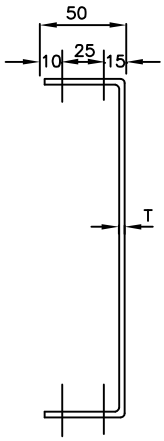
600/~~450~~/300/150 TRAYS

1



SECTION–DD

100/50 TRAYS



SECTION–CC

(100/50 TRAYS)

TRAY WIDTH W (mm)	600	450	300	150	100	50
TRAY DEPTH D (mm)	100	100	100	100	50	50
T (mm)	2	2	2	2	2	2

PERFORATED TYPE TRAY

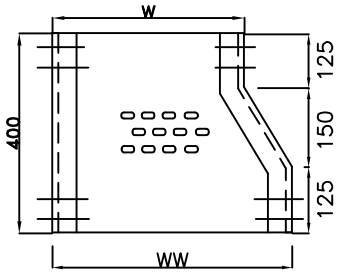
1

FOR GENERAL NOTES REFER SHEET 14 OF 14

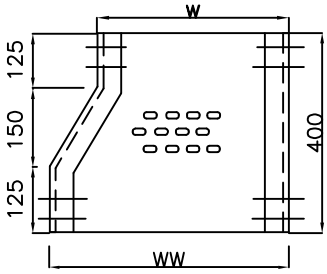
TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.

SHT. 09 OF 14 REV. 01



LEFT HAND REDUCER

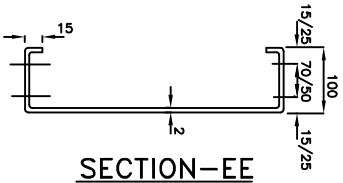


RIGHT HAND REDUCER

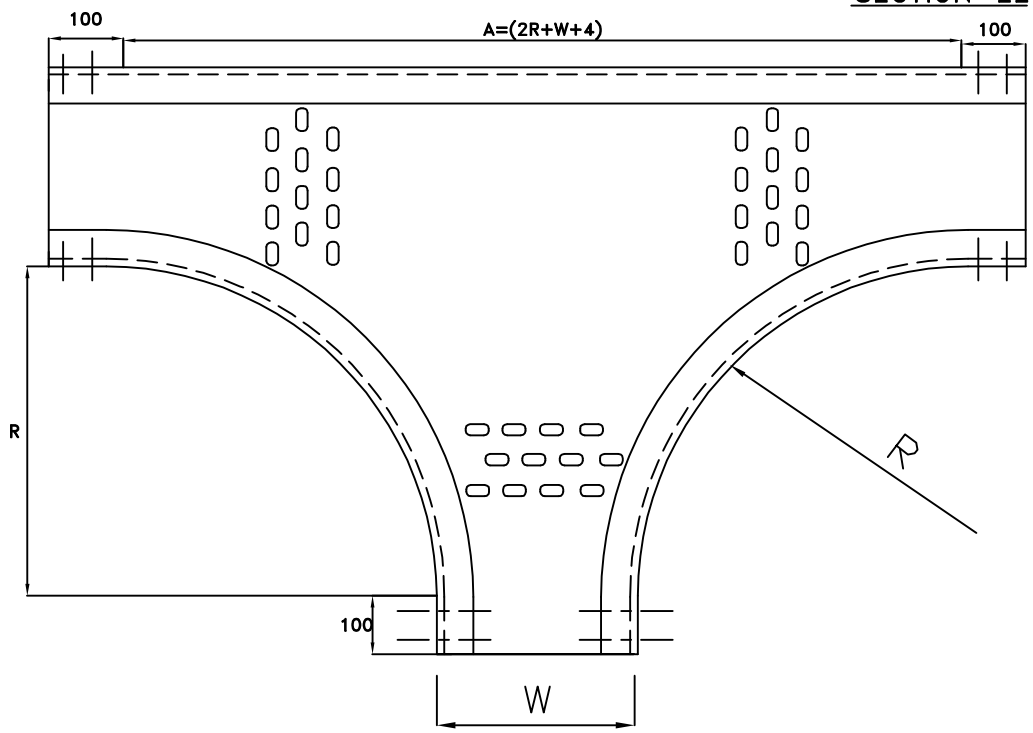
WW	W	DEPTH
600	450	100
600	300	100
600	150	100
450	300	100
300	150	100

1

PERFORATED TYPE



SECTION–EE



TEE

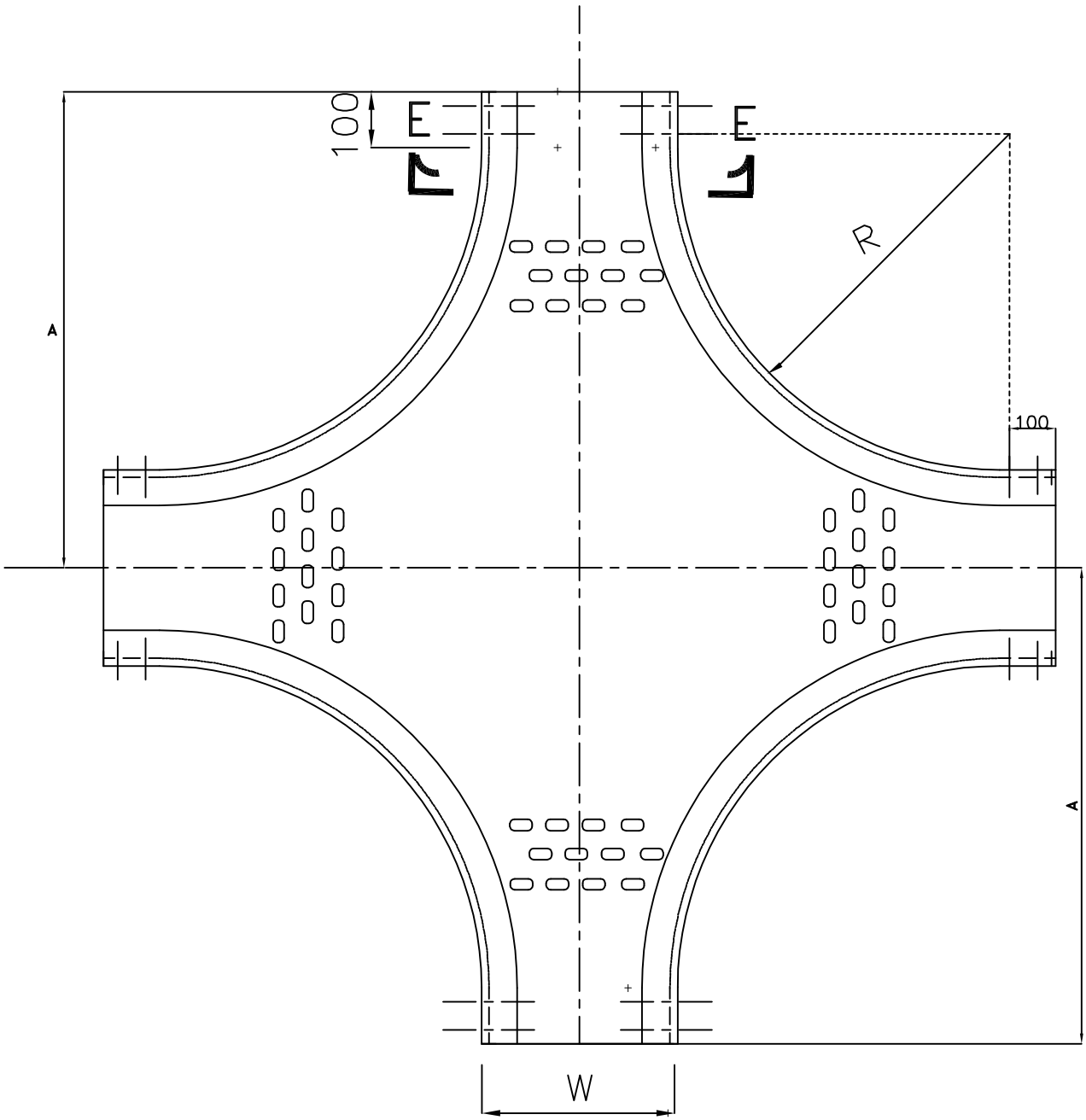
WIDTH W	BENDING RADIUS R	DEPTH	A			
			W			
			150	300	450	600
150, 300, ~~450~~ & 600	600	100	1354	1504	1654	1804

1 1

PERFORATED TYPE

FOR GENERAL NOTES REFER SHEET 14 OF 14

BHEL	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO.
		SHT. 10 OF 14 REV. 01



CROSS

WIDTH W	BENDING RADIUS R	A=R+W/2+100
600	600	1000
~~450~~	~~600~~	~~925~~
300	600	850

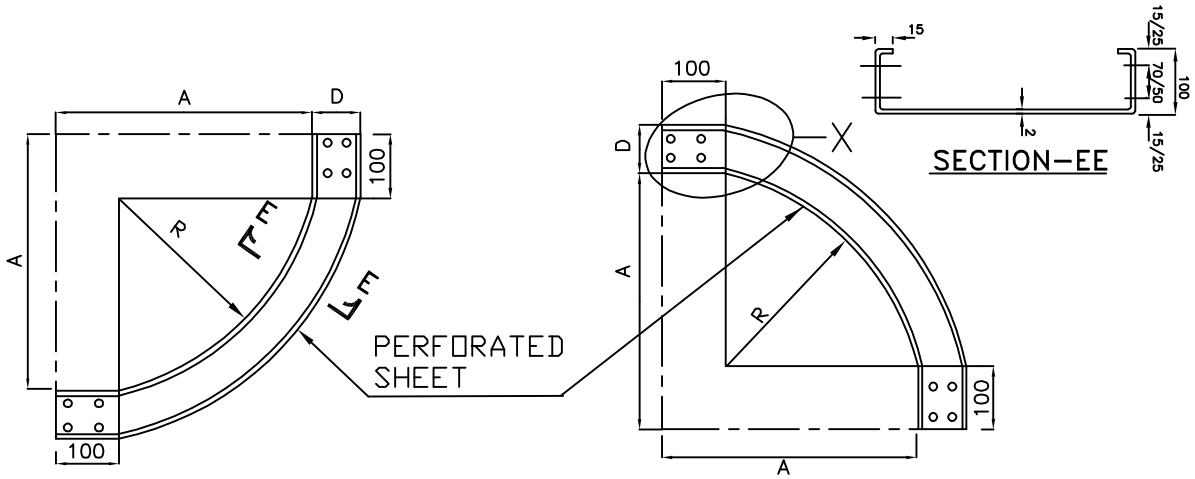
1

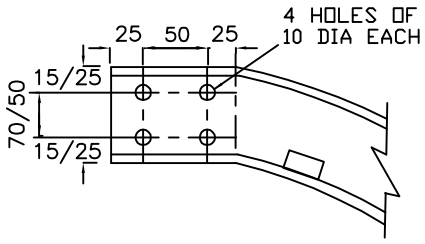
FOR GENERAL NOTES REFER SHEET 14 OF 14

TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.

SHT. 11 OF 14 REV. 01





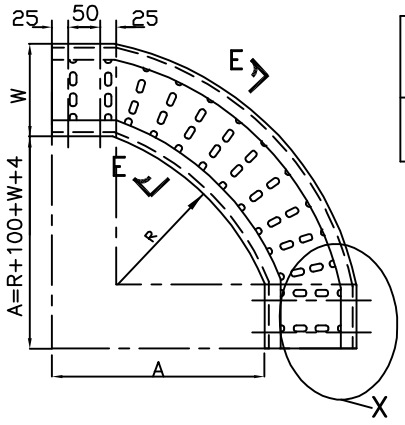
ENLARGED VIEW OF "X"

90° VERTICAL BEND – PERFORATED TYPE

VERTICAL ELBOW 90 DEG UP/DOWN

INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A
600, ~~450~~, 300 & 150	600	100	700

1



HORIZONTAL ELBOW 90 DEG

INSIDE WIDTH W	BENDING RADIUS R	DEPTH	A			
			W			
			150	300	450	600
150, 300, ~~450~~ & 600	600	100	854	1004	1154	1304

1

1

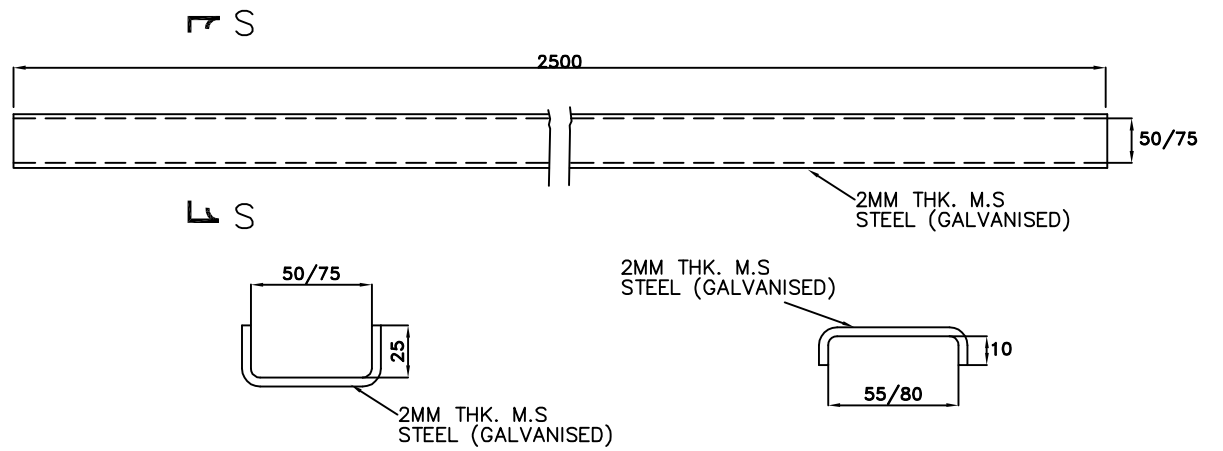
90° HORIZONTAL BEND – PERFORATED TYPE

FOR GENERAL NOTES REFER SHEET 14 OF 14

TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DWG. NO.

SHT. 12 OF 14 REV. 01



CABLE TROUGHS

FOR GENERAL NOTES REFER SHEET 14 OF 14

BHEL	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO.
		SHT. 13 OF 14 REV. 01

NOTES:–

1. THE CABLE TRAYS AND ACCESSORIES SHALL BE MADE OF 2mm HOT ROLLED M.S.SHEET CONFIRMING TO IS:1079. ALL THE COUPLER PLATE SHALL BE OF 3 MM THICK.
2. THE CABLE TRAYS AND ACCESSORIES SHALL BE HOT DIP GALVANISED AS PER IS 2629. THE MASS OF ZINC COATING SHALL BE 610 gm/m AND THICKNESS SHALL BE 75 MICRONS (MINIMUM).
3. FOR LADDER TYPE CABLE TRAYS AND ACCESSORIES, ALL RUNGS SHALL BE SLOTTED.
4. PERFORATED TRAYS SHALL BE FABRICATED OUT OF A SINGLE M.S. SHEET.
5. THE DIMENSIONS OF ALL BENDS, TEES, CROSSES, ETC. FOR PERFORATED CABLE TRAYS SHALL BE THE SAME AS FOR LADDER TYPE TRAY FITTINGS.
6. SIDE CHANNELS OF PERFORATED TRAY ACCESSORIES SHALL BE WELDED WITH THE PERFORATED SHEET AT INTERVALS OF 100mm.
7. LENGTH OF WELDING SHALL NOT BE LESS THAN 25mm. WELDING SHALL BE AS PER IS 9595.
8. PREFERABALY SINGLE MS PERFORATED SHEET SHALL BE USED AS BASE OF ALL PERFORATED TYPE TRAY ACCESSORIES. HOWEVER, IF USE OF PIECES OF PERFORATED SHEET IS UNAVIODABLE FOR BASE, PIECES SHALL BE WELDED WITH EACH OTHER IN LINE WITH THE ABOVE.
9. ALL TRAY CORNERS SHALL BE FREE OF SHARP EDGES & SMOOTH.
10. THE DEPTH, WIDTH AND LENGTH OF TRAYS AND ACCESSORIES SHALL BE WITHIN A TOLERANCE +/–2MM ~~PER RELEVANT IS~~
11. TO FACILITATE ASSEMBLY, ALL ACCESSORIES AT ENDS SHALL HAVE 100mm STRAIGHT PORTION.
12. ALL NUTS, BOLTS, WASHERS ETC., SHALL BE HOT DIP GALVANISED AS PER IS 1367 FOR SIZES ABOVE 12MM AND ELECTROPLATED/ELECTROGALVANISED FROM SIZE BELOW 12MM.
13. ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE.
14. TRAY ACCESSORIES SHOWN IN THIS DRAWING SHALL BE FACTORY FABRICATED FOR USE AT SITE AS PER APPROVED LAYOUT DRAWINGS. FOR SPECIFIC SITE REQUIREMENTS (E.G. IRREGULAR ANGLE BENDS SUCH AS 30°/60° BENDS, ETC) AS PER SITE LAYOUT CONDITIONS, TRAY ACCESSORIES SHALL BE FABRICATED AT SITE FROM THE STRAIGHT LENGHT OF RESPECTIVE SIZES AS REQUIRED. GALVANISATION DAMAGED DURING CUTTING/WELDING OPEARTIONS SHALL BE BRUSHED AND RED LEAD PRIMER, OIL PRIMER AND ALUMINIUM PAINT SHALL BE APPLIED BEFORE INSTALLATION OF THE ACCESSORIES.
15. WIDTH OF CABLE TRAYS PROPOSED TO BE USED FOR PROJECT ARE AS UNDER :
    LADDER TYPE CABLE TRAY (MM) : 600,~~450~~,300 & 150.
    PERFORATED TYPE CABLE TRAY (MM) : 600,~~450~~,300,150,100 & 50.
16. 600MM WIDE CABLE TRAY SHALL BE SUITABLE FOR WEIGHT OF 100KG/M INCLUDING LIVE LOAD OF RUNNING LENGTH OF CABLE TRAY.
17. CABLE TROUGHS SHALL BE USED FOR BRANCHING OUT FEW CABLES FROM MAIN CABLE ROUTE.
18. MAKE OF ALL ITEMS SHALL BE AS PER ~~BHEL/CUSTOMER~~ NTPC QA APPROVAL.
19. CABLE TROUGHS OR 50/100MM WIDE PERFORATED TYPE TRAY SHALL BE USED FOR LOCAL CABLING/BRANCHING OUT FEW CABLES FROM MAIN ROUTE.

BHEL	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO.
		SHT. 14 OF 14 REV. 01

QUALITY PLAN FOR MOTORS BELOW 55 KW (LV)

		QUALITY PLAN	CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION TITLE			
		SHEET 1 OF 2	SYSTEM			ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-	
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	2	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUFR'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	2	1		NOTE -1 & NOTE-3
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-	NOTE -1 & NOTE-3

BHEL	**PARTICULARS**	**BIDDER/VENDOR**
	NAME	
	SIGNATURE	

	QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION : TITLE :			
		SHEET 2 OF 2	SYSTEM			ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION			VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	W	V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-	

NOTES:

1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON

2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.

3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.

Legends for Inspection agency

1. BHEL/CUSTOMER
2. VENDOR (MOTOR MANUFACTURER)
3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)

P. PERFORM
W. WITNESS
V. VERIFY

BHEL	**PARTICULARS**	**BIDDER/VENDOR**	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

NTPC LTD.

(ENGINEERING DIVISION)
ENGINEERING OFFICE COMPLEX
A-8A, SEC-24, NOIDA, U.P. 201301
PH.: 011-8-2596872 FAX: 011-91-4410208

TRANSMITTAL FOR DOCUMENTS

FROM : DGM (QA)

REF. : 01/CQA/0000-SPL-

DATE :03/08//2010

TO: M/s ABB Limited,
Phase Plot No. 5 & 6
Peenya Industrial Area,
Bangalore 560 058

CC :RIO-Bangalore, NTPC LTD

CC: Sh. P.K.Basu, DGM-QA-Elect

Please find enclosed following documents for necessary action at your end as indicated in purpose code

S. No.	Item	RQP No	Rev No	No. of Copies	Purpose code	Remarks
01	LT MOTOR 55 KW-200 KW	0000-999-QVE-P-259	00	1	11	

1.Approved in CAT-1
2.Approved in CAT-II With comments resubmit
3.Not APPROVED- CAT-III
4.Approved in CAT-IV(For information only)
5Released for Fabrication/Construction
6.for your comments
7.Revised as per your comments
8. For your approval
9.for your information
10.As-built
11.Approved for Reference subject to approval of Endorsement sheet

SIGNATURE :

NAME : O.P.NIRANJAN

FORMAT NO. : QS-01-DIV-P-02/F2- ENGINEERING DIVISION

MANUFACTURER'S NAME AND ADDRESS	REFERENCE QUALITY PLAN			TO BE FILLED IN BY NTPC	
ABB LTD., Phase Plot No 5& 6 Peenya ,Industrial Area, Bangalore - 560058	ITEM /EQUIPMENT : LT MOTOR SUB-SYSTEM :55 KW – 200KW	QP NO.: NTPC-RQP-001 REV. NO.: 00 DATE : 29-07-2010 PAGE : 1 OF 6	SIGN. OF MFGR'S.	QP NO.: 0000-999 - QVE - P - 259 REV. NO.: 0 DATE : 30/07/10 PAGE...1.. OF..6 VALID UPTO: 29/07/13	REVIEWED BY: V SHRIVASTAVA, O P NIRANJAN, P K BASU APPROVED BY: AK DUTTA

SL. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	D *	AGENCY M	AGENCY C	AGENCY N	REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.		** 10.			11.
I A	**INCOMING INSPECTION BOUGHT OUT ITEMS**													
1	Casting Body, End shield, Terminal box, Bearing Cover.	a)Surface defects	Major	Visual	100%	--	No defect	No defect	Inspn.		P	-	-	ABB to ensure the concentricity (bore and the spigot) of End shields is maintained as per the specification. Records to be maintained. 1/Lot to be witnessed by ABB
		b)Dimn. Conformity	Major	Measure	1 sample/heat	--	ABB Drawing	ABB Drawing	report		P	-	-	
		c)Hardness	Major	Mech.	1 sample/lot	1 sample/lot	FG150:3GYN951001/ FG200:3GYN951002	FG150:3GYN951001/ FG200:3GYN951002	Suppl. TC		V	V	V	
		d)Tensile strength	Major	Mech	1 sample/lot	1 sample/lot	- do -	- do -	- do -		V	V	V	
		e)Chemical composition	Major	Chem	1 sample/lot	1 sample/lot	- do -	- do -	- do -		V	V	V	
2	STAMPINGS FOR ROTOR & STATOR	a)Thickness	Major	Measure	1 sample/lot	1 sample/lot	ABB Drawing	ABB Drawing	Suppl.		W	V	V	
		b)Burr height	Major	Measure	- do –	- do –	3GT961001.	3GT961001.	TC		W	V	V	
		c)Grade	Major	Measure	- do -	- do -	3GYN 951008/ 3GYN951019	3GYN 951008/ 3GYN951019	- do –		W	V	V	
		d)Core loss (before and after ageing)	Major	Electrical	- do –	- do –	- do -	-do-	- do –		W	V	V	Magnetic Induction and Insulation Resistance are Verified through Raw material certificate.
		e)Magnetic Induction test.	Major	Electrical	- do -	- do -	-do-	-do-	- do -		V	V	V	
		f)Insulation Resistance	Major	Electrical	-do-	-do-	-do-	-do-	RM certificate		V	V	V	
		g) Vendor Identification	Major	Visual	1 Piece	-do-	3GTD431001	3GTD431001	Insp. Report		P	V	V	
3	STATOR STACK	a)Dimn. Conformity (Core length. & Inner diameter)	Major	Measure	1 sample/lot	1 sample/lot	ABB Drawing	ABB Drawing	Inspn. Report		P	V	V	Co relation between raw material , bought out items and finished motor shall be maintained for verification
		b)Stacking Factor	Major	Measure	1 sample/lot	1 sample/lot	3GYN 951008/ 3GYN951019	3GYN 951008/ 3GYN951019			W	V	V	
		b) Slot alignment	Major	Visual	- do -	--	No Mismatch	No Mismatch	- do -		P	-	-	
		c) cleanliness	Major	Visual	- do -	--	No Burr / Foreign Particles	No Burr / Foreign Particles	- do -		P	-	-	
4	ALUMINIUM DIE-CAST ROTOR	a) Chemical comp.	Major	Chemical	1 sample/lot	-	3GT952001	3GT952001	Sup.TC		V	-	-	
		b) Conductivity	Major	Electrical	1 sample/lot	One Sample per lot	-do-	-do-	Inspn. Report		W/V	V	V	Witness by ABB every 3 months
		c) Free from Blow Hole & cracks	Major	Visual	100%	-do-	-do-	-do-	-do-		W/V	V	-	
		d) Dimension	Major	Mech.	1 sample/lot	-do-	ABB Drawing	ABB Drawing	-do-		W/V	V	-	

LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION
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Note:# NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of Inspection

MANUFACTURER'S NAME AND ADDRESS	REFERENCE QUALITY PLAN		TO BE FILLED IN BY NTPC	
ABB LTD., Phase Plot No 5& 6 Peenya ,Industrial Area, Bangalore - 560058	ITEM /EQUIPMENT : LT MOTOR SUB-SYSTEM :55 KW – 200KW	QP NO.: NTPC-RQP-001 REV. NO.: 00 DATE : 29-07-2010 PAGE : 2 OF 6	SIGN. OF MFGR'S	QP NO.: 0000-999 - QVE – P - 259 REV. NO.: 0 DATE : 30/07/10 PAGE 2 OF 6 VALID UPTO: 29/07/13	REVIEWED BY: V SHRIVASTAVA, O P NIRANJAN, P K BASU	APPROVED BY: A K DUTTA

SL. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	D *	AGENCY M	AGENCY C	AGENCY N	REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.		** 10.			11.
5	SHAFT MACHINED	a) Dimension	Major	Mech.	1 sample/heat/ Lot	-	ABB Drawing	ABB Drawing	Suppl TC	✔	P	-	-	
		b) Ultrasonic Testing	Major	Mech	100 %	100 %	3GT951004/ 3GTD951014	3GT951004/ 3GTD951014	-do-		V	V	V	
		c) Tensile Strength, Yield Strength, Elongation	Major	Mech	1 sample/heat/ Lot	1sample/heat/ Lot	-do-	-do-	-do-		V	V	V	
		d) Hardness	Major	Mech.	-do-	-do-	- do -	- do -	- do -	✔	V	V	V	
		e) Chemical composition	Major	Chemical	-do-	-do-	- do –	- do –	- do –	✔	V	V	V	
		f)Heat treatment	Major	Measurement	-do-	-do-	-do-	-do-	-do-		V	V	V	
		g) inclusion rating	Major	Metallurgical	-do-	-do-	-do-	-do-	-do-		V	V	V	
6	FAN BLADE (ALUMINIUM)	a) Internal dia	Major	Measure	1 sample/lot	-	ABB Drawing	ABB Drawing	Inspn. Report		P	-	-	
		b)Overall dia	Major	Measure	1 sample/lot	--	- do -	- do -	-do-		P	-	-	
		c) Casting defect	Major	Visual	100%	1Sample per lot	3T952005	3GT952005	-do-		P	V	V	
7	TERMINAL PLATE EPOXY Molded	a) Material	Major	Visual	1 sample/lot	--	3GT 964302	3GT 964302	-do-		V	-	-	
		b) Proof voltage test	Major	Electrical	1 sample/lot	--	3GT964302	3GT964302	Suppl TC		V	-	-	
8	Space heater	a)I R	Major	Electrical	100%	--	3GYN960004	3GYN960004	Supplier TC		V	-	-	
		b)HV test	Major	Electrical	100%	--	-do-	-do-	-do-		V	-	-	
		c)Continuity & wattage	Major	Electrical	100%	--	-do-	-do-	-do-		V	-	-	
9	INSULATING PAPER	a) Type of paper	Major	Review TC	1 sample/lot	--	3GT954303 / 3GTD954311	3GT954303 / 3GTD954311	Suppl. TC		V	-	-	
		b) Thickness	Major	Measure	1 sample/lot	--	-do-	-do-	Inspn. Report + Suppl. TC		P	-	-	
		c) BDV Test	Critical	Electrical	1 sample/lot	1 sample/lot	- do -	- do -	- do -		P	V	V	
10	FIBER GLASS SLEEVE	a)Dimn. (Bore dia & Wall thickness)	Major	Measure	1 sample/lot	--	ABB / BOM 3GYN964301/ 3GYN964303	ABB / BOM 3GYN964301/ 3GYN964303	Inspn. Report + Supplr		P	-	-	
		b)Voltage proof test	Major	Electrical	1 sample/lot	--	-do-	-do-	TC		P	-	-	
		c)IR value	Major	Electrical	1 sample/lot	--	-do-	-do-	-do-		V	-	-	
		d)Bending test	Major	Mech.	1 sample/lot	--	-do-	-do-	-do-		V	-	-	
		e)Stability test	Major	Chemical	1 sample/lot	--	-do-	-do-	-do-		V	-	-	

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Note:# NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of Inspection

FORMAT NO.: QS-01-QAI-P-10/F1-R1

1/1

ENGG. DIV./QA&I

ABB	MANUFACTURER'S NAME AND ADDRESS	REFERENCE QUALITY PLAN		एनटीपीसी NTPC	TO BE FILLED IN BY NTPC
	ABB LTD., Phase Plot No 5& 6 Peenya ,Industrial Area, Bangalore - 560058	ITEM /EQUIPMENT : LT MOTOR SUB-SYSTEM :55 KW – 200KW	QP NO.: NTPC-RQP-001 REV. NO.: 00 DATE : 29-07-2010 PAGE : 3 OF 6	QP NO.: 0000-999 - QVE – P - 259 REV. NO.: 0 DATE : 30/07/10 PAGE 3 OF 6 VALID UPTO: 29/07/13	REVIEWED BY: V SHRIVASTAVA, O P NIRANJAN, P K BASU APPROVED BY: A K DUTTA

SL. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	D *	AGENCY M	AGENCY C	AGENCY N	REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.		** 10.			11.
11	VARNISH	a) Shelf life	Major	Visual	100%	--	3GYN954403	3GYN954403	Suppl TC		V	-	-	
		b) Type	Major	Visual	100%	--	-do-	-do-	-do-		V	-	-	
		c) Viscosity	Major	Measure	1 sample/lot	--	-do-	-do-	Insp. record		W	-	-	
12	COPPER WIRE (Dual coated Enameled)	a)Dimension	Major	Measure	1 sample/lot	--	IS : 13730(part13) /CEI IEC 60317-0-1 /3GT962006	IS : 13730(part13) /CEI IEC 60317-0-1 /3GT962006	Inspn. Report +		P	-	-	
		b)Elongation	Major	Mech.	1 sample/lot	--	- do -	- do -	Suppl		P	-	-	
		c)Mandrel winding test	Major	Visual	1 sample/lot	--	- do -	- do -	TC		P/V	-	-	
		d)Peel test	Major	Test	1 sample/lot	--	- do -	- do -			P	-	-	
		e)BD voltage test	Critical	Electrical	1 sample/lot	1 sample/lot					P	V	V	
		f) Cut through test	Major	Electrical	1 sample/lot	--	- do -	- do -	-do-		P	-	-	
		g)Heat shock test	Major	Test	1 sample/lot	--					P	-	-	
		h)Resistance	Major	Electrical	1 sample/lot	--	- do -	- do -	- do -		P	-	-	
		i)Springiness	Major	Mech.	1 sample/lot	--	- do -	- do -	- do -		P	-	-	
		j)Abrasion test	Major	Performance	1 sample/lot	--	- do -	- do -	Suppl		P	-	-	
		k)Continuity test	Major	Electrical	1 sample/lot	--	- do -	- do -	TC		P	-	-	
		l)Tan delta bending point test	Major	Thermal	1 sample/lot	1 sample/lot	IS 1377 B. Part 5	IS 1377 B. Part 20			V	V	V	
13	BEARING(Make-SKF	a) Make & Type of bearing	Major	Visual	Each lot	--	Suppliers standard	Suppliers standard	Suppl. Doc.		V	-	-	Surveillance verification By NTPC
14	GASKET	a) Dimension	Major	Measure.	1 sample/lot	--	ABB Drawing	ABB Drawing	Inspn. Report		P	-	-	
		b) Hardness (Before and After Ageing)	Major	Measure.	1 sample/lot	--	3GYN953005	3GYN953005	Supl TC		*V	-	-	* Report for Surveillance test/checks by ABB on quarterly basis shall be available
		c)Flame test	Major	Chemical	1 sample/lot	--	-do-	-do-	Suppl		*V	-	-	
		d) Neoprene test	Major	Chemical	1 sample/lot	--	-do-	-do-	TC		*V	-	-	

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SL. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	D *	AGENCY M	AGENCY C	AGENCY N	REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.		** 10.			11.
15	Brazing Alloys Rods	Chemical composition	Major	Chemical	1 sample/lot	--	3GYN 954406	3GYN 954406	Suppl TC		V	-	-	
16	PAINTS	a) Shade	Major	Measure	1 sample/lot	--	As per Customer Requirement.	As per Customer Requirement.	Shade Card		P	-	-	
		b) Shelf life	Minor	Visual	100%	--	As per Manuf. Recommends.	As per Manuf. Recommends.	Suppl TC		V	-	-	
B-1	Coil Forming	a) Conductor diameter	Major	Measure	100%	--	Winding sheet	Winding sheet	-		P	-	-	
		b) No of turns	Major	Visual	100%	-	Winding sheet	Winding sheet	-		P	-	-	
2	WOUND STATOR	a) Resistance	Major	Electrical	100%	100%	Winding sheet	Winding sheet	Inspn. record		W/V	V	V	Witness by ABB on 25% Lot
		b) H.V. Test	Major	Electrical	100%	100%	IS : 325	IS : 325	- do -		W/V	V	V	
		c) Surge test	Major	Electrical	100%	100%	WI - 01	WI - 01	- do -		W/V	V	V	
		d) Overhang Dimensions (by snap gauge)	Minor	Measure	100%	--	ABB Drawings	ABB Drawings	-do-		W/V	-	-	
		e) Application of Trophicalisation gel on Winding Overhang	Major	Visual	100%	100%	-do-	-do-	-do-		W/V	V	V	
3	VPI	a)Preheating	Major	Mechanical	100%	100%	WI-02	WI-02	Inspn		W	V	V	VPI process carried out at M/S Rajamane & Hegade Pvt.Ltd. Tumkur.
		b)Vacuum created	Major	Mechanical	100%	100%	-do-	-do-	Record		W	V	V	
		c)Viscosity	Major	Measure	Once daily	Once daily	-do-	-do-	-do-		W	V	V	
		d)Gel time	Major	Measure	Once in a month	Once in a month	Resin Manf.Std	Resin Manf.Std	-do-		W	V	V	
		e)Air pressure	Major	Mechanical	100%	100%	WI-02	WI-02	-do-		W	V	V	
		f)Curing Cycle	Major	Mechanical	100%	100%	-do-	-do-	-do-		W	V	V	

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1.	2.	3.	4.	5.	6.		7.	8.	9.		** 10.			11.
II	**INPROCESS INSPECTION**													
1	Machined rotor	a)Dimension- OD	Critical	Measure	100%	--	ABB Drg.	ABB Drg.	Insp.		P	-	-	Effective Control of Material / Sub Assemblies according to internal specifications to be maintained.
		b)Runout	Major	Mech.	sample		ABB Drg.	ABB Drg.	record		P	-	-	
2	Rotor Assembly	Dynamic Balancing	Critical	Mech.	100%	100%	ISO 1940 / G2.5	ISO 1940 / G2.5	Record		P	V	V	Rotor and Fan balanced separately
3	Fan	Dynamic Balancing	Critical	Mech.	100%	100%	ISO 1940 / G2.5	ISO 1940 / G2.5	Record		P	V	V	
4	Assembly	a) Rotor and stator selection as per BOM	Major	Visual	100%	--	As per specification	As per specification	-		P	-	-	
		b) T box location and casketing	Major	Visual	100%	--	As per specification	As per specification	-		P	-	-	
		c) Name plate preparation and fixing	Major	Visual	100%	--	As per specification	As per specification	-		P	-	-	
III	**FINAL INSPECTION**													
A	**TYPE TEST**	**Type test approval / clearance to be obtained from NTPC Egg. before offering for inspection**												
B	**ROUTINE TEST**	a) Name plate verification	Major	Visual	100%	100%	Approved Data sheet	Approved Data sheet	Test Result	✓	P	W	W	
		b) Mounting dimensions	Major	Measure	1 each type	1 each type	Do/Drg	Do/Drg	-	✓	P	W	W	
		c) Space heater insulation resistance and H.V. test	Major	Electrical	100%	100%	IS ; 325	IS : 325	Test record	✓	P	W	W	
		d) Resistance of stator winding	Major	Electrical	100%	100%	do	do	Test record	✓	P	W	W	
		e) Insulation resistance before & after H.V. test of stator winding	Major	Electrical	100%	100%	IS : 325/ NTPC Tech. Specification	IS : 325/ NTPC Tech. Specification	Test record	✓	P	W	W	
		f) No load test at rated voltage	Major	Electrical	100%	100%	IS : 325	IS : 325	Test record	✓	P	W	W	

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FORMAT NO.: QS-01-QA1-P-10/F1-R1 1/1 ENGG. DIV./QA&I

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REVIEWED BY:	APPROVED BY:
V SHRIVASTAVA O P NIRANJAN P K BASU	A K DUTTA

SL. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N				D *	M	C	N	
1.	2.	3.	4.	5.	6.		7.	8.	9.		** 10.			11.
		g) H.V. test between Ph to Ph & Ph to earth	Major	Electrical	100%	100%	ADS & IS325	ADS & IS325	Test record	✔	P	W	W	
		h) Locked rotor test	Major	Electrical	100%	100%	IS : 4029	IS : 4029/Data sheet	Test record	✔	P	W	W	
		i) Reduced voltage running	Major	Electrical	100%	100%	IS: 325	IS : 325	Test record	✔	P	W	W	
		j) Over speed test at 120% of rated speed for 2 min.	Major	Electrical	100%	100%	Data sheet / No Abnormal Vibration	Data sheet / No Abnormal Vibration	Test record	✔	P	W	W	
		k) Vibration measurement at rated speed & voltage	Major	Measure	100%	100%	IS:12075	IS:12075	Test record	✔	P	W	W	
		l) Test for degree of protection with 0.1mm feeler gauge wire	Major	Visual	100%	1 sample/ rating/lot	IS-325/IS4029	IS-325/IS4029	Test record	✔	P	W	W	
		m) Direction of rotation	Major	Electrical	100%	100%	Approved data Sheet	Approved data Sheet	-do-	✔	P	W	W	
		n) Completeness of assembly & Accessoirise	Major	Visual	100%	100%	-do-	-do-	-do-	✔	P	W	W	
		o) Air Gap Measurement	Major	Measure	1 Sample/Lot	1 Sample/ Lot	ABB Drawing	ABB Drawing	-do-	✔	P	W	W	
C	PAINTING	a)Paint shade	Minor	Visual	100%	100%	Approved data sheet	Approved data sheet			P	W	W	
		b)Paint thickness	Minor	Measure	100%	100%	NTPC spec/Data Sheet/WI-04	NTPC spec/Data Sheet/WI-04			P	W	W	
		c)Scratch test\ (adhesion test)	Minor	Measure	1 each type	1 each type	-do-	-do-			P	W	W	No peel off for Adhesion test
D	PACKING	a)Fixing of key in keyway	Minor	Visual	100%	--	-do-	-do-			P	-	-	
		b)Mounting pad	Minor	Visual	100%	--	-do-	-do-			P	-	-	
		c)Sturdiness of packing	Minor	Visual	100%	--	-do-	-do-			P	-	-	
		d)Case marking	Minor	Visual	100%	--	-do-	-do-			P	-	-	

LEGEND: * **RECORDS**, INDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION
** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER. N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION AS APPROPRIATE. **CHP:** NTPC SHALL IDENTIFY IN COLUM "N" AS 'W'

Note:# NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of Inspection

SUB-SECTION–E-42

MOTORS

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 frequency variation, hot starts, pull out 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 on NTPC review of Routine 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 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, 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 IE2/IE3 shall be checked/verified in addition to

Compliance of relevant standard IS:12615/IEC requirement. In case actual results are not within the tolerance limit as declared by manufacturer during QP submission,

the motor shall be subjected to efficiency test.

ANNEXURE-I

1.0	Design ambient temperature	:	50 °C
2.0	Maximum acceptable kW rating of LV motor	:	200KW *
3.0	Installation (Indoors/ Outdoors)	:	As required
4.0	Details of supply system		
	a) Rated voltage (with variation)	:	415/240V ± 10%
	b) Rated frequency (with variation)	:	50 Hz + 3 % to - 5%
	c) Combined voltage & freq. variation	:	10% (sum of absolute values)
	d) System fault level at rated voltage	:	50 kA for 1 sec
	e) Short time rating for terminal boxes		
	○ 90 kW and above (Breaker Controlled)	:	50 KA for 0.2 sec.
	○ Below 90 kW (Contactor Controlled)	:	50 KA protected by HRC fuse
	f) LV System grounding	:	Solidly

5.0 Class of insulation: Refer Clause 7.03.00 of customer specification-motors.

6.0 Minimum voltage for starting :Refer Clause 10.00.00 of customer specification- general electrical specification

7.0	Power cables data	:	Shall be given during detailed engg.
8.0	Earth Conductor Size & Material	:	Shall be given during detailed engg.
9.0	Space heater supply	:	240 V, 1¢, 50 Hz
10.0	Rating up to which Single phase motor	:	Acceptable below 0.2 kW

11.0 Locked rotor current: Refer Clause 10.00.00 of customer specification- general electrical specification

12.0 Flame-proof motor: Refer Clause 7.03.00 of customer specification-motors.

13.0	Makes	:	BHEL/ Customer approval
14.0	Tests: As per customer specification		

* **LT motors of continuous duty shall be energy efficient IE3 class conforming to IS-12615**

Also detail Customer spec. for Motors to be referred as enclosed with the specification to be referred.

CLAUSE NO.	Bidder's Name ……..

DE-1B	LT MOTORS	
A.	**GENERAL**	
5.	Manufacturer & Country of origin. (Shall be as per approved QA make)	
6.	Equipment driven by motor	
7.	Motor type	
8.	Quantity	
B.	**DESIGN AND PERFORMANCE DATA**	
18.	Frame size	
19.	Type of duty	
20.	Type of enclosure /Method of cooling/ Degree of	
21.	Applicable standard to which motor generally	
22.	Efficiency class as per IS 12615	
23.	(a)Whether motor is flame proof	Yes/No
	(b)If yes, the gas group to which it conforms as per IS:2148	
24.	Type of mounting	
25.	Direction of rotation as viewed from DE END	
26.	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)	
27.	Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)	
28.	Maximum continuous load demand of driven	
29.	Rated Voltage (volts)	
30.	Permissible variation of :	
	a. Voltage (Volts)	
	b. Frequency (Hz)	
	c. Combined voltage and frequency	
31.	Rated speed at rated voltage and	
32.	At rated Voltage and frequency:	
	a. Full load current	

	b. No load current	
33.	Power Factor at	
	a. 100% load	
	b. NO load	
	c. Starting.	
34.	Efficiency at rated voltage and frequrecy,	
	a.100% load	
	b. 75% load	
	c. 50% load	
35.	Starting current (amps) at	
	a. 100 % voltage	
	b. 85% voltage	
	c. 80% voltage	
36.	Minimum permissible starting Voltage (Volts)	
37.	Starting time with minimum permissible voltage	
	a. Without driven equipment coupled	
	b. With driven equipment coupled	
38.	Safe stall time with 100% and 110% of rated	
	a. From hot condition	
	b. From cold condition	
39.	Torques :	
	a. Starting torque at min. permissible voltage(kg-	
	b. Pull up torque at rated voltage.	
	c. Pull out torque	
	d. Min accelerating torque (kg.m) available	
	e.Rated torque (kg.m)	
40.	Stator winding resistance per phase (ohms at 20	
41.	GD^2 value of motors	

42.	No of permissible successive starts when motor is in hot condition	
43.	Locked Rotor KVA Input	
44.	Locked Rotor KVA/KW	
45.	Vibration limit :Velocity (mm/s)	
46.	Noise level limit (dBA)	
C.	**CONSTRUCTIONAL FEATURES**	
1.	Stator winding insulation	
	a. Class & Type	
	b. Winding Insulation Process	
	c. Tropicalised (Yes/No)	
	d. Temperature rise over specified maximum ambient temperature of 50 deg C	
	e. Method of temperature measurement	
	f. Stator winding connection	
2.	Main Terminal Box	
	a. Type	
	b. Location(viewed from NDE side)	
	c. Entry of cables(bottom/side)	
	d. Recommended cable size(To be matched with cable size envisaged by owner)	
	e. Fault level (MVA),Fault level duration(sec)	
	f. Cable glands & lugs details (shall be suitable for	
3.	Type of DE/NDE Bearing	
4.	Motor Paint shade	
5.	Weight of	
	a. Motor stator (KG)	
	b. Motor Rotor (KG)	
	c. Total weight (KG)	
D.	**List of accessories.**	

1. 3.	Space Heaters (Applicable for 30 KW & above motor) (Nos./Power in watts/supply voltage)	
2.	Terminal Box for Space Heater (Yes/No)	
3.	Speed switch (Yes/No)	
4.	Insulation of bearing (Yes/No)	
5.	Noise reducer(Yes/No)	
6.	Grounding pads	
	i) No and size on motor body	
	ii) Nos on terminal Box	
7.	Vibration pads	
	i) Nos and size	
	ii) Location	
8.	Any other fitments	
E.	**List of curves.**	
1.	Torque speed characteristic of the motor	
2.	Thermal withstand characteristic	
3.	Starting. current Vs. Time	
4.	Starting. current Vs speed	
5.	P.F. and Effi. Vs Load	
F.	**Additional Data to be filled for each rating of DC Motor**	
1.	Rated armature voltage (Volt)	
2.	Rated field excitation (Amp)	
3.	Permissible % variation in voltage	
4.	Minimum Permissible Starting voltage (volt)	
5.	At rated voltage	
	i)Full load Armature current.(Amp)	
	ii)Full load Field current (Amp)	

	iii)No load Armature current (Amp)	
6.	Full load Field current (Amp)	
7.	No load Aramature current (Amp)	
8.	Minimum permissible field current(Amp) to avoid	
	i) Maximum permissible voltage	
	ii) Rated voltage	
	iii) Minimum Permissible Voltage	
9.	Resistance (indicative Values) in ohm	
	i)Armature winding(Arm + IP + Series) at 25	
	ii) Field Winding at 25 deg. C	
10..	Inductance (indicative values)	
	i) Armature winding	
	ii) Field winding	
11	Value of trimmer resistance (ohm) to be connected in series with the shunt field to	
	i) 220 V DC	
	ii) 250 V DC	
	iii) 187 V DC	
12	Value of the external resistance (ohm)required to be connected in series with armature during starting only	
13	Technical data sheet for external resistance box	
14	GA drawing of motor	
15	Starting time calculation	
16	Starter resistance design calculation	
17	Electrical connection diagram of motor	

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.	VERIFICATION FROM MOTOR DATASHEET (Y/N)	KKS 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	20	21

ANNEXURE-III

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)/ CUSTOMER
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 (cc): 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	2 X 660MW TALCHER TPP	NAME		DATA FILLED UP ON	
	SYSTEM	DM/ PT PLANT	SIGN.		DATA ENTERED ON	
	DEPTT. / SECTION	MAX	SHEET 1 OF 1	REV. 00	DE'S SIGN. & DATE	

CABLE SCHEDULE FORMAT

ANNEXURE IV

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

SECTION-C3
(SPECIFIC TECHNICAL REQUIRMENT-C&I)

SPECIFIC TECHNICAL REQUIREMENTS (C&I)
PT PLANT

1. The control system for PT plant shall be DDCMIS based (BHEL's scope). Profibus based controls and conventional controls (hardwired 4-20mA/DI/DO) are envisaged for this package.

2. Bidder to provide **Profibus PA protocol compatible PT(Pressure Transmitters),DPT(Differential Pressure Transmitters),TT(Temperature Transmitters) and Flow/Level Transmitters(DP based)** for entire PT Plant package.

3. **All motorized valves shall be supplied with Non-intrusive Profibus based Electric Actuator(with integral starter)** for PT plant package along with necessary interface units for linking to corresponding Control System as applicable.

4. **Profibus based electronic positioner** (as per standard and proven practice of valve OEM) is to be provided with all the pneumatic operated control valves.

5. The Profibus protocol design shall be further validated by BHEL and approved by NTPC during detailed engineering and any variation/changes required based on DDCMIS system requirements and actual field installation, operational philosophy etc. shall be considered by bidder without any implications

6. Bidder to note that all transmitters(except Profibus compatible transmitters) shall be smart type and shall have 4-20mA DC signal with superimposed digital communication(HART)

7. Profibus DP based IMC in LV SWGR/MCC (BHEL's scope) shall be provided.

8. 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.

9. Bidder to provide **Comprehensive Annual Maintenance Services (AMS)** for three (03) years after warranty period for the Analyser instruments and Profibus instruments of PT plant.

10. Bidder shall provide the following :-
    a) Configuration/ diagnostic tool for Non-intrusive profibus based actuators - 5 Nos. or 5% of total quantity of actuator whichever is more.
    b) Configuration/ diagnostic tool for all Profibus based instruments – 2 Nos of each make.

    Bidder shall also provide all required software (lifetime licensed) and hardware (cables/connectors, Tablet/ Laptop etc.) along with these tools.

11. Bidder to provide all the instruments envisaged for sea water 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.

12. Bidder to provide Junction Boxes in field for termination of all the instruments.

13. Bidder to provide atleast 20% spare terminals in Junction boxes,LIE/LIRs etc.

14. All the transmitters supplied by Bidder shall be LIE/LIR mounted . The LIE/LIRs shall be in Bidder's scope of supply.

15. All the instruments having contact with corrosive media shall be provided with chemical/diaphragm seal.

16. All weather Local Panel fitted with integral Air Conditioner shall be provided by the Bidder for housing analyzers etc if the same are not kept in AC rooms.

17. For level transmitters, electronics items etc. all weather canopy\ rack enclosures shall be provided by Bidder for protection from direct sunlight and rain for open locations. For applications where transmitter location is not accessible, the transmitter shall have separate sensor unit and electronic unit for such applications. It should be mounted at accessible location.

18. All field instruments/analyzers/actuators/sov/control valves etc. shall be hooked with DDCMIS based control system as per requirement mentioned elsewhere in the specification.

19. All electrical devices like switches/ transmitters/ controller/ analyzer/ solenoid valves which are located in the in hazardous areas shall be made intrinsically safe by providing suitable type of transformer isolated barrier / Zener barrier of standard make & shall be provided with explosion proof enclosure suitable for hazardous areas described in National Electric Code (USA), Article 500, Class-I, Division-I or EN60079-14 or shall comply with the essential requirements of ATEX directives.

20. All measuring instruments/equipment/analysers and subsystems offered by the Bidder shall be from reputed experienced manufacturers ((from BHEL/customer approved vendor list) of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards.
    Further, Bidder to meet the **provenness criteria** for all the supplied C&I items mentioned elsewhere in the specification

21. 230 V AC UPS Power supply shall be provided by BHEL at a single point, 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. Further, Bidder to furnish UPS load data during detailed engineering in BHEL format.

22. Bidder to provide mandatory spares for C&I items as per mandatory spares list

23. Bidder to perform tests of C&I items/instruments/systems as per Quality plans/type test attached in the specification.

24. Bidder's representative shall be present at BHEL-PEM for 3 man-days, for preparation of Control scheme of PT PLANT. All the expenses like boarding, lodging and travel, air fare etc. shall be in bidder's scope.

25. Bidder's presence is required for 3 Man days (Excluding travel time) at EDN Bangalore during FAT of DDCMIS for certifying correctness & completeness of implementation of Control logic. Intimation regarding FAT shall be given 2

days in advance. All the expenses like boarding, lodging and travel, air fare etc. shall be in bidder's scope.

26. Bidder's presence is required for 15 Man days (in three visits) at site during commissioning of DDCMIS for assistance related to process correctness. Three visits shall be made with total 15 Man days(excluding travel time) in which one visit shall be of 5 man days each. All the expenses like boarding, lodging and travel, air fare etc. shall be in bidder's scope.

27. Bidder shall furnish Instrument Schedule, Control Scheme, I/O list, Drive list, Cable Schedule, Cable interconnection, Instrument/SOV/Analyzers Installation diagram, Instrument/Analyzer datasheets, JB grouping, SOV grouping,Annunciation list, List of Instruments/devices for Profibus/HART,configuration diagram for Profibus based actuators/instruments in BHEL approved format. Also, editable database format like MS Excel, MS Access etc. of these documents shall also be provided by Bidder.

28. Bidder shall provide complete Instrumentation for control, monitoring and operation of entire PT PLANT. 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 BHEL/customer shall prevail without any commercial implication.

ACTUATORS

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.

4.00.00 REQUIREMENT FOR NON-INTRUSIVE PROFIBUS ACTUATOR

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 for calibration / settings/ configuration of various parameters of actuator shall be provided.
4.11.00	**SIL Certification**	All actuators shall be certified for SIL 2 or better.

contd. on next page

REQUIREMENT FOR NON-INTRUSIVE PROFIBUS ACTUATOR

4.12.00	**Interfaces**	For ON-OFF and INCHING type actuators interface with the control system shall be through fieldbus network. a) Open/ close commands, open/ close feedback status, disturbance signal etc. shall be available to the Control System through the fieldbus network along with diagnostics. The detailed diagnostics including the actuator operating data shall be available to the DDCMIS through the fieldbus network. b) All actuators shall be Profibus compatible. However the exact protocol shall be based on finalized protocol of If Profibus DP protocol is envisaged then actuator shall have two (redundant) Profibus DP ports for connecting the redundant Profibus DP cables. That is if one profibus cable is cut or not working/ not available, then complete actuator functionality shall be available through the second redundant cable without any manual intervention. Also, for Profibus DP cable connection, suitable connector integral to the actuator, or external devices/ accessories (mounted inside minimum IP65 protection class enclosure) shall be provided so that the actuator can be isolated online from the profibus network without disturbing the Profibus communication of other actuators of the segment. c) Open/close command termination logic shall be suitably built inside actuator. d) For all actuators GSD and DTM files are to be provided which shall be configured/ tested with DCS for proper interfacing and diagnostics.
4.13.00	**Terminal Box**	Suitable terminals/ connectors, integral to actuator, for terminating fieldbus cables and power cables shall be provided. Necessary glands for power cables and armored fieldbus cables shall be provided.
4.14.00	**Training**	Contractor shall provide training on Non-Intrusive Profibus Electric Actuator along with detail training on Profibus interface used in actuator for Employer's personnel.

	DATASHEET FOR MOTORISED VALVE ACTUATOR (2X660MW Talcher STPP)	SPECIFICATION NO.:	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE:06/03/2020
		SHEET 1 OF 4	

Data Sheet A & B

	DATA SHEET-A (TO BE FILLED BY PURCHASER)		DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL*	* PROJECT	2X660 MW TALCHER STPP		
	OFFER REFERENCE			
	* TAG NO. SERVICE			
	* DUTY	☐ ON / OFF ** ☐ INCHING		
	* LINE SIZE (inlet/outlet): MATERIAL			
	* VALVE TYPE	☐ GLOBE ☐ GATE ☐ REG. GLOBE ☐ BUTTERFLY		
	* OPENING / CLOSING TIME			
	* WORKING PRESSURE			
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF -20 to70 DEG C AND RELATIVE HUMIDITY OF 0-95%IN HOT HUMID AND TROPICAL ATMOSPHERE AND HIGHLY POLLUTED AT PLACES OF COAL DUST AND FLY DUST		
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY		
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY		
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY		
CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF,DUST TIGHT SUITABLE FOR OUTDOOR USE WITHOUT CANOPY, NEMA6/IP:68		
	MECHANICAL POSITION INDICATOR	TO BE PROVIDED FOR 0-100% TRAVEL		
	BEARINGS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.		
	GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION	METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.		
	SIZING	OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 85% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. **FOR INCHING SERVICE - 150 STARTS/HR MINIMUM & FOR REGULATING SERVICE - 600 STARTS/HR MINIMUM** as per IEC60034-1		
HANDWHEEL as per standard EN 12570:2000	* REQUIRED	■ YES ☐ NO		
	* ORIENTATION	☐ TOP MOUNTED ☐ SIDE MOUNTED		
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.			
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY		
	MOTOR MAKE / MODEL / TYPE / RATING (KW) (REFER NOTE NO. 6 & 7)	BIDDER TO SPECIFY		
	@ MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT-INCLUSIVE OF **I.S.** TOLERANCE		
	ACTUATOR APPLICABLE WIRING DIAGRAM (TO BE DECIDED DURING DETAILED ENGINEERING)	BIDDER TO FURNISH WIRING DIAGRAM		
	COLOUR SHADE	☐ BLUE (RAL 5012) ☐ SIEMENS GRAYRAL 7030/32 ■TO BE DECIDED DURING DETAILED ENGINEERING		
	PAINT TYPE	☐ ENAMEL ☐ EPOXY CONFIRMING TO CORROSION CATEGORY C5-I ■ TO BE DECIDED DURING DETAILED ENGINEERING		
	SHAFT RPM	BIDDER TO SPECIFY		
	OLR SET VALUE	BIDDER TO SPECIFY		
	@ STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		

Data Sheet A & B

		DATA SHEET-A (TO BE FILLED BY PURCHASER)	DATA SHEET-B (TO BE FILLED-UP BY BIDDER)
	@ PWR SUPP TO MTR / STARTER	415V, 3PH, AC	
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER ■ 230 V ■ 110 V	
	@ ENCLOSURE CLASS OF MOTOR	☐ IP 67 ■ IP 68 ■ FLAME PROOF TO BE DECIDED DURING DETAILED ENGINEERING	
	@MOTOR BEARING WITH 2 EARTH TERMINALS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI FRICTION	
	@ INSULATION CLASS	CLASS F. TEMPERATURE RISE 70 Deg C. OVER 50 Deg C AMBIENT	
	@ WINDING TEMP PROTECTION	■ THERMOSTAT (3 Nos.,1 IN EACH PHASE)	
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED (THERMISTOR PTC)	
INTEGRAL STARTER	INTEGRAL STARTER	■ REQUIRED ☐ NOT REQUIRED	
	TYPE OF SWITCHING DEVICE	■ CONTACTORS ■ CONTACTORS(REVERSING TYPE) ■ THYRISTORS	
	TYPE	☐ CONVENTIONAL ■ NON-INTRUSIVE PROFIBUS	
	IF NON-INTRUSIVE PROFIBUS (REFER BELOW POINT a – g)		
	a) INTERFACE WITH CONTROL SYSTEM	■ PROFIBUS ☐ HARDWIRED	
	b) FIELDBUS PROTOCOL	■ PROFIBUS DP ☐ PROFIBUS PA ☐ FOUNDATION FIELDBUS	
	c) REDUNDANT PORTS(IN CASE,PROFIBUS DP PROTOCOL)	■ REQUIRED ☐ NOT REQUIRED	
	d)TORQUE/LIMIT MEASUREMENT TRANSMITTER(REFER NOTE NO.9)	■ REQUIRED ☐ NOT REQUIRED	
	e)POSITION MEASUREMENT TRANSMITTER(REFER NOTE NO.9)	■ REQUIRED ☐ NOT REQUIRED	
	f)LCD DISPLAY INTEGRAL TO ACTUATOR BODY(REFER NOTE NO.10)	■ REQUIRED ☐ NOT REQUIRED	
	g) SIL CERTIFICATION(SIL 2 OR BETTER)	■ REQUIRED ☐ NOT REQUIRED	
	STEP DOWN CONT. TRANSFORMER	■ REQUIRED	
	OPEN / CLOSE PB	■ REQUIRED ☐ NOT REQUIRED	
	STOP PB	■ REQUIRED ☐ NOT REQUIRED	
	INDICATING LAMPS	■ REQUIRED ☐ NOT REQUIRED	
	LOCAL REMOTE S/S(LOCKABLE)	■REQUIRED ☐ NOT REQUIRED	
	STATUS CONTACTS FOR MONITORING	■ REQUIRED ☐ NOT REQUIRED	
	INTEGRAL STARTER DISTURBED SIGNAL (TO BE DECIDED DURING DETAILED ENGINEERING)	REQUIRED MOTOR THERMOSTSTTRIP O/L RELAY OPTD, CONT./POWER SUPPLY FAILED,S/S IN LOCAL/REMOTE/OFF MODE,TORQUE SWITCH OPEN/CLOSE CUT OFF/STOP PB OPTD,VALVE JAMMED ETC)	
	ACTION ON LOSS OF EXTERNAL ELECTRIC POWER	■ STAYPUT ■ FAIL SAFE TO BE DECIDED DURING DETAILED ENGINEERING	
INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter) DATASHEET & WIRING DIAGRAM OF	TYPE OF ISOLATING DEVICE	■ INTERPOSING RELAY ■ OPTO COUPLER TO BE DECIDED DURING DETAILED ENGINEERING	
	QUANTITY	■ 2 NOs. ■3 NOs. TO BE DECIDED DURING DETAILED ENGINEERING	
	DRIVING VOLTAGE	■ 20.5 – 24V DC ☐ _____V DC	
	DRIVING CURRENT	■ 125mA MAX ☐ _____mA MAX	

Data Sheet A & B

	DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)		
ISOLATION DEVICE TO BE PROVIDED(NOT APPLICABLE FOR NON-INTRUSIVE PROFIBUS ACTUATOR)	LOAD RESISTANCE	■ > 192 ohms - <25 k ohms ☐ > _____ohms - < _____ohms				
TORQUE SWITCH(NOT APPLICABLE FOR NON-INTRUSIVE PROFIBUS ACTUATOR)	MFR & MODEL NO.	BIDDER TO SPECIFY				
	OPEN / CLOSE	■1 No. ☐2Nos. / ■1 No. ☐2Nos				
	CONTACT TYPE	2 NO + 2 NC				
	RATING	5A 240V AC AND 0.5A 220V DC				
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE				
	ACCURACY	+3% OF SET VALUE				
LIMIT SWITCH(NOT APPLICABLE FOR NON-INTRUSIVE PROFIBUS ACTUATOR)	MFR & MODEL NO.	BIDDER TO SPECIFY				
	OPEN : INT : CLOSE	☐1 No ■2 Nos.	2 Nos. (ADJ.)	☐1 No. ■2Nos.			
	CONTACT TYPE	2 NO + 2 NC				
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V				
	ACCURACY	2% OF SET VALUE				

POSITION TRANSMITTER (ALSO REFER NOTE NO.9)	POSITION TRANSMITTER	■ REQUIRED ☐ NOT REQUIRED	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	TYPE	■ ELECTRONIC (2 WIRE) R/I CONVERTER ■ ELECTRONIC (2 WIRE) CONTACTLESS TO BE DECIDED DURING DETAILED ENGINEERING	
	SUPPLY	■ 24V DC ☐	
	OUTPUT	■ 4-20mA	
	ACCURACY	± 1% FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY (NON NTEGRAL)	240V AC,1 PH.,50 Hz	
	@ POWER SUPPLY (INTEGRAL)	BIDDER TO SPECIFY	
	@ RATING		
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED	
	ENCL CLASS ACTUATOR/MOTOR T.B.	@■ IP 68 @■ TO BE DECIDED DURING DETAILED ENGINEERING	
	@ EARTHING TERMINAL	REQUIRED	
	PLUG & SOCKET	■ REQUIRED ■ NOT REQUIRED (TO BE DECIDED DURING DETAILED ENGINEERING)	
	NO. OF PINS REQUIRED	■ 9 PINS ■ 13 PINS (TO BE DECIDED DURING DETAILEDENGINEERING)	
	NOS. OF PLUG & SOCKET	☐ 1 Nos. for ON/OFF ☐ 2 NOS.(for inching duty)	
CABLE GLANDS	@ POWER CABLE GLAND	QUANTITY & SIZE TO BE DECIDED DURING DETAILED ENGINEERING	
	@ SPACE HEATER CABLE GLAND		
	CONTROL CABLE GLANDS-1		

Data Sheet A & B

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

	CONTROL CABLE GLANDS-2		
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY	_____ Kg.

NOTES:

1. **SCOPE**: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY.
2. **CODES & STANDARDS**: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH:
   IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691, IS-4722, IEC 60947-5-1 AND EN 15714-3 :2010 OR LATEST VERSION.
3. TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C.
4. CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED.
5. THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION.THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE.
6. THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.
7. THE MOTOR SHALL BE CAPABLE OF STARTING AT 85 PERCENT OF RATED VOLTAGE RUNNING AT 80 PERCENT OF RATED VOLTAGE AT RATED TORQUE AND 85 PERCENT RATED VOLTAGE AT 33 PERCENT EXCESS RATED TORQUE FOR A PERIOD OF 5 MINUTES EACH
8. IN ADDITION TO ABOVE REQUIREMENTS FOR LIMIT/TORQUE SWITCH, MECHANICAL END STOP WITH ACCURACY OF 2% SHALL BE SUPPLIED.
9. 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
10. A LOCAL LCD DISPLAY SHALL BE PROVIDED TO GIVE INFORMATION REGARDING ACTUATOR ALARMS, STATUS AND VALVE POSITION INDICATION AS A MINIMUM IN LOCAL.
11. IT SHOULD BE POSSIBLE TO OPERATE THE ACTUATOR LOCALLY. LOCKABLE LOCAL/REMOTE SELECTION SHALL BE PROVIDED ON THE ACTUATOR.
12. LOCAL POSITION INDICATOR SHALL BE PROVIDED FOR 0 TO 100 % TRAVEL.
13. CONTROL WIRING SHALL BE SUITABLE VOLTAGE GRADE COPPER WIRE OF 1.5 SQ. MM.
14. ENDURANCE: RATED TORQUE RANGE SHOULD BE BASED ON ISO 5211, ISO5210.
15. TAG PLATE SHALL BE CONFIRMING TO STANDARD BS-15714.
16. THE ACTUATORS SHALL BE DESIGNED TO BE SELF-LOCKING UPON LOSS OF POWER. MOTOR SHALL BE DESIGNED TO CLOSE IN 30 SECS. FROM FULL OPEN POSITION AND SHALL HAVE ADEQUATE CAPACITY TO OPEN AND CLOSE UNDER FULL UNBALANCED DESIGN PRESSURE.
17. AUTOMATIC PHASE CORRECTION FACILITY AND POTENTIAL FREE CONTACT FOR ANNUNCIATION OF POWER FAILURE SHALL BE PROVIDED.
18. LIMIT SWITCHES SHALL BE SILVER PLATED WITH HIGH CONDUCTIVITY AND NON-CORROSIVE TYPE. CONTACT RATING SHALL BE SUFFICIENT TO MEET THE REQUIREMENT OF CONTROL SYSTEM SUBJECT TO A MINIMUM OF 60 V, 6 VA RATING. PROTECTION CLASS SHALL BE IP67.
19. SUITABLE TERMINALS/CONNECTORS.INTEGRAL TO ACTUATORS ,FOR TERMINATING FIELDBUS(PROFIBUS-DP) CABLES AND POWER CABLES SHALL BE PROVIDED.NECESSARY GLANDS FOR POWER CABLES AND ARMORED FIELDBUS CABLES SHALL BE PROVIDED.
20. THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +5% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%.
21. ACTUATOR SHALL ATTAIN FULL SPEED OPERATIONS BEFORE VALVE LOAD IS ENCOUNTERED AND IMPART AN UNSEATING BLOW TO START THE VALVE IN MOTION (HAMMER BLOW EFFECT).
22. OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 90% OF RATED VOLTAGE.

NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @ BE FILLED BY ES

	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL
NAME				NAME
SIGNATURE				SIGNATURE

SPECIFIC TECHNICAL REQUIREMENTS (C&I)

1.FIELD & MEASURING INSTRUMENTS.
2.PROCESS CONNECTION AND PIPING.
3.INSTRUMENT INSTALLATION DIAGRAM.

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/ /Profibus PA complying to IEC 61158.) 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

Above parameters/features of offered models shall be strictly as defined in standard published catalogue of the manufacturer only.

Transmitter shall have weather proof IP-67 metallic housing with durable corrosion resistant coating, integral digital display with self-indicating diagnostics, Plug and socket type electrical connection for HART and ½ "NPT (F) for Profibus type Transmitter, calibration using Profibus calibrator, 2/3/5 Valve non integral manifold and rack with canopy. For HART transmitter SIL 2 certification is required.

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	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.
Adjustment/ calibration	Using hand held HART calibrator/ centralized PC based system (as applicable).
Zero & span	Continuous, temper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument

adjustment	without any level in the tank/sump etc.
Display	Integral digital display.
Load Impedance	500 ohms (minimum).
Electromagnetic compatibility	Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2
Mounting	(i) External cage shall be provided where ever side mounting is required. External cage and other mounting accessories to be provided by the contractor. (ii) Where ever 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	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.
7.	Adjustment/calibration/ maintenance	Using hand held 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 HART Hand Held calibrator

Hand held calibrator shall be provided for adjustment/calibration/maintenance of the HART compatible transmitters. The hand held calibrator shall be suitable for all types of transmitters supplied in the package. If one type of hand held type calibrator is not suitable for communicating with all types of transmitters then separate hand held calibrator will be provided for that specific type of transmitter.

3.00.00 **Temperature Elements and accessories**

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 Aluminium. 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 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.

3.04.00 **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, 1974)

(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 HART/ Profibus terminal/calibrator).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/Fieldbus (Profibus PA/
complying to IEC 61158)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 Fielbus , 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.
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 upto 85 deg C. Maximum number of inputs per such temperature transmitter shall be eight. One (1) no. input shall be kept as spare wired upto 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.

(b) Synchroscope: Accuracy class 0.5 of IS:

5.00.00 **IMPACT HEAD TYPE FLOW ELEMENT**

The impact head type element shall be tubular insert type with four impact ports facing upstream direction, located precisely for determination of average flow velocity and shall be of SS 316 L.

Accuracy shall be 1.0% of actual value or better. Repeatability shall be + 0.1% of actual value or better.

The elements shall be supplied complete with mounting hardware; end support plugs and CS valve manifold (1/2" NPT connection) for instrument connections. All pertinent data including instrument tag no. for the flow element shall be punched on a stainless steel plate and affixed to the element.

Flushing arrangement shall be provided.

For quantity and line size etc., refer Part-A.

Dual path transit time clamp-on Ultrasonic Flow meter may also be used for measurement of CW flow.

12.00.00 SPECIFICATION FOR CORIOLIS FLOW TRANSMITTER

Type	Coriolis
Material of Wetted Parts	316 SS
Material of Housing	304L SS
Accuracy	± 0.2% of Rate
Repeatability	± 0.1% of Rate
Output	4-20 mA DC, HART Compatible
Power Supply	230 VAC or 24VDC operated
Process Temperature range	0-200 degree Celsius
Others	Drain / purging arrangement shall be provided as per standard practice.

Notes: Coriolis Mass flow meter upstream of Burners shall be sized to measure minimum flow corresponding to one burner operation and maximum BMCR rating flow with 25% margin.

The offered Coriolis type flow transmitter shall be suitable for intended application. Contractor shall submit flow and sizing calculation for Employer's approval. For each type of Coriolis type flow transmitter general arrangement and assembly drawing and cable wiring diagram shall be submitted for Employer's approval.

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 and6 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

13.04.00 **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-55, 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.

6) Vibration Rod type switches to be provided for first two fields of ESP.

16.00.00 **NOT USED**

17.00.00 **SOLENOID VALVES**

Solenoid valves shall fulfil the following requirements: